Association of Egyptian-American Scholars

Established in the USA and Canada in 1974

"40th Annual Conference"

"Scientific Challenges & Emerging technology Transfer in Modern Egypt and The Arab World"

In Partnership with

Arab Academy for Science, Technology & Maritime Transport

Under the Patronage of

H.E. Dr. Nabil Al Araby
Secretary General of The League of Arab States

H.E. Dr. Ramzy George Stino
Minister of Scientific Research

Prof. Dr. Ismail Abdel Ghafar
President of Arab Academy

Conference Chair

Tawfik Ayoub, MD
AEAS President
University of Southern California

Conference Co-Chair

Dr. Naser El-Sheimy
AEAS Secretary General
University of Calgary

December 28th – 30th, 2013
Abu Qir - Alexandria - Egypt

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Arab Academy for Science, Technology & Maritime Transport

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AEAS Organizing Committee

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About The Association of Egyptian American scholars (AEAS)

The idea of creating the Egyptian-American scholars association star ted by a discussion between Dr. Mohamed El-Wakil of Wisconsin and Dr. Ahmed Shouman of New Mexico in 1968. They both pursued the formalization of the group suppor ted in Cairo by the Egyptian government and the Society of Friends of Egyptian Scholars Abroad. In 1971, fifteen Char ter members were declared, and by 1972 the registration list reached 62 members. In 1973, the Association of Egyptian-American Scholars in the United States and Canada was formally established, and by 1974 it was officially incorporated in the State of Wisconsin, with Dr. Mohamed El-Wakil as its President. Through the years close to 600 scholars have joined the Association, very many are still active and supportive.

Since its establishment in 1974, the AEAS mission remained to create a forum for North American Egyptian scholars that facilitates dialogue and promotes partnerships with Egyptian counterparts to implement beneficial scholarly endeavors.

The AEAS has contributed abundantly to the scientific and cultural advancement in Egypt. In order to achieve its mission, AEAS members have also collaborated throughout the years with many organizations in Egypt. These organizations include the President's office, the Prime Minister's office, different Ministries such as the Ministry of Higher Education, Ministry of Industry and the Ministry of Electricity, the Supreme Council of Universities, the Academy for Science and Technology and The National Authority for Quality Assurance and Accreditation in Higher Education.

The AEAS Directory on the association website offers much more information that could fit in the book.
http//www.aeascholars.org http//www.aeascholars.org/AEAS-Directory-Full.pdf

About The Arab Academy for Science, Technology & Maritime Transport (AASTMT) The Arab Academy for Science, Technology and Maritime Transport is one of the specialized organizations of the League of Arab States whose member-states are participants in the AASTMT.

Since its establishment in 1972, the Academy has been involved in the various fields of education, training, scientific research and community service. Being a multi-purpose, multi-task institution, the Academy basically offers its services to students from the entire Arab world, as well as those from African countries. The Academy under takes teaching, training designed to qualify students in the all fields of knowledge, including sciences, technology and humanities.

For more than 40 years, the Academy has made several educational, training and research achievements in the spheres of maritime transport, engineering and management sciences through adopting methodological applications of cutting edge technology. The Academy has thus managed to move forward from regionalism to internationalism, occupying a leading, worldwide rank in the list of educational institutions. In 2007, the Academy was granted the award offered by International Organization for Standardization (ISO), thus securing a position among the world's top six institutions in applying standardized levels in higher education.

The Academy offers its educational, training and research ser vices through its branches inside and outside

Egypt

Alexandria	Abu Qir Main Campus
Miami Campus	
Cairo Branch	Heliopolis Campus
Dokki Campus	
Smart Village Campus	
Aswan Branch	
Syria	Latakia Branch

http//www.aast.edu

Maps & Directions

1 Main Conference Hall
2 Farsi Hall (Building E ground Floor)
3 Hall 303 (Building A 3rd Floor)
4 Mosque
5 Restaurant
6 Bank
7 Post Office
8 ATM

Keynote Speakers

Dr. Mostafa El-Sayed

Julius Brown Chair and Regents Professor
Director, Laser Dynamics Lab
Georgia Institute of Technology
School of Chemistry and Biochemistry
Atlanta, Georgia, USA

Dr. Waguih ElMaraghy

Professor & Head
Dept. of Industrial and Manufacturing Systems Engineering
Director, Intelligent Manufacturing Systems Centre IMS Faculty of Engineering, University of Windsor
Windsor, Ontario, Canada

Letter from the AEAS President

Welcome to the Association of Egyptian American Scholars (AEAS) 40th International Conference.
A landmark conference created by the hard work and dedication of the organizing committee, the executive board, AEAS members and friends as well as the strong partnership and commitment to success despite all uncertainties and doubts. The very generous support of the Arab Academy of Science Technology & Maritime Transport, its leadership and staff made this conference in the excellent format and venues we are enjoying, and leaves to us the scientific endeavor as the only tasks to worry about. The collaboration and scholarly input from the academic community and institutions contributed to the rich scientific content and outcome of the conference.

This conference is the fruit of the strategic planning established by the AEAS leadership over the years, to provide support to our mother country on a continuous bases and never the less in time of need. The resultant is a collective effort from scientist, scholars, and experts in the field at the international level, inside and outside Egypt, to provide solutions to Egypt's eminent problems and similar ones in the Arab world. The long-term plan remains the development and strengthening of indigenous science and technology and the investment in future social & economic development of our country to its appropriate role and place in the leading advanced countries.

The collaborative work of this cream of the crop is a hefty sixty papers in different disciplines by utilizing and investing in the most valuable resource in Egypt; we can solve all Egypt's current problems and build the future. By providing "Education, Health and Job" to we could solve all Egypt current problems and build a bright future we all seek for our country. The example is already at hand allowing our Young Researchers to present the results of their work, a very scholarly educational activity aiming at building future generation of scientist & researchers who will hold the future banner of our countries. I strongly believe together we will build this Nation Strong, a Shining Torch of culture, science and wealth to all other nations.

Finally, I sincerely express my gratitude to all and each, and I will leave you with a quote from the speech "The Man in the Arena" by "Theodore Roosevelt" at the Sorbonne, France April 23, 1910.
"*It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat*".

Tawfik Ayoub, MD
President of AEAS

Letter from the ASSTMT President

As the President of the Arab Academy for Science, Technology and Maritime Transport (AASTMT), I would like to extend my hearty welcome to all of you who are participating in the 40th annual Conference of the association of the Egyptian/Arab Scholars, focused on “Scientific Challenges and Emerging Technology Transfer in Modern Egypt & Arab World”.

The Arab Academy is honored to host this highly regarded event, which shows the emphasis that it places on technology and its major importance in this era.

As a specialized organization affiliated to the League of Arab States, the Arab Academy would like to share its expertise, resources and facilities with all the knowledgeable scholars participating in this significant event.

This event is the culmination of an enormous collective effort of highly qualified scientists seeking the development of our country and the Arab world at large.

In recent years, the scientific arena in the Arab world has witnessed a paramount interest in the applications of technology and the vital role they play in finding possible and proper solutions aiming at developing society and boosting multifarious technological advances.

Our ambition is to establish strong channels of communication in order to facilitate transfer of knowledge and expertise and to encourage creativity at all scientific levels in Arab countries.

We still have a long way to go, and only through joint efforts, we will be able to reach our fundamental goal. In the name of the AASTMT, I sincerely hope that the discussions and recommendations of this conference will positively serve as a catalyst for concrete outcomes that will have a significant impact on the Arab world.

I hope you find this conference both interesting and stimulating and wish you a good stay in Alexandria.

Prof. Ismail Abdel Ghafar Ismail Farag
President of AASTMT

DAY ONE
(December 28th, 2013)

Conference Registration: 08:00 am - 05:00 pm

09:00 - 10:00 am	**AASTMT Tour** *The Planetarium Center* *Bus tour in Abu-Qir Campus*

Master of Ceremony
Dr. Naser El-Sheimy
AEAS Secretary General & Conference Co-Chair
Professor and Canada Research Chair - University of Calgary

Roadmaps & Strategic Development
"Role of Education & Scientific Research In the Economic Development of Egypt"

10:00 - 10:30 am	***Dr. Hassan Alwakil*** *Representing* ***Dr. Hassan Rateb*** Chairman of Board of trustees of Sama Group ***Development of Sinai as Strategic Goal for Egyptian Economics***
10:30 - 11:00 am	***Dr. Mohamed Attalla*** Associate Vice-President, McMaster University – Ontario, Canada ***Energy Conservation and Renewable Energy implementation in the Egyptian Economy***
11:00 - 11:30 am	***Dr. Mohamed ElGhamry*** Dean of the Technical and Vocational Institute at AASTMT ***Research & Development Center as a Model for all other Egyptian Universities to Pursue***
11:30 am – 12:00 pm	***Dr. Naser El-Sheimy, PEng, CRC*** Professor and Canada Research Chair & Scientific Director, TECTERRA Department of Geomatics Engineering, the University of Calgary ***The Role of Geo-informatics in Economic Development***

Exhibition Opening & Coffee Break: 12:00 - 01:00 pm

Open Ceremony	
01:00 - 01:10 pm	***Dr. Tawfik Ayoub*** President of AEAS & Conference Chair Keck School of Medicine University of Southern California Los Angeles, California - USA
01:10 - 01:20 pm	***Dr. Mohamed Attalla*** AEAS Past-President
01:20 - 01:35 pm	***Dr. Ismail Abdel Ghafar*** Arab Academy President and Host
01:35 – 01:50 pm	***H.E. Dr. Ramzy Georges Stino*** Minister of Scientific Research
01:50 – 02:20 pm	***Dr. Essam Heggy*** Advisor of the President of Egypt
02:20 – 02:30 pm	***H.E. Dr. Nabil Al Araby*** Secretary General of the States of Arab League
Keynote Speech: "Nano-Technology meets biology in the cancer cell"	
02:30 – 03:00 Pm	***Dr. Mostafa El-Sayed*** Julius Brown Chair and Regents Professor Georgia Institute of Technology
Lunch & Socialization: 03:00 – 04:30 pm	

"Role of Education & Research On Egyptian Health"

04:30 – 05:00 pm	***Dr. Rashad Barsoum*** Former chair of Medical sector in the Supreme Council of Universities ***Reform of Medical Education in Egypt - a vision for the future***
05:00 – 05:30 pm	***Dr. Somaya Hosny*** Dean of Faculty of Medicine, Suez Canal University ***Quality in Higher Education, the lack of which is one of the main reasons for Egypt's current problems***
05:30 – 06:00 pm	***Dr. Salwa Elgebaly*** President & CEO Nour Heart, Inc. Maryland, USA ***Economic Development In Egyptian Pharmaceutical Companies***
06:00 – 06:30 pm	***Dr. Fouad Kandeel*** Chair and Professor, Department of Clinical Diabetes Endocrinology and Metabolism – City of Hope ***Diabetes in Egypt: current & Future perspectives***

DAY TWO (December 29th, 2013)		
General Schedule		
Scientific Papers Posters & Oral Presentations		
From	To	Activity
08:00 am	**09:00 am**	**Registration**
09:00 am	10:00 am	Keynotes - Dr. Waguih ElMaraghy
10:00 am	**11:30 am**	**Scientific Presentations**
11:30 am	12:30 pm	Coffee & Posters Discussions
12:30 pm	**02:30 pm**	**Scientific Presentations**
02:30 pm	03:30 pm	Lunch
03:30 pm	**05:30 pm**	**Scientific Presentations**
07:00 pm	10:00 pm	Dinner & Award Banquet The Hilton Corniche Hotel - Alexandria

DAY TWO - December 29th, 2013
Main Conference Hall

Health and health related topics "Egypt Health - Past, present & future"
صحة المواطن المصري

Morning Sessions
Sessions Co-Chairs
Dr. Rashad Barsoum, Dr. Tawfik Ayoub, Dr. Rasmy Talaat

From	To	Name	Paper Title
10:00 am	10:30 am	Dr. Salwa Elgebaly	Early identification of patients with ischemic heart disease
10:30 am	11:00 am	Dr. Lamis Ragab	Medical education in Egypt: current status, points of strength and weakness
11:00 am	11:30 am	Dr. Mostafa Abdel Nasser	**Abstract submitted Presenter no Show**
11:30 am	12:30 am	Coffee & Posters Discussions	

Early Afternoon Sessions
Sessions Co-Chairs
Dr. Rashad Barsoum, Dr. Somaya Hosny, Dr. Lamis Ragab

12:30 pm	01:00 pm	Dr. Atef Radwan	Medical education reform without a change: the teacher gap
01:00 pm	01:30 pm	Dr. Shoukry Kantiry Dr. Amer El-Ahraf	Medicine and public Health in Ancient Egypt: A Historical and Pictorial Presentation
01:30 pm	02:00 pm	Dr. Tawfik Ayoub	Health Reform In Egypt – A Must For Current Recovery And Future Development
02:30 pm	3:30 pm	Lunch	

DAY TWO - December 29th, 2013
Main Conference Hall

Health and health related topics "Egypt Health - Past, present & future"
صحة المواطن المصري

Late Afternoon Sessions
Sessions Co-Chairs
Dr. Adel Talaat, Dr. Salwa Elgebaly, Dr. Fouad Kandeel

From	To	Name	Paper Title
03:30 pm	04:00 pm	Dr. Ahmed Fadil	The price is high, and the outcome is poor
04:00 pm	04:30 pm	Dr. Rasmy Talaat	Egypt: Hub of Preclinical and Clinical Pharmaceutical Research, Potentials and Challenges
04:30 am	05:00 am	Dr. Amr Elmaraghy	The Diagnosis and Management of Pectoralis Major Tears
07:00 pm	10:00 pm	Dinner & Award Banquet The Hilton Corniche Hotel - Alexandria	

DAY TWO - December 29th, 2013
Farsi Hall

Engineering, technology and Egypt infrastructures related issues
Shore & Environmental Protection, Traffic management systems and techniques and Ports development

Morning Sessions
Sessions Co-Chairs
Dr. Waguih ElMaraghy, Dr. Adel Kamal Ismail, Dr. Adel Nofal

From	To	Name	Paper Title
10:00 am	10:30 am	Dr. Hassan El shall Dr. El-Sayed Abdel-Aal	Desalination of Red Sea Water Using Hybrid System of Electrodialysis and Ion Exchange
10:30 am	11:00 am	Dr. Hassan El shall Dr. El-Sayed Abdel-Aal	Preparation and Coating of Hydroxyapatite for Medical Applications
11:00 am	11:30 am	Dr. Adel Kamal Ismail	Potentials of Alternative Energy Sources in Egypt
11:30 am	12:30 am	Coffee & Posters Discussions	

Early Afternoon Sessions
Sessions Co-Chairs
Dr. Waguih ElMaraghy, Dr. Adel Kamal Ismail, Dr. Adel Nofal

12:30 pm	01:00 pm	Dr. Adel Nofal	The Foundry Industry: A Major Player in the Egyptian Wind Energy Program
01:00 pm	01:30 pm	Dr. Mohamed Elghamry Eng. Amr Khamis	Energy Efficient and Low cost Atmospheric Water Generator
01:30 pm	02:00 pm	Dr. Mohamed Elghamry Eng. Riham Zein	Networked, Anti-failure and Cost efficient Neonatal Incubator Model
		Dr. Ahmed Tawfik	**Abstract submitted Presenter no Show**
02:30 pm	3:30 pm	Lunch	

DAY TWO - December 29th, 2013
Farsi Hall

Engineering, technology and Egypt infrastructures related issues
Shore & Environmental Protection, Traffic management systems and techniques and Ports development

Late Afternoon Sessions
Sessions Co-Chairs
Dr. Waguih ElMaraghy, Dr. Adel Kamal Ismail, Dr. Adel Nofal

From	To	Name	Paper Title
03:30 pm	04:00 pm	Dr. Hesham El-Askary	On the Influence of dust storms, anthropogenic pollution and biomass burning on air quality over the Nile Delta during 2000-2010
04:00 pm	04:30 pm	Dr. Ahmed ElSawy	A Study on Using Pulsed Corona Discharges to Degrade Humic Acid from Drinking Water With and Without Titanium Dioxide
		Dr. Kamilia El Barawy	**Abstract submitted Presenter no Show**
		Dr. Khalid Abd Elghany	**Abstract submitted Presenter no Show**
		Dr. Maha El-Meligy Dr. Ahmed Farahat Dr. Eman El-Shenawy	**Abstract submitted Presenter no Show**
		Eng. Ashraf Salah-Eldin	**Abstract submitted Presenter no Show**
07:00 pm	10:00 pm	Dinner & Award Banquet The Hilton Corniche Hotel - Alexandria	

DAY TWO - December 29th, 2013
Hall 303

Egypt's Culture, Environment, Economic Development, Natural Resources, Commerce, Education and Workforce Development to Meet the Expected Economic Growth

Morning Sessions
Sessions Co-Chairs
Dr. Ismail Gomaa, Dr. Mohamed Abousalem

From	To	Name	Paper Title
10:00 am	10:30 am	Dr. Fatma El Zahraa Mostafa	Reengineering the higher education system in Egypt according to the excellence management Outlook study
10:30 am	11:00 am	Eng. Hossam Younes Dr. Ossama Badawy Dr. Nevine Khourshid	Using Knowledge Management System and Innovation Framework (KMIF) for Quest of Excellence Achievement
11:00 am	11:30 am	Dr. Ismail Gomaa	The Role of Education and Innovation in Global Transition
11:30 am	12:30 am	Coffee & Posters Discussions	

Early Afternoon Sessions
Sessions Co-Chairs
Dr. Abo Bakr Selim Abdo, Dr. Rasha Abdel Aziz

12:30 pm	01:00 pm	Dr. Mahmoud Omar Selim	Women and Horse Riding in the Pharaonic New Kingdom
01:00 pm	01:30 pm	Eng. Mai Mokhtar Mohamed	Impact of Urban Landscape on City Environment – A GIS Based Study on Urban Plant
01:30 pm	02:00 pm	Dr. Mohamed Abousalem	TECTERRA: A Unique Organization Leading the Commercialization of Innovative Technology in Canada
02:00 PM	02:30 PM	Dr. Essam ElSaeed	مشروع توثيق التراث بمركز الخطوط بمكتبة الاسكندرية
02:30 pm	3:30 pm	Lunch	

DAY TWO - December 29th, 2013
Hall 303

Egypt's Culture, Environment, Economic Development, Natural Resources, Commerce, Education and Workforce Development to Meet the Expected Economic Growth

Late Afternoon Sessions
Sessions Co-Chairs
Dr. Mahmoud Omar, Dr. Essam ElSaed

From	To	Name	Paper Title
03:30 pm	04:00 pm	Dr. Nevine Sobhy	Quality in E-Learning Accounting Courses.... Is it Possible?
04:00 pm	04:30 pm	Mr. Sherif El-Batanomy Dr. Rasha Abd El Aziz	The Competitive Advantage of it in Egyptian Firms: a Resource Based Perspective
04:30 pm	05:00 pm	Dr. Abo Bakr Selim Abdo	Minorities Impact on International Politics
05:00 pm	05:30 pm	Dr. Shoukry Kantiry	Midwives and maternity care in Ancient Egypt
07:00 pm	10:00 pm	Dinner & Award Banquet The Hilton Corniche Hotel - Alexandria	

DAY TWO - December 29th, 2013

Poster Presentations

Economics, Oceanography, Education & Engineering

Poster Session Discussion Committee
Dr. Tawfik Ayoub, Dr. Mohamed Attalla, Dr. Ahmed ElSawy

Name	Paper Title
Mr. Adeeb Arafeh Dr. Samir Arafeh	Business process management new concepts applied in healthcare case of "Continuous Performance Improvement"
Mr. Mohamed Abdalmoniem Khamis	Enhancing Technology Commercialization in Egypt: Lessons from the Malaysia Case
Dr. Ghada Abdel Wahab El Khayat	New Technology Parks in Egypt: Location or Networking decisions?
Dr. Maha Ahmed Mohamed Abdallah	**Abstract submitted,☐Presenter no Show**
Eng. Reham Reda Abbas Awad	**Abstract submitted,☐Presenter no Show**

DAY THREE (December 30th, 2013)		
General Schedule		
Scientific Papers Posters & Oral Presentations		
From	**To**	**Activity**
08:00 am	09:00 am	Registration
09:00 am	11:30 am	Scientific Presentations
11:30 am	12:00 pm	Coffee Break
12:00 pm	02:30 pm	Scientific Presentations
02:30 pm	03:30 pm	Resolution & Adjourn

DAY THREE - December 30th, 2013
Main Conference Hall

Health - Human Disease & Animal Origin - Dental Medicine

Morning Sessions
Sessions Co-Chairs
Dr. Tawfik Ayoub

From	To	Name	Paper Title
09:00 am	09:30 am	Dr. Heba Ahmed Abdalla	Prevalence of Salmonella and Staph. aureus in poultry and human in contact; with investigating the genetic relationship between some isolates
09:30 am	10:00 am	Dr. Dalia Ahmed El Said Saba	Comparative Study between Conventional and Translucent Zirconia in Dentistry
10:00 am	10:30 am	Dr. Rasha Mohamed Abd El Raouf	Understanding the Nature of Extended-Pour Dental Alginate Impression Material
		Dr. Soad Mohamed Nasr	**Abstract submitted Presenter no Show**
		E. A. Nasr Dr. Hazem Farouk	**Abstract submitted Presenter no Show**
11:30 am	12:00 am	Coffee Break	

DAY THREE - December 30th, 2013 Main Conference Hall			
Health - Human Disease & Animal Origin - Dental Medicine			
Early Afternoon Sessions Sessions Co-Chairs Dr. Adel Talaat, Dr. Heba Ahmed Abdalla			
12:00 pm	12:30 pm	Dr. Adel Talaat	Biotechnology For Economic Growth in Egypt; The Wisconsin Idea Experience
12:30 pm	01:00 pm	Dr. Reham Mokhtar	Spot Light On Accreditation Impact On Egyptian Hospitals, Challenges And Benefits From Its Adoption And Implementation
		Dr. Hossam I. Maaty	**Abstract submitted Presenter no Show**
		Dr. Ola Elgaddar	**Abstract submitted Presenter no Show**
		Dr. Heba Mohtady	**Abstract submitted Presenter no Show**
02:30 pm	03:30 pm	Resolution & Adjourn	

DAY THREE - December 30th, 2013
Farsi Hall

Engineering & Infrastructure

Morning Sessions
Sessions Co-Chairs
Dr. Mohamed Attalla, Dr. Ahmed ElSawy, Dr. Naser El-Sheimy

From	To	Name	Paper Title
09:00 am	09:30 am	Dr. Mohamed Sawan	Nuclear Energy as an Essential Element of a Sustainable and Environmentally Clean Energy Mix in Egypt
09:30 am	10:00 am	Dr. Mostafa Elshahed	Novel approaches for biofuel production from Lignocellulosic biomass
10:00 am	10:30 am	Dr. Ahmed El-Menshawy Dr. Suzan S. Ibrahim	Coal Production Challenges in Egypt
		Eng. Mahmoud Mourad	**Abstract submitted Presenter no Show**
		Eng. Reham Reda Abbas Awad	**Abstract submitted Presenter no Show**
11:30 am	12:00 am	Coffee Break	

DAY THREE - December 30th, 2013
Farsi Hall

Engineering & Infrastructure

Early Afternoon Sessions
Sessions Co-Chairs
Dr. Mohamed Attalla, Dr. Ahmed ElSawy, Dr. Naser El-Sheimy

12:00 pm	12:30 pm	Dr. Taha Mattar	Know – how and technology transfer of nano - inoculants addition to steel alloys for spare parts and castings manufacturing
12:30 pm	01:00 pm	Dr. Ibrahim Ghayed Dr. Zeinab Abdel Hamid	Applied Research in The Area of Advanced Industrial Coatings Applications
01:00 pm	01:30 pm	Dr. Mohamed Attalla	Energy Conservation Incentive Programs for the Egyptian Economy – The Canadian Experience
01:30 pm	02:00 pm	Dr. Ahmed ElSawy	Development of Professional Science Master's Degree in Manufacturing Sustainability
02:00 pm	02:30 pm	Dr. Ahmed Abd Elkader Elrashedy	Synthesis of Some New Biologically Active Thiazolo[3,2-a]pyrimidine Derivatives Containing Benzimidazole Moieties as dual KSP and Aurora-A kinase inhibitors for anti-cancer agents
02:30 pm	03:30 pm	Resolution & Adjourn	

Keynotes Speeches

Opening Day Keynotes Speech

NANO-TECHNOLOGY MEETS BIOLOGY IN THE CANCER CELL.

Mostafa A. El-Sayed
Laser Dynamics Laboratory; School of Chemistry and
Biochemistry, Georgia Institute of Technology;
Atlanta; Georgia 30337-0400;

Abstract:

Using biochemical-targeting methods, one can conjugate the plasmonic nanoparticles to many parts of the cell, healthy or sick. Since the nanoparticles have comparable size to many parts of the cell, binding plasmonic (or nonplasmonic) nanoparticles to parts of the cell could change its properties including curing, or, most likely, killing sick cells. Using plasmonic nanoparticles has the advantage of using their enhanced scattering properties to image the response of the cells [1-3] (including death) to the effect of binding the nanoparticles to selected part of the cell. Not only one can image the response of the cells directly bound to the nanoparticles but also the reaction of the community of the surrounding nanoparticle-free cells In order to gain intra-cell molecular information, and thus molecular cell mechanisms instead of just global cell information, we were recently able[4] to record the enhanced molecular Raman vibration spectra (SERS) of molecules anywhere in the cell during the full cell cycle, from birth to division.
Furthermore, if we give the cells cancer drugs, we can determine the time of the cell death, i.e we can determine drug efficacy. The potential future applications of this technique of Targeted Plasmonically Enhanced Single Cell Imaging Spectroscopy (T-PESCIS) in molecular cell biology, in drug testing[5], in determining drug action and cell death mechanisms will be pointed out.

References:

Kang, B.; Mackey, M. A.; El-Sayed, M. A. J. Am. Chem. Soc Comm. 2010, 132, 1517
Austin, L.; Kang, B.; Yen, C.-W.; El-Sayed, M. A. J. Am. Chem. Soc. Comm. 2011, 133, 17594.
Austin, L. A.; Kang, B.; Yen, C.-W.; El-Sayed, M. A. Bioconjugate Chem. 2011, 22, 2324.
Kang, Bin; Austin, Lauren A. and El-Sayed, Mostafa A.; Real-Time Molecular Imaging throughout the Entire Cell Cycle by Targeted Plasmonic-Enhanced Rayleigh/Raman Spectroscopy, , Nano Lett., 2012, 12 (10), pp 5369–5375.
Austin, L.; Kang, B.; Yen, C.-W.; El-Sayed, M. A. A New Nanotechnology Technique for Determining Drug Efficacy Using Targeted Plasmonically Enhanced Single Cell Imaging Spectroscopy. JACS comm, 2013, 135 (12), 688-4691.

Second Day Keynotes Speech

Complex Cyber-Physical Systems for Wealth Creation

Professor Waguih ElMaraghy [(1)] and Professor Hoda ElMaraghy (ElGammal)[(2)]

(1) Ph.D., P.Eng., FCIRP, FASME, FCSME, FCAE, FEC, Head
(2) Ph.D., P.Eng., FCIRP, FSME, FCSME, Canada Research Chair in Manufacturing Systems
Department of Industrial and Manufacturing Systems Engineering (IMSE)
Director, Intelligent Manufacturing Systems Centre
University of Windsor, Canada
wem@uwindsor.ca & hae@uwindsor.ca

Abstract

This paper recognizes the aspiration of the Egyptian people for the establishment of a modern and principled democratic society supported by a prosperous and sustainable economy. This is essential in spite of current significant cultural and socio-technical problems. Political stability, security and social justice are pre-requisites for the sustainability of a successful economy. This is crucial for both the industrial as well as the service-based economies such as Tourism. Although a service economy, in addition to large national infrastructure projects can help employment and economic prosperity, a real industrially-based economy is essential for sustainable wealth creation.
In this complex, turbulent and competitive global environment, Innovation in every domain, as well as wealth creation through a smart knowledge based economy is the basis for development and growth of a sustainable economy. Egypt has made significant developments in ICT (Information and Communication Technology) and has a good basis for continuing the development in the direction of implementing cyber-physical systems for increased wealth generating products and systems.

Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes with embedded computers and networks to monitor and control the physical processes. The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the technology. The technology builds on the embedded systems technology, computers and software embedded in devices. The mission of these devices and systems is not computational but rather providing the requirements and needs of humans, such as cars, toys, medical devices, scientific instruments, and production systems.
This keynote will attempt to clarify the positioning of Egypt in a challenging and complex global economy and via one of the main gateways for modernizing Egypt. Fortunately, Egypt possesses the infrastructure and level of technological advancement in ICT as well as human talent necessary for modernization in the age of Cyber-physical Systems and globalization.

Association of Egyptian-American Scholars
رابطة العلماء المصريين في أمريكا و كندا

Innovation and Management of Current and Future Challenges

Keynote Paper By
Prof. Waguih ElMaraghy &
Prof. Hoda ElMaraghy (ElGammal)

University of Windsor

Intelligent Manufacturing Systems (IMS) Center
Department of Industrial & Manufacturing Systems Engineering (IMSE), University of Windsor, Ontario, Canada
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40th AEAS Conference, Alexandria, Egypt - December 28-30, 2013

OUTLINE

- Introduction
- The Current & Future Challenges
- Complexity Management Engineering
- ICT, IoT, M2M, and CPS Methods/Tools
- Innovative Applications in All Areas
- Summary & Conclusions

View of Detroit from Windsor, Ontario

Artist view of Riverside Drive, Windsor, Ontario

Windsor, Ontario, the Automotive Capital of Canada near Detroit & the Great Lakes

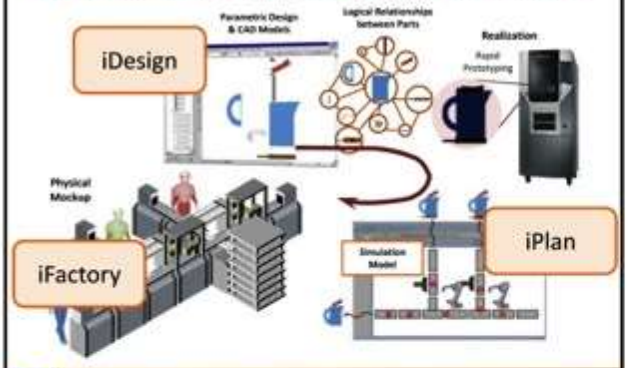
The Intelligent Manufacturing Systems Centre

- Established in July 1994 at the University of Windsor. Annual Budget > $350k
- **Researchers (20-25 PDFs, PhD, MSc)** are engaged in many projects involving networks and centers of research excellence, as well as International collaborations and exchanges.
- Over 100 researchers graduated and working in industry and academia.
- Housed in the Ed Lumley Centre for Engineering Innovation (CEI) - A "Leed" certified environmentally friendly and live building.

Current Research Thrusts

- Flexible, Reconfigurable and Changeable Manufacturing Systems - *Design, Planning & Control.*
- Complexity Management in Engineering – Products & Systems
- Product Variety Management - *Families and Platforms Architecture and Configuration Design*
- Products/Systems Co-Development, Sustainability & Scalability
- Mass Customization and Personalization
- Cyber-Physical Products and Systems
- 3D Prototyping and CMM Inspection
- Flexible and Reconfigurable Automotive Framing Systems

R&D: Integration of Products, Planning & Production



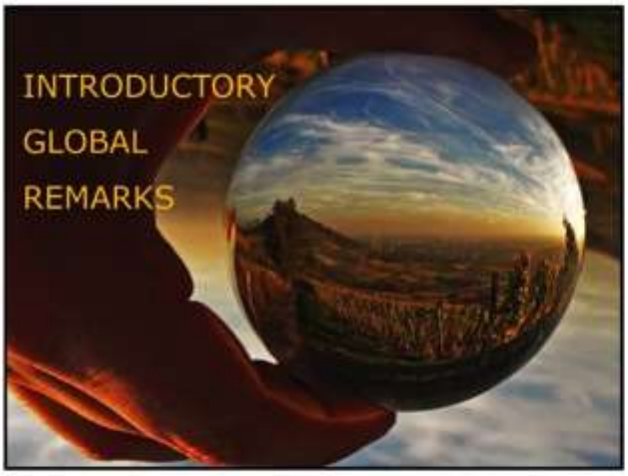
R&D: Learning Factory in a Lab at Windsor, Canada

Plug & Produce modules that can be easily reconfigured to change the system *"layout and functionality"* using unique drive technology, control and interfaces (FESTO Automation, Siemens Control, RFIDs, Vision, Robots, ASRS,....).

iFactory is a Changeable Industrial Grade Manufacturing System - one of a kind in NA.

It demonstrates innovative physical and logical enablers of change such as variant - oriented re-configurable process and production plans and manufacturing systems

It is a Cyber-Physical System



What are the Grand Challenges for People?

Energy **Mobility** **Environment**

Health **Communication** **Safety**

Adapted from CIRP Presidential Address by Prof. Dr. Ing. F. Klocke, Manchester, August 2008

Production Engineering - Framework

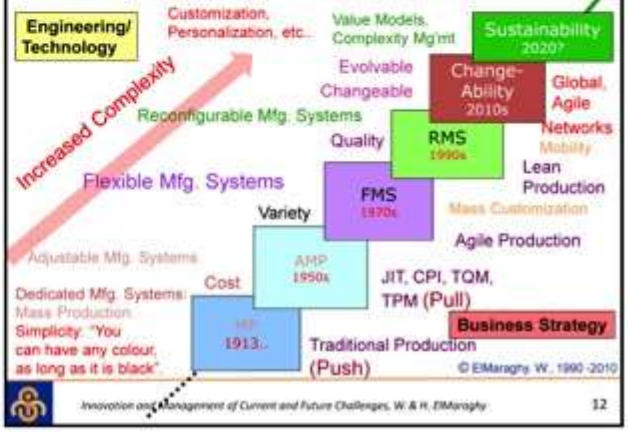
- Value chain
- Product life cycle

- Fundamentals and Basics
- Methods and Methodologies

- Organization
- People
- System / Process
- Standards

Adapted from CIRP Presidential Address by Prof. Dr. Ing. F. Klocke, Manchester, August 2008

Evolution of Manufacturing Systems & Strategies



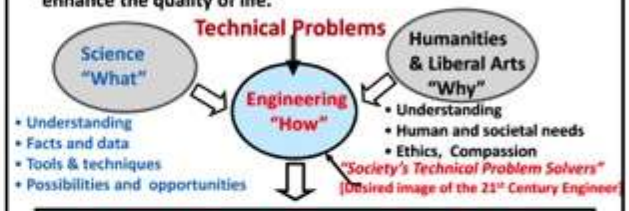
The Changing Industrial Paradigm

Paradigm	Craft Production	Mass Production	Flexible Production	Mass Customization and Personalization	Sustainable Production
Paradigm started	~1850	1913	~1980	2000	2020?
Society Needs	Customized products	Low cost products	Variety of products	Customized products	Clean products
Market	Very small volume per product	Demand > supply Steady demand	Supply > demand Smaller volume per product	Globalization Fluctuating demand	Environment
Business Model	Pull sell-design-make-assemble	Push design-make-assemble-sell	Push-Pull design-make-sell-assemble	Pull design-sell-make-assemble	Pull Design for environment-sell-make-assemble
Technology Enabler	Electricity	Interchangeable parts	Computers	Information Technology	Nano/biomat-erial Technology
Process Enabler	Machine tools	Moving assembly line & DML	FMS robots	RMS	Increasing manufacturing

Source: Manufuture, Milan, 2003

Engineering Isn't Just "Applied Science"

Engineering is about applying knowledge (in a systems sense) from a broad range of disciplines (including mathematics, science, economics and information technology) to create products, services and processes that meet societal needs and enhance the quality of life.



Solutions (products, services, etc.) of Value to Society

Engineering is Crucial for Sustainability

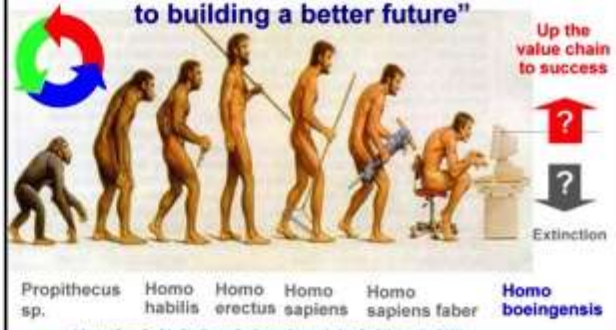
"Without science engineering would have no roots, but without engineering science would bear no fruit. They're both critical to our future."

"Innovation comes form people, not from institutions – companies, governments, universities don't innovate – people innovate."

"To boost innovation it is fundamental to create skilled high-tech workforce drawing upon talents of citizens – and this requires strong education system"

Productivity and Effectiveness Key to Success

"Speaking as a designer committed to building a better future"



Adapted from Prof. Leifer, Centre for Design Research, Stanford University, 2002

"Scientists discover the world that exists;

engineers create the world that never was"

- Theodore Von Karman aerospace engineering

Dreams of Leonardo da Vinci

Tandem Wing Fliers

Microraptor gui
Northern China

Rutan "Proteus" (circa the present)
The scaled composites Model 281 Proteus is a tandem high-endurance aircraft designed by Burt Rutan to investigate the use of aircraft as high altitude telecommunications relays. An extremely efficient design, the Proteus can orbit a point at over 65,000 feet (19,800 m) for more than 18 hours.

A genus small, four-winged pavarian dinosaurs. Numerous well-preserved fossil specimens have been recovered from Leioning, China. They date from 125 to 120 Mya.

Ref. Xu, et al., *Nature*, Vol.421, 23 January 2003, pp. 335-40

The first in North America Commuter Cars were introduced in Toronto, Canada in 1975. Chief Design Engineer Dr. Waguih ElMaraghy explains the innovative design of the suspension system capable of managing the Complexity of "creep" at the wheel/rail interface, while carrying 550 passengers!

Product Development Complexity

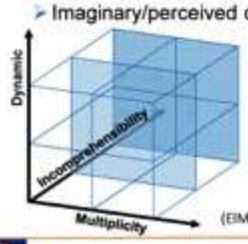
- The production industry must rely on the best practices of collaborative engineering to stay competitive when designing, manufacturing and operating complex products.
- **Designing complex technical systems is critical for sustaining a healthy economy**
- Product adaptations affect all aspects of product generation and require appropriate complexity management

Perspectives on complex systems

Variety-induced Complexity

Complexity increases due:

- Number and variety of parts and products
- Connectivity and dynamic relationships
- Multi-disciplinarity within products
- Imaginary/perceived complexity



(ElMaraghy, et al., CIRP KN, 2012)

Product Variety is Everywhere

Mechatronics

Complex

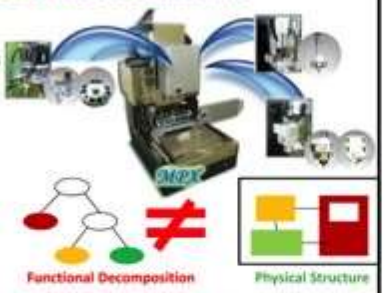
Simple

Electronics

Multi-disciplinary Complexity

Desktop Size Process Machine

- **Increasing Complexity**
  - Increasing Number of Subsystems & Interfaces
  - Multidisciplinarity
- **System Architecting**
  - Hierarchical Physical Structure Definition in Parallel with Functional Decomposition
  - Difficulty in Establishing Hierarchical Correspondences

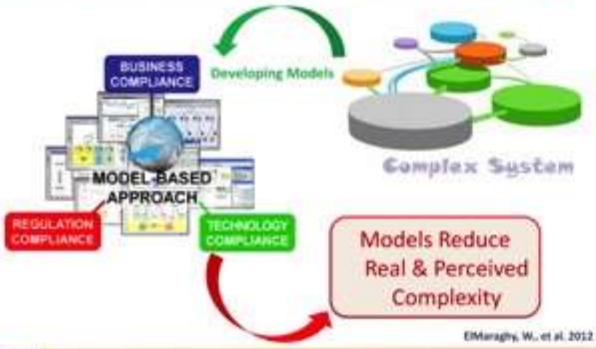


H. Komoto, N. Mishima and T. Tomiyama, 2012. An integrated computational support for design of system architecture and service. CIRP Annals - Manufacturing Technology , Volume 61, Issue 1, 2012, Pages 159-162.

The Scope of Complexity

- For engineered systems, the three relevant product development domains that need to be considered are:
  - product
  - manufacturing system
  - business organization

Complexity Enablers and Management Strategies

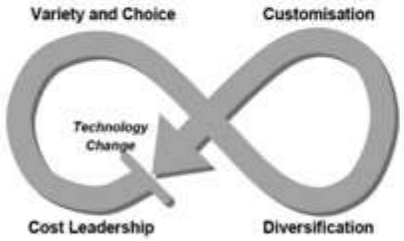


ElMaraghy, W., et al. 2012

A Century of Changing Products and Services

- In 1908 Henry Ford introduced affordable mobility by mass producing the Model -T, with very limited variety
- Ford started rationalizing product variety in the mid 1980s.
- Today competitiveness is driven by differentiation
- Products variety is increasing dramatically

Helix Dynamics Of Competition



e.g. Diversification through leadership in design, technology or manufacturing excellence, and mass customization, marks the current competitive frontier in automotive Powertrain

"The Evolution of Competition in the Automotive Industry" (Matthias Holweg, Judge Business School, U. of Cambridge), Chapter 2, Build to Order-The Road to the 5-Day Car (Eds.) G. Parry, A.P. Grave, 2008, Springer

Multi-disciplinary Complexity

- **Electronics in Cars today:**
  - 50 to 100 CPUs
  - 100 Million line of code !
  - The Boeing 787 "Dreamliner" has about 6.5 million line of software code to operate its avionics and onboard support systems.

In 2005, Toyota voluntarily recalled 160,000 of 2004 and 2005 Prius hybrids because of a software issues. More recently, more problems by other companies also ! Last few years there were several automotive recall notices related to software problems.

Increasingly Complex Cyber-Physical Products

- Smarter products:
  - Electronic safety
  - Driver customisation
- Resource-efficient products:
  - Fuel efficiency
  - Info-mobility & traffic management
  - ICT-enabled disposal
- Value-adding services:
  - Active safety features
  - Remote diagnostics & assistance
  - Infotainment & travel guidance

By 2016, electronics & software in cars will account for up to 55% of their value

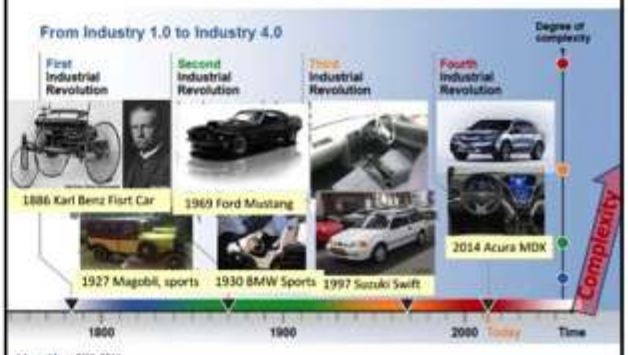
Cyber-Physical Systems

- Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes with embedded computers and networks to monitor and control the physical processes.
- The technology builds on the embedded systems technology, computers and software embedded in devices.
- The mission of these devices and systems is not computational but rather providing the requirements and needs of humans, such as cars, toys, medical devices, scientific instruments, and production systems.
- The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the technology.

CPS role in Egypt's Economy

- Fortunately, Egypt possesses the infrastructure and level of technological advancement in ICT as well as human talent necessary for modernization in the age of Cyber-physical Systems and globalization.
- In this complex, turbulent and competitive global environment, Innovation in every domain, as well as wealth creation through a smart knowledge based economy is the basis for development and growth of a sustainable economy.
- Egypt has made significant developments in ICT (Information and Communication Technology) and has a good basis for continuing the development in the direction of implementing cyber-physical systems for increased wealth generating Products, Systems, and Services.

Evolution of Products & Production



Adapted from DFKI, 2011

Top Inventions of the Year 2013: Smart traffic lights

Our cities are increasingly becoming more congested with traffic, so Samah El-Tantawy of the University of Toronto designed 'smart traffic lights' that use artificial intelligence and 'game theory' to ease that congestion.

The lights all work as a team, coordinating and adapting to traffic patterns in real-time, with the goal of keeping traffic moving as smoothly and efficiently as possible.

Virtual Reality Windshield

To help us when we get stuck behind a bus or transport truck that's lumbering up a narrow country road, giving us no opportunity to see if it's safe to pass them, researchers at the University of Porto in Portugal have designed a new 'virtual reality' See-Through System for your windshield.

Cameras on the front of these big vehicles send images to the See-Through System, letting you see what's in front of them and when it's safe to go around.

Strawscaper

Self-sustaining buildings that generate their own power are a dream of city planners and engineers, as they cut down on how much electricity the city's power grid has to handle.

The Söder Torn tower in Stockholm, Sweden, called the Strawscraper, will use rows and rows of piezoelectric strips that will generate electricity just by blowing in the wind, while at the same time giving the city just a touch of the alien design aesthetic it may have been missing.

Google Glasses

Google Glass is a wearable computer with an optical head-mounted display (OHMD) + Virtual Reality ++

Google Glass is expected to reach store shelves sometime in 2014.

When it does, the connected headset could do more than change the wearables market: it could change Google, and people too !

Google Driveless Car

Toyota Prius modified with Google's experimental driverless technology.
The **Google driverless car** is a project that involves developing technology for autonomous cars.

- Google had been lobbying for robotic car laws.
- The U.S. state of Nevada passed a law on June 29, 2011 permitting the operation of autonomous cars in Nevada.
- Florida and California have passed laws in 2012 to allow the licensing of autonomous cars on their public roads.

The Personal Flying Car

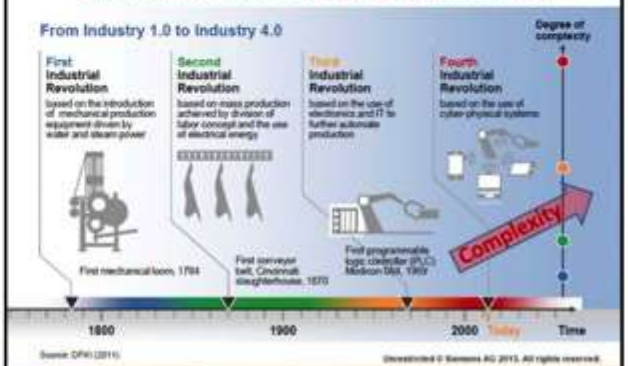
We were made certain promises by futurists of years past that we would have flying cars by now. The people at Terrafugia are looking to finally turn those promises into reality

With their TF-X, which will be both street legal and a way to take off and fly to your destination with minimal training. Look for them patrolling the skies by 2021.

M2M (Machine to Machine)

Transportation	Energy	Healthcare	Finance - Retail	Remote Monitoring
• Asset Tracking • Fleet Management • Parking Meters/ Terminals • Driver behavior	• Energy Monitoring • Smart Grid • Renewables / Wind • Car Charging Stations • Utility Controls • Environmental Monitoring	• Home & Mobile • Tele-Monitoring • Disease Management • Assisted Living	• ATM • POS • Temporary Kiosks • Vending Machines • Cash Registers	• Asset Monitoring • Security & Surveillance • Remote Service Alarming • Smart Robotics • Smart Metering

Evolution towards CPS Production



Sustainability and evolution of engineering systems

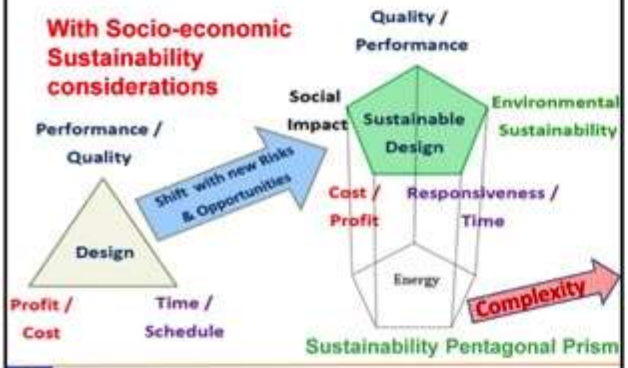
- The growing global population, demographic shifts, climate change and increasing pressure on natural resources have all brought sustainability to the top of the political, social and business agenda
- Sustainability represents a "complexity" with both major challenges and tremendous opportunities for businesses.

Engineering Increasing Challenges

With the increasing concern over Energy the product development engineering objectives have changed from the "Magic Triangle" to a "Sustainable Tetrahedron"

Further Change in Product Development Objectives

With Socio-economic Sustainability considerations

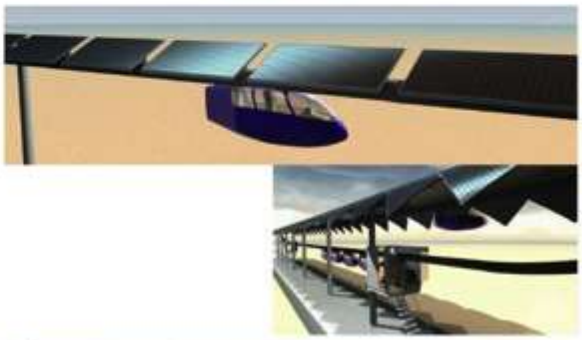


The socio-technical systems

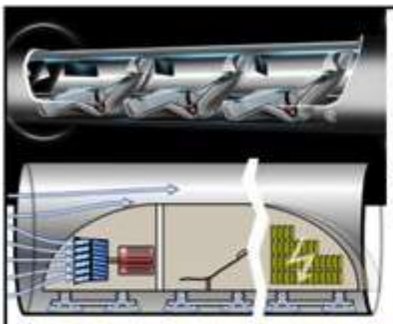
- Socio-technical systems stress the philosophy of shaping both the technical and the social conditions of work

Evolution of Manufacturing Systems

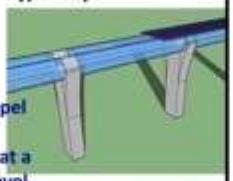
Solar PRT



Hyperloop



Elon Musk, one of the most famous inventers of our time, turned his attention to mass transit this year and came up with the Hyperloop.



This high-speed rapid transit system will propel riders through tubes at about 1,000 km/h, interconnecting our cities like never before, at a fraction of both the cost and hassle of air travel.

Innovation and Creating Value

- ***Innovation*** in products and in manufacturing technologies and processes are important to create value to customers, companies and the economy.
- ***Economic Sustainability requires designing and producing complex systems*** that create opportunities and competitive advantages, but they must be managed well.

It is no longer sufficient to "*Make Things Better*"

We must "*make better things*".

Summary

- We are currently on the threshold of the "fourth industrial revolution" or "industry 4.0", which refers to the integration of Internet technology into production processes, as well as developments such as "Cyber-Physical Systems (CPS)" and the "Internet of Things" and "M2M".
- In CPS Systems, each part has a digital memory that defines what it is and where it is, as well as its status.
- Products and Production Systems define their status throughout the entire value-added chain.

Conclusion (1)

- Manufacturing is increasingly multidisciplinary: social, business, economics, environmental, and technology.
- The goal is not only to mitigate potential negative effects of complexity but also to maximize the benefits from it, such as using it to gain a competitive advantage.
- Integrating ICT, IoT, and M2M into complex CPS Systems is critical for sustaining a healthy economy, and innovation is one of the keys to success in engineering and business.
- Design and manufacturing are indispensable socio-economic activities for the well being of humankind on a global scale, and for wealth creation.

Conclusions (2)

- Advances in CPPS research can be accelerated by close collaborations between academic disciplines in computation, communication, control, other engineering and computer science disciplines, coupled with grand challenge applications.

Conclusions (3)

- Fortunately, Egypt possesses the infrastructure and level of technological advancement in ICT as well as human talent necessary for modernization in the age of Cyber-physical Systems and globalization.
- Unprecedented collaboration between scientists within Egypt and abroad as well as Industry and Government is needed to make this futuristic dream come to fruition

Papers, Abstracts & Presentations

DAY ONE
(December 28th, 2013)

"Roadmaps & Strategic Development
"Role of Education & Scientific Research
In the Economic Development of Egypt""

Energy Conservation Incentive Programs and Renewable Energy for the Egyptian Economy, the Canadian Experience

Dr. Mohamed Attalla, P.Eng., FCSCE
Assistant Vice President, McMaster University
AEAS, Immediate Past President

The cost of producing, importing and distributing energy is one of the major challenges for the Egyptian economy. It is also one of the major drivers for the Egyptian economy reform. Energy conservation incentive programs play an important role in advancing energy conservation globally. It is very crucial for the Egyptian economy and particularly the energy sector to develop energy conservation incentive programs that encourage and motivate Egyptian institutions, industrial establishments and individual residents to take an active role and participate in energy conservation.

This paper will present the Canadian experience with its energy incentive programs for energy conservation as well as for the implementation of Renewable Energy measures as well as its applicability for implementation in Egypt.

The benefits of energy conservation in the Canadian program and the implementation of Renewable resources are self-evident from the documented results. Every dollar invested in energy conservation is estimated to result in two to three dollars in net savings over the life of the investment.

Financial energy incentives help move the economy towards energy conservation and has been shown in the Canadian Province of Ontario to yield significant results by allowing for realizing smart energy savings which would otherwise be cost-prohibitive for institutions in the competitive marketplace as well as residential energy consumers who have limited capacity for capital investments in energy conservation.

The Canadian Experience is very much applicable to the Egyptian market. Its application will save the Egyptian economy a large volume of investments and will help produce a sizable portion of its energy requirement from renewable

AASTMT Research Centers And Its Role in Solving The Arab Region National Problems Using R&D

Dr Mohamed Elghamry
Industry Service Complex Dean
Arab Academy for Science, Technology and Maritime transport
mohamed@elghamry.net

Challenges are many, but willingness was never less. History is full of stories for the Arab nation in general and Egyptian in specific, when they managed not only to develop innovative solutions for their long lasting problems, but to lead the civilization towards a new horizon.

The Arab Academy for Science, Technology and Maritime Transport (AASTMT) as a non-profit organization created by the Arab league has identified clearly the need to use the applied research to overcome the national problem we face during this era. Thus, the Industry Service Center (ISC) was created at AASTMT to offer the required consultation service to the regional industries to offer high technological service and support. Through its well selected team members, the Applied Research Center at ISC is actively analyzing the national problems facing the nation to design and develop an Engineering product, which can offer an immediate solution for this problem. Keeping in mind the economic feasibility for the developed product, many completely finished products were developed in the field of energy, water, transportation, Health, public safety and information technology and communication.

Those solutions will be presented during the conference not only to show how far AASTMT has managed to contribute to the society, but also to show to the decision makers in our countries how much the applied research approach can be a successful tool to improve the quality of life for our nation and reduce our dependability on others.

The Role of Geo-Informatics in Economic Development

Dr. Naser El-Sheimy, PEng
Professor and Canada Research Chair
Department of Geomatics Engineering, The University of Calgary
2500 University Dr. N.W. Calgary, Alberta, Canada T2N 1N4
Tel: (403) 220 7587, Fax: (403) 284 1980
E-mail: elsheimy@ucalgary.ca

Geo-Informatics is an emerging, innovative, key information technology for the twenty-first century that deals with the acquisition, modeling, analysis and management of spatially referenced data and its applications in our day-to-day activities. Geo-Informatics includes applications such as positioning by satellites, monitoring and control through remote sensing, land information management through Geospatial Information Systems (GIS), as well as real-time time applications such as forest fire fighting, traffic management, and environmental monitoring applications. Geo-Informatics has a significant impact on our society and quality of life and is becoming an integral component of complex engineering and management systems that are aimed at creating a sustainable environment.
Geo-Informatics and geographic information system (GIS) technology is a key component to successful economic gardening programs and this presentation will present how economic developers can take on the challenge of promoting healthier economic development through mindful application of Geo-Informatics and GIS technology.

Biography:

Dr. Naser El-Sheimy is Professor and former Head of the Department of Geomatics Engineering, at the University of Calgary. He holds a Canada Research Chair (CRC) in Mobile Multi-sensor Systems and the scientific director of Tecterra Research Centre. His research expertise includes GPS/INS integration, multi-sensor systems, and mobile mapping systems. Prior to joining the University of Calgary, Dr. El-Sheimy held the position of VP R&D with VISAT Technologies Inc., a high-tech company in Montreal.
Dr. El-Sheimy published two books, 9 book chapters and over 450 papers in academic journals, conference and workshop proceedings, in which he has received over 30 national and international paper awards. He organized and participated in organizing many national and international conferences. Dr. El-Sheimy is the former president of Commission I on "Sensors and Platforms" of the International Society for Photogrammetry and Remote Sensing (ISPRS). Dr. El-Sheimy is currently a member of the Editorial Board of Journal of Survey Review, Journal of Applied Geodesy, and Coordinates. He served as a member of the Alberta Geomatics Group Board of Directors, Geoide NCE Board of Directors, Technical Committee Member of the ASPRS Direct Georeferencing Committee, regular reviewer for the Journal of Geodesy, Journal of Photogrammetric Record, the Photogrammetric Engineering and Remote Sensing Journal and other scientific journals.

Papers, Abstracts & Presentations

DAY ONE
(December 28th, 2013)

"Role of Education & Research On Egyptian Health"

The Egyptian Medical Qualification Reform Project

Rashad Barsoum, MD, FRCP, FRCPE

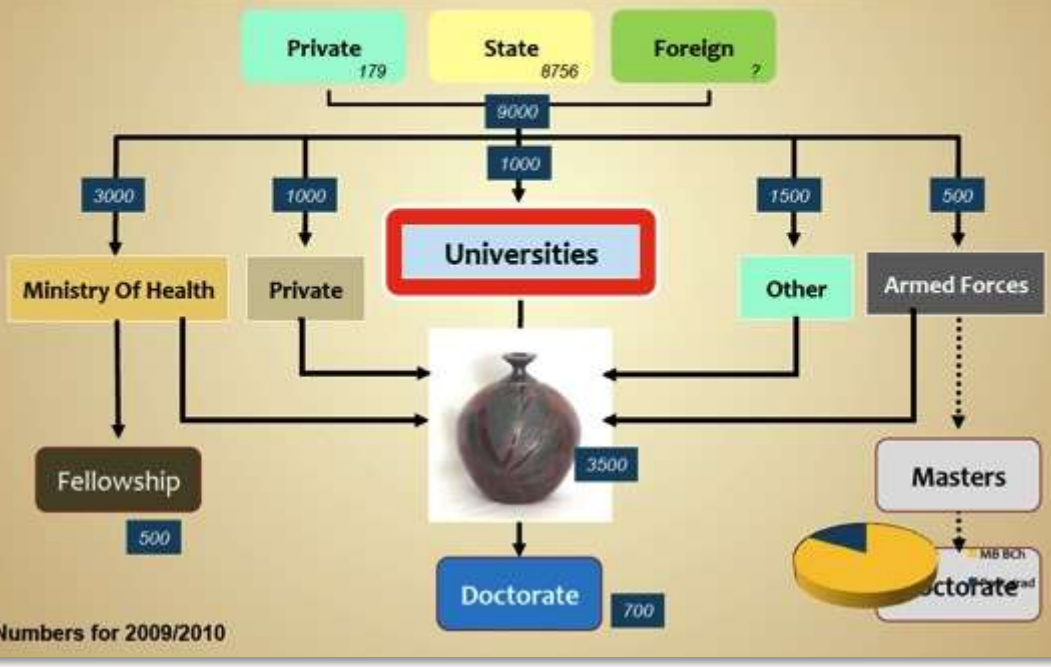
Emeritus Professor of Medicine, Cairo University. Former Chairman, Medical Sector Committee, Supreme Council of Egyptian Universities. Chairman, Project Steering Committee.

The Medical Sector Committee conducted a simple SWOT analysis in March 2008, to evaluate the status of post-graduate medical qualification in Egypt. It turned out that only 10% of the current practitioners in the country hold any post-graduate degree. The chances of a recent graduate to get such qualification in 1 in 3, the bottle neck being the Masters degree offered by all 23 state and private medical schools. A subsequent gap analysis showed a very gloomy picture with regards to patients, doctors, and medical institutions. A strategic plan was developed to satisfy three main requirements, namely; a) Unifying the standard of patient care across the country regardless of affiliation; b) Improving the value of Egyptian clinical practitioners for the sake of regional and international competition; and c) Relieving Egyptian universities from teaching overload in favor of creativity and research. The plan was developed by collaboration of many stakeholders including the universities, ministry of health, military medical academy, and medical syndicate. It was discussed and refined in many meetings, conferences and retreats, including the ministers of health and high education. Finally the project was approved as shown in the attached flow diagram, including seven items: 1) Development and implementation of a national House Officer Training Program; 2) Holding a National Licensing Examination; 3) Developing National Residency Training Programs in different specialties; 4) Awarding National Board certification in those specialties; 5) Organizing a Continued Medical Education Program; 6) Establishment of the Egyptian Medical Board as an independent body to oversee all of the above and 7) Stratifying Medical Licensing to parallel the achieved level of clinical training and qualification. The ministers of health and High Education issued a joint decree to establish a steering committee to look into the implementation steps. This was composed as a balanced structure to represent the major stakeholders, and developed the national training programs for house officers and residents in the 5 major general specialties internal medicine, surgery, ob/gynae, pediatrics, and family medicine. A draft of the Egyptian Medical Board was developed and revised by legal experts in the ministries of health and high education and submitted for ratification by the parliament. Unfortunately, the political instability that supervened after the 25th January revolution halted further progress to date.

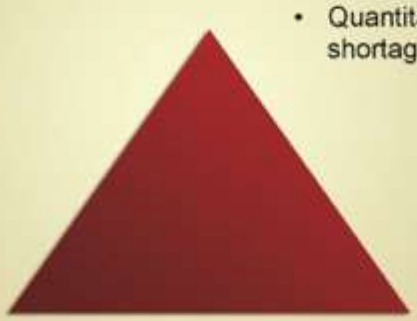
Medical Sector Committee

Egyptian Medical Qualification Reform

Current Qualification Path



Consequences



Patients

- Quantitative and Qualitative shortage of medical service

Doctors

- Poor competitive capacity
- Low international profile
- Impaired self confidence
- Low income

Universities

- Low educational and research standards
- Very low international grading

Mission

- **Unifying the standard of patient care across the country regardless of affiliation**
- **Improving the value of Egyptian clinical practitioners for the sake of regional and international competition**
- **Relieving Egyptian universities from teaching overload in favor of creativity and research**

Process

2008

Mar	SWOT/ Gap and Overall plan
Apr	Pre-licensing examination
May	Professional certification
Jun	MOH approach
Jul	1st Ministerial meeting
Aug	Syndicate and MMA involvement
Nov	Joint subcommitteess
Dec	First Project draft
	1st Alexandria retreat

2009

Feb	Core Project
Mar	2nd, 3rd, 4th Ministerial meetings
Apr	Universities feed back (SCU included)
May	University Hospitals
Jun	People Assembly Sahel Hospital Matareya Institute Egyptian American Scholars Assoc
Jul	2nd Alexandria retreat
Aug	Final project (*)
Sep	1st Ministerial decree (MOH)
Oct	Integration with MOH reform

2009

Oct	5th Ministerial meeting (PM)
Nov	MOH Leadership meeting, Sharm

2010

	Presidential decree draft
Jan	Luxor retreat (Rectors)
Mar	Supreme Council of State Universities
May	State Council
Sep	2nd Ministerial decree 3227/5290
Dec	Steering Committee
	3rd Ministerial decree 56/18

2011

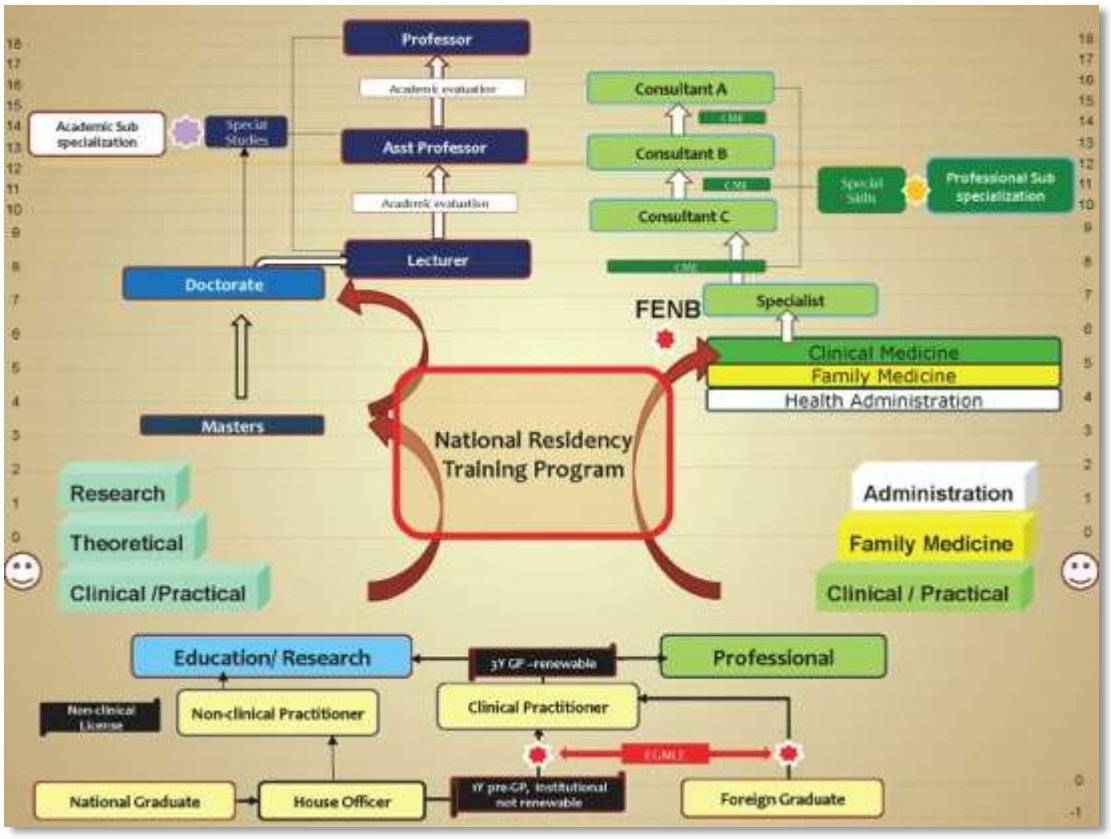
Jan	National HO training program
May	4th Ministerial decree (MHE1161)
	"Doctors' Academy" conference
	Mansoura meeting conference
Jun	Suez Canal University Students
Sep	Scientific Committees I
	Law draft

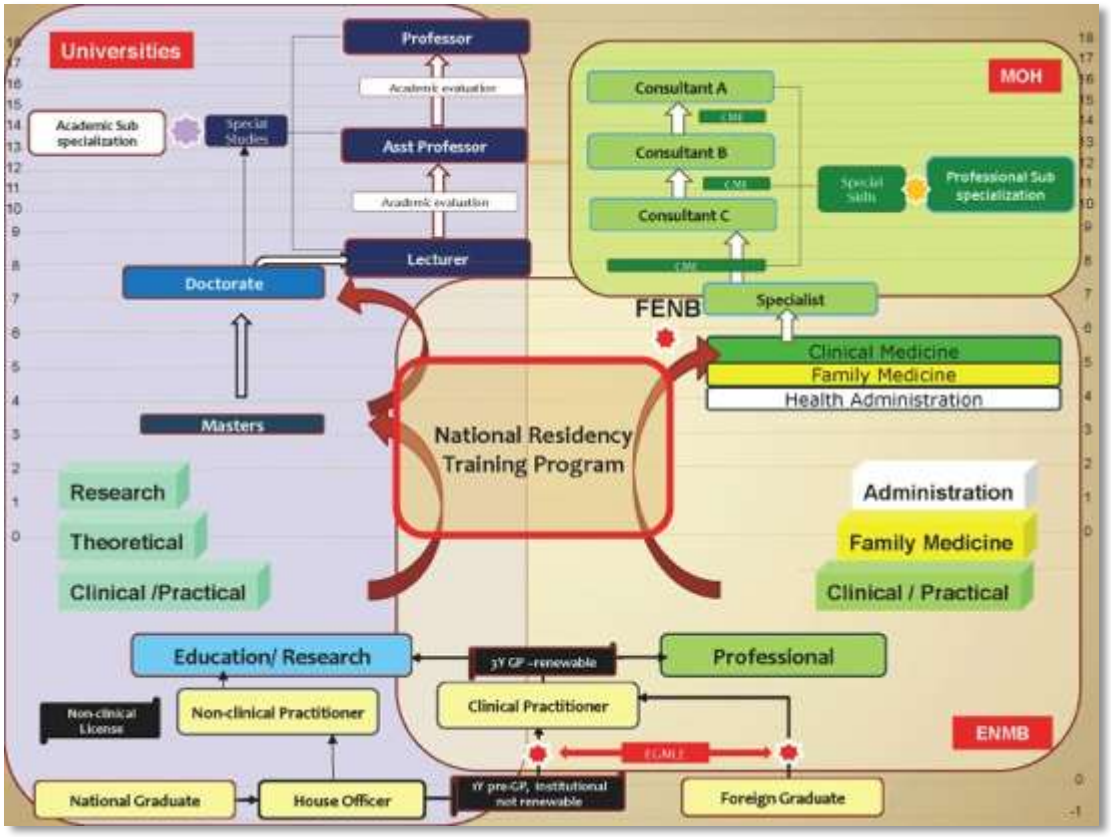
2012

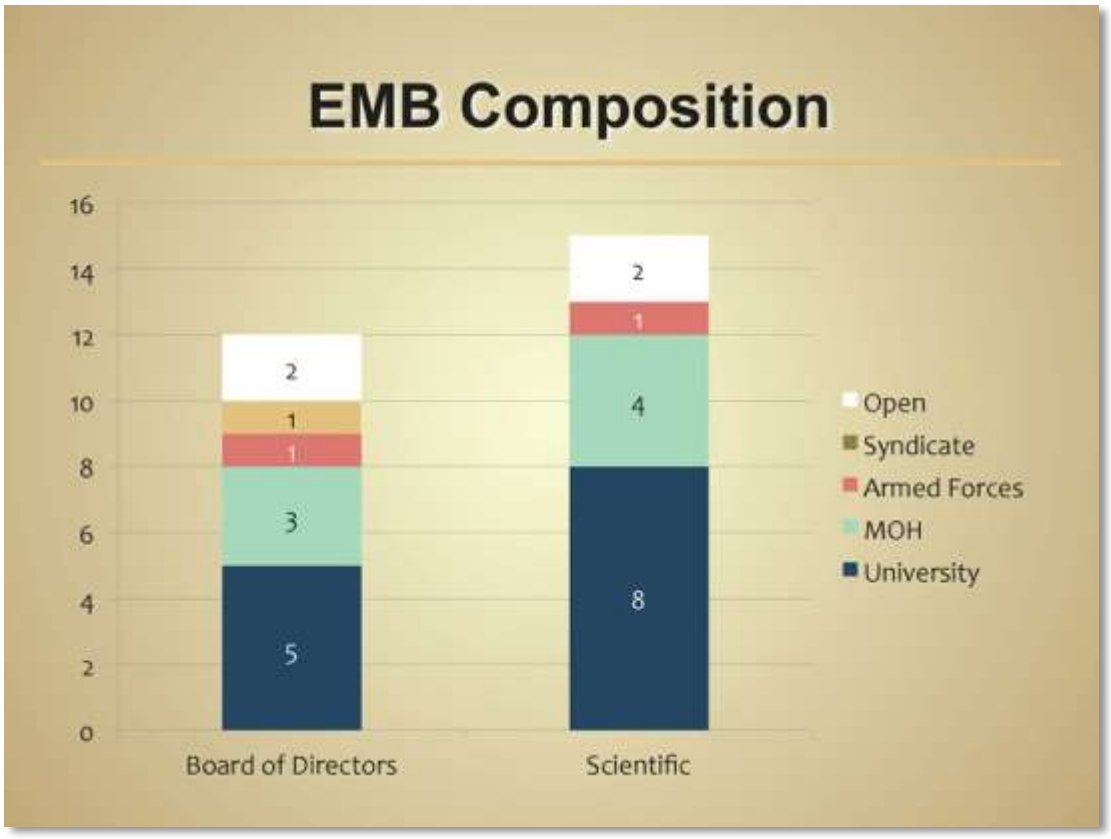
Jan	National HO training program
Feb	Scientific Committees II
Mar	6th Ministerial meeting
Apr	Residency Training Program

Components

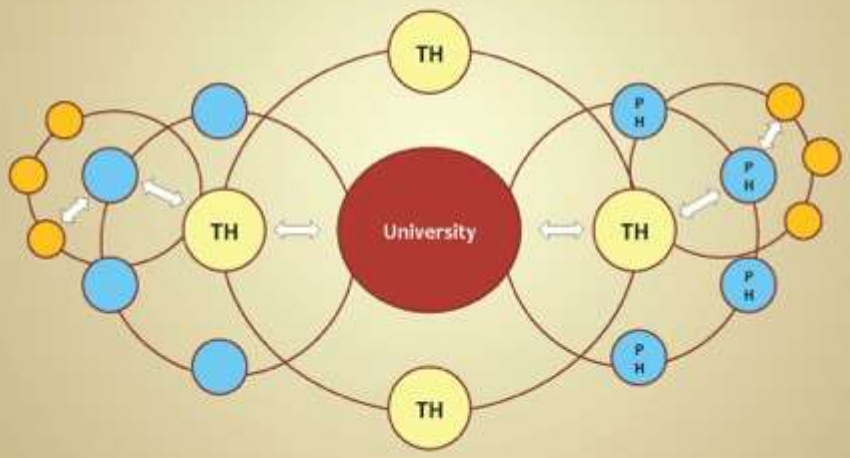
1. National House Officer Training Program
2. National Licensing Examination
3. National Residency Training Programs
4. National Boards in Medical specialties
5. Continued Medical Education
6. Establishment of the Egyptian Medical Board
7. Stratified Licensing parallel to the level of clinical training and qualification.



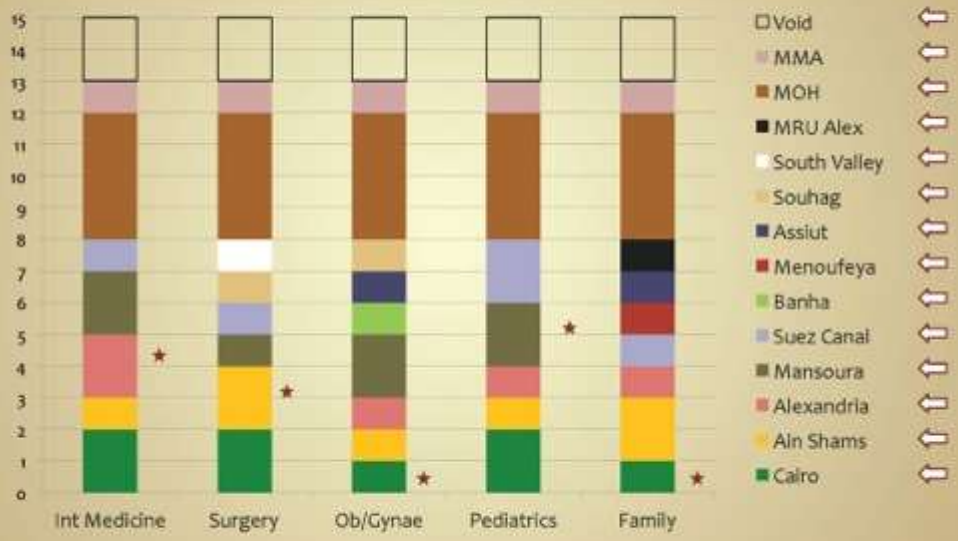

Universities
Professor
Academic evaluation
Academic Sub specialization
Special Studies
Asst Professor
Academic evaluation
Lecturer
Doctorate
Masters
MOH
Consultant A
CME
Consultant B
CME
Consultant C
CME
Special Skills
Professional Sub specialization
FENB
Specialist
Clinical Medicine
Family Medicine
Health Administration
National Residency Training Program
Research
Theoretical
Clinical /Practical
Administration
Family Medicine
Clinical / Practical
Education/ Research
3Y GP -renewable
Professional
Non-clinical License
Non-clinical Practitioner
Clinical Practitioner
ENMB
FCMLE
National Graduate
House Officer
1Y pre-GP, institutional not renewable
Foreign Graduate


EMB Composition
16
14
12
10
8
6
4
2
0
2
1
1
3
5
2
1
4
8
Open
Syndicate
Armed Forces
MOH
University
Board of Directors
Scientific

Regional Training Units



EMB Scientific Committees



★ Temporary moderator

Future Plans

- **Legislation**
  - EMB
  - MOH Licensing
  - Privileges
  - Military service
- **Announcement of formal implementation timeline**
  - EGMLE
  - NRTP
  - FENB
- **Financing**
  - Administrative
  - Trainers
  - Trainees
- **EMB**
  - Headquarters Venue
  - Personnel
  - Equipment
  - Examination Venues
  - Information Technology

Future Plans

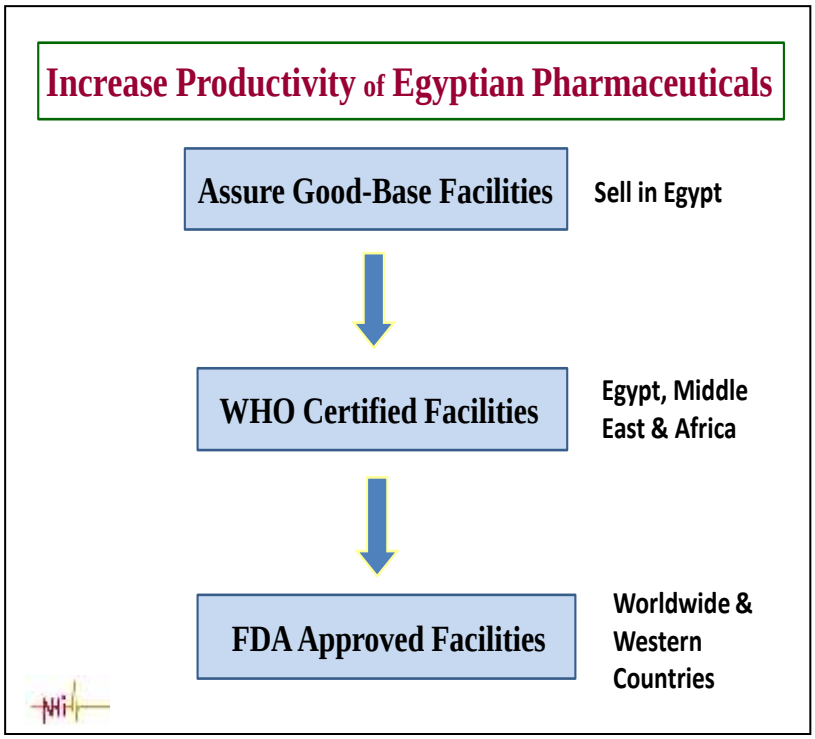
- **Completion of all topical committees**
- **National Residency Training Programs**
- **Training Units**
  - Identification
  - Accreditation
  - Trainers
  - TOT
  - Administration
  - Logistics
- **Examinations**
  - Banks
  - Capacity building
  - Regional and International recognition
  - Students training, website, Mock exams

Economic Development In Egypt In Egyptian Pharmaceutical Companies

Dr. Salwa Ahmed Elgebaly
President & CEO Nour Heart, Inc.
Maryland, USA

Goals: Economic Development
Job creation
Manufacture pharmaceutical products that are in short supply – can be resolved quickly

How? Provide crucial technical and financial assistance - Two approaches:



Approach I: **November 2013**
To improve currently existing pharmaceutical companies in order to increase their production capacity **from 20-40% to 60-80%** and also upgrade their facilities to globally compliant plants so they can **export** their products worldwide. This will result in selling their pharmaceutical products in millions of dollars yearly and significantly increase the number of new jobs of highly-paid individuals. Our specific plan is as follows:

Assure ***good-base facilities*** in current pharmaceutical plants to increase their production
Convert the good-based plants to ***globally compliant facilities*** for worldwide export
Manufacture in Egypt ***new pharmaceutical*** products which are in short supply
Attract ***Western pharmaceutical companies*** to manufacture their products in Egypt

Assist in writing ***business plans*** required to obtain funds from the Overseas Private Investment Corporation (OPIC) or other programs and investors to pay for their efforts to expand their production capacity. Information about the OPIC includes:
Citizens of the U.S. have to apply for the OPIC program and also own at least 25% of the businesses that they established in Egypt
Egypt is still a ***priority region*** for the OPIC program
The OPIC program will provide the business insurance via the *political risk program*.

Approach II: **Spring 2014 Conference**
Organize efforts by:
Egyptian American Individuals
Egyptian American Associations
Egyptian American Non-profit organizations
Effectively implement various programs targeting Economic Development for:
Job creation of highly paid jobs – e.g., VACSERA
Job creation in low income areas
Discuss grants from the USAid and the State Department suitable for Egypt
Identify non-profit organizations in Egypt that can implement our goals
Identify the need of other industries in Egypt that need to increase their production capacity
Other points to be discussed.

Diabetes in Egypt: Current and future perspectives

Fouad Kandeel, M.D., Ph.D.
Chair & Professor, Department of Clinical Dibetes
Endocrinology and Metabolism - City of Hope
California, USA

ABSTRACT

Type 1 (insulin-dependent, or juvenile) and type 2 (insulin-independent, or adult-onset) diabetes mellitus (DM) are metabolic disorders that derange blood glucose and lead to considerable health problems. Long-term complications include diabetic retinopathy, neuropathy, and end-stage renal failure (ESRD), making DM one of the most serious health threats of the modern era. Both types of DM currently affect 246 million people worldwide[1]—projected to include 366 million in 2030[2]. This considerable rate of increase will be substantially exceeded in the Middle East, where many of the largest and fastest-growing adult diabetic populations reside in 22 countries with a total population of almost 300 million[3], including Saudi Arabia, many of the Gulf states, and Egypt. In 2000, 15,188,000[2] people in the Eastern Mediterranean region were affected with DM, with an estimated 42,600,000[2] people affected in 2030. Because as many as half of all diabetic patients remain undiagnosed, these already sizable figures are likely gross underestimations.

DM is also a common cause of nephropathy in the Arab world[4]. Few available data[5] indicate high prevalence rates that range from 21.2% in Kuwait[6] to 35% in Egypt[7] and 46.8% in Lebanon[8]. One center study in Saudi Arabia found that in patients admitted for dialysis, the incidence of DM as a cause of ESRD increased from 4% in the early 1980s to 40.5% in 1999[9].

Obesity is known to predispose to insulin resistance and diabetes. According to a report published in 1999[10], at least one-third of the Arab population can be categorized as obese. Further, 20% to 38% have hyperlipidemia, and 24% to 46% have hypertension[11, 12]. These data present a significant opportunity to reduce the incidence of obesity and therefore the number of individuals who may potentially develop DM through educational campaigns for lifestyle modification and weight loss.

Since the discovery of insulin in 1922, there have been many major advances in diabetes management, including the development of novel pharmaceutical agents, glucose monitoring and insulin infusion systems, and cell and gene therapies. Further, recent studies have shown that with proper intervention, the insulin resistance underlying the development of type 2 diabetes can be reduced; consequently, the onset and complications of disease can be delayed or prevented. Additional evidence suggests that in the future, even the autoimmunity responsible for type 1 diabetes can likely be circumvented.

Currently updated and projected diabetic health statistics for the populations of Egypt are strongly needed, such as the rates of diabetic complications and co-morbid diseases, the impact on the health of the adult workforce and national productivity, the costs of care, and measures to gauge treatment success. With these data, we can progress towards the development of specific strategies to overcome the epidemic of DM.

In order to accomplish the above objectives, several realistic steps must be taken. Educational programs that are focused on the prevention and delay of diabetic complications via behavior modification, exercise, diet, and weight management in both school-age and urban adult populations must be developed and applied. Specific approaches that may assist in the attainment of the vital goal of reducing diabetes burden in Egypt may include the establishment of a national steering committee to oversee performing necessary epidemiologic studies, creating and maintaining a national disease registry, and spearheading the development of new, high-volume, low-cost approaches for disease management with well-defined standards that are consistent with Egyptian culture and customs, including the education of patients regarding glucose self-monitoring and diabetic survival skills, and the provision of behavior modification tools in terms of diet and exercise, while simultaneously ensuring that each patient is annually screened for eye, kidney, nerve, and cardiovascular complications. In addition, active engagement of all relevant sectors of the society including media, academic institutions involved in nutrition, agricultural, physical fitness and urban development sciences, funding agencies including philanthropy, much be accomplished and maintained. Moreover, the future of diabetic care in the Egypt will depend upon the acquisition of new scientific knowledge, as well as the effective use of this knowledge in designing successful interventional strategies, including:

The establishment of organizations dedicated to the promotion of diabetic care and research in Egypt, capable of competing for highly needed national and international resources
The improvement of population-based diagnostics
The development of culturally acceptable educational programs focused on the prevention and delay of diabetes and its complications via behavior modification, exercise, diet, and weight management in both school-age and urban adult populations
The increased availability of low-cost, highly effective medications, as well as state-of-the-art interventions, including home glucose monitoring, insulin pumps, artificial pancreatic systems, islet transplantation, embryonic and adult stem cell research, and gene modification.

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Papers, Abstracts & Presentations

"Health and health related topics"
"Egypt Health - Past, present & future"

صحة المواطن المصري

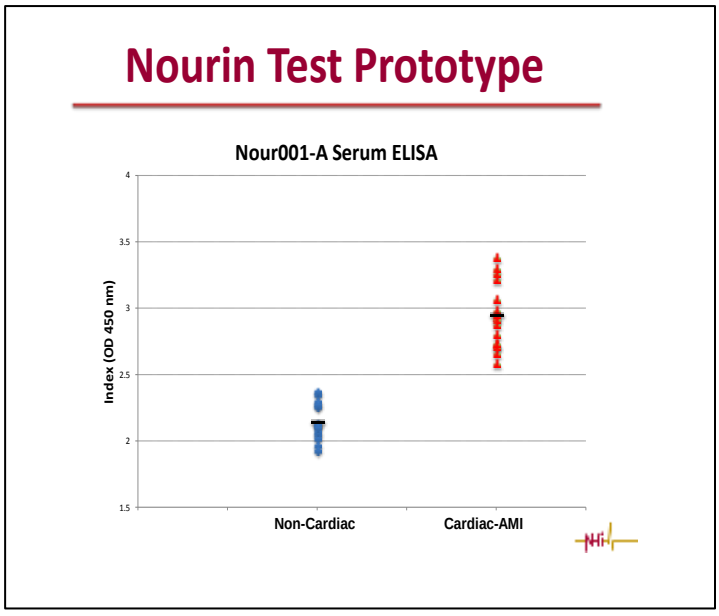
Early Identification of Cardiac Ischemia Patients in the Emergency Department

Salwa A. Elgebaly, Ph.D., Robert Christenson, Ph.D., Elliott Schiffmann, Ph.D., Qiao Yi, M.D. and Donald L. Kreutzer, Ph.D.
Nour Heart, Inc.

Background: We demonstrated the rapid release of a potent 3 KDa *formyl peptide* chemotactic factor (Nourin) by reversible and irreversible ischemic myocardial tissues. Mass spectrometry analysis confirmed that Nourin is a formyl peptide.

Using modified Boyden chambers, we found that Nourin was 3 fold higher in plasmas of ACS patients who presented to the Emergency Department (ED) within 1.5 - 3.5 hours after the onset of symptoms when compared to normal controls ($P \leq 0.001$). Additionally, three formyl peptide receptor competitive antagonists (soluble receptor fragment, t-Boc-FLFLF and Spinorphin) inhibited chemotactic activity detected in plasmas from heart attack patients by over 50%. We hypothesize that formyl peptides released by ischemic hearts can be used as early biomarkers for myocardial ischemia.

Methods: We developed an ELISA for the cardiac-derived formyl peptide Nourin using antibodies against its f-Met moiety, and determined its levels in serum samples collected from heart attack patients (n=10) with troponin levels below the clinical decision level and non-cardiac chest pain patients (n=10 - negative troponin). In a second study, the levels of cardiac Nourin were determined in frozen plasma samples (-70 °C for 3 years) collected from 10 patients with heart attack and unstable angina and non-cardiac chest pain (n=5). Blood samples in both studies were collected within 8 hours of onset of chest pain.



Results: Figure shows samples from heart attack patients had significantly higher levels of the formyl peptide Nourin ($p<0.0001$) compared to non-cardiac patients. Similar results were obtained regardless if the blood samples were fresh or frozen (-70 °C for 1 month).
In the second study using frozen plasma samples, we also demonstrated a significant difference between samples collected from patients with heart attack and unstable angina versus non-cardiac patients presenting to the ED with signs and symptoms suggestive of MI ($p=0.012$).
Conclusion: These data from a limited group of patients show a great promise for the use of cardiac Nourin ELISA for detection of myocardial ischemia/injury.

Medical Education in Egypt: current status, points of strength and points of weakness

Professor Lamis Ragab
Faculty of Medicine
Cairo University

Abstract

Egypt has a long and proud tradition as a leading center of medical excellence. Many experts recognize Imhotep, of the 27thcentury B.C., as the world's first physician. Moreover, Egypt is one of the first centers of medical education in the world, having established a medical school in the 9th century A.D.

Today, that proud tradition is being challenged by a burgeoning population and inadequate facilities to meet the demands of 21st century medical education.

There are 17 public and two private medical schools in Egypt, graduating more than 8,000 physicians annually. Four other universities applied this year to the Supreme Council of Universities to establish new medical schools. However, most medical schools –public and private –have problems of overcrowding and underfunding.

Students enroll from Egypt and throughout the Middle East and beyond. The student admissions process is conducted by an admissions office, which is overseen by the Ministry of Higher Education. The policy does not account for a student's aptitude to study or practice medicine.

The current medical education program is six years, beginning with two academic years (sciences, computers, and English), followed by one pre-clinical year, and three clinical years. The program includes 19 courses distributed over 6 years.

Following medical school, students serve one year as a Pre-Registration House Officer (PRHO), a formal apprenticeship for the medical profession, where they rotate among specialties.

The curriculum is primarily discipline-based, with the goal of providing a general professional undergraduate medical education.

Entrance to medical school in Egypt today is based largely upon scores on national examinations.

The undergraduate program is more or less the same in most Egyptian medical schools. It consists of a six year curriculum organized by discipline and delivered by basic and clinical-science faculty.

Student workload is distributed so that students have adequate time to pursue independent study. About 58% of the students' contact time in the academic phase consists of lectures.

No student-patient contact takes place before the 4th year.

All courses are obligatory, no elective or selective educational activities exist. There is no system for integration between the basic and clinical sciences.

The Faculty of Medicine at Suez Canal University (FOM-SCU) is the only medical school applying problem-based, community-based education (CBE) in Egypt.

The governmental medical schools share the same problems as regards the big number of students, high admission rates, a centralized student admission policy, low funding etc.

The medical schools are now reviewing the undergraduate program's ILOs to be aligned with the National Academic Reference Standards (NARS) that have been recently developed by the National Authority for Quality Assurance and Accreditation in Education. These efforts are a part of the educational reform supported by the Ministry of High Education and the Supreme Council of Universities.

Medical education reform without a change: the teacher gap

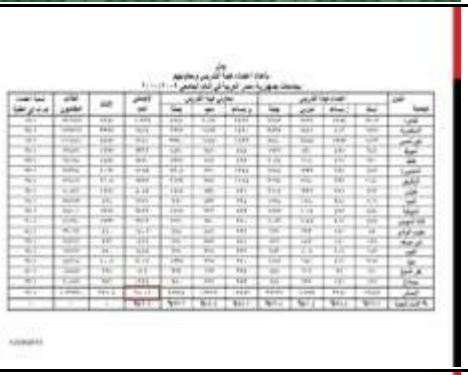
Atef Radwan*
Prof of Anesthesia & Intensive Care
Diploma in Medical Education (DHPE-SCU)
European Master in Disaster Medicine

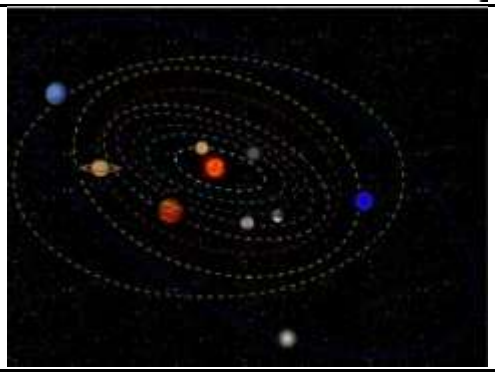
For many decades, medical education stakeholders meet at different retreats to reform education and many books and meeting minutes were issued. However dissatisfaction and frustration regarding the reform in education continues to prevail as no significant transformation in medical education could be perceived. In this talk, we will scan the barriers of actual change regarding the teacher, the student, the curriculum and the institutional culture, and we will focus on the qualification of the human resources (the teacher) needed for major transformation. The social failure in the irrational institutions make them difficult to transformation and they need appropriate understanding of the basics of sociology as the structural Functionalism theory (Talcott Parsons). Application of the scientific bases of the change management models as Kotter, Lewin, and McKenzie models is mandatory to overcome the barriers to change and pave the way to actual transformation in medical education system. Based on that, the main pillar of the educational system namely the teacher and his/her competencies will be in focus in the lecture.

MEDICAL EDUCATION REFORM WITHOUT A CHANGE: THE TEACHER GAP

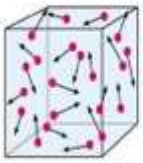
Adel Radwan

Prof. of Anaesth. and Intensive Care
Head of Scientific Board ADOM
European Master in Disaster Medicine
Diploma of Health Professions Education,
Programme Director of Disaster
Training Egypt- ALSG-UK





OUR CASE
EDUCATION-HEALTH CARE SERVICE



Irrationa
l

Wicked

WICKED PROBLEM

- Difficult to clearly define
- Has many interdependencies and are often multi-causal.
- Attempts to address wicked problems often leac uence

- Ever changing
- Usually have no apparently clear solution.
- socially complex: many stakeholders
- hardly ever sit conveniently within the responsibility of any one organization

Book Review

So Much Reform, So Little Change:
The Persistence of Failure in Urban Schools

Charles Payne
Cambridge, MA: Harvard Education Press, 2008

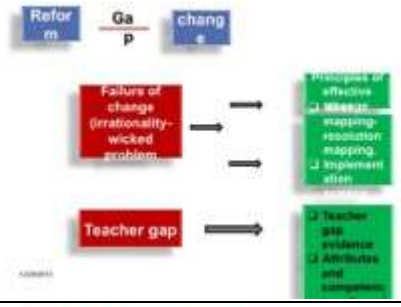
Reviewed by: Augusto Riveros
University of Alberta

IRRATIONAL ORGANIZATION

OBJECTIVES

- To define reform and change
- Describe the sociology of the change failure (reform- change gap)
- Overview the principles for effective change
- Describe the Wicked problems mapping and resolution
- Prove the teacher gap (evidence)
- Describe the competencies and attributes of good educators

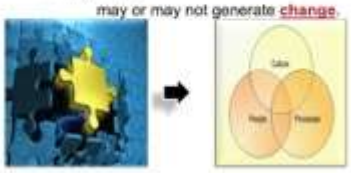
VES



REFORM and CHANGE

- Reform : a deliberated intervention in education through policy;

may or may not generate change.



THE SOCIOLOGY OF FAILURE

Payne, 2008

- Wide "Reform- Change gap" in dysfunctional (irrational) organization
- More reforms, dysfunctionality gets more accentuated.
- Individuals move with own goals

- Another threat for successful change rests in the "What works?" question.

1. Context related change

2. Model change

Payne's preference is to start from the bottom, meaning from the schools and classrooms instead of higher-level interventions such as the school district or even nation-wide

WHO WILL LEAD THE CHANGE

"Problems cannot be solved with the same mind set that created them."

قانون السذاجة

أن نعمل نفس الأمور بنفس
الطريقة ثم تتوقع نتائج مختلفة

The human variance is the main to effect the change

عندما تتغير البنية التحتية فإن كل شيئ يصدر صوتًا مدويًا

External and Internal environment- the context

ORGANIZAIONAL ALIGNMENT

THE CHANGE FORMULA

Kathie Dannemiller

Can teaching the teacher be the first concrete step?

D x V x F > R

D = Dissatisfaction with how things are now

V = Vision of what is possible

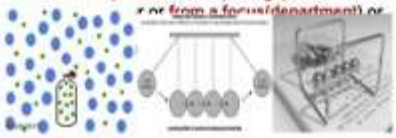
F = First, concrete steps that can be taken towards the vision

R= resistance

MODEL APPLICATION AND CHANGE

ROGERS' DIFFUSION OF INNOVATIONS THEORY

The concept of diffusion of innovations usually refers to the spread of ideas(change) from one



PLAN FOR THE RESISTANCE

1. The reason for the change is unclear
2. Lack of competence
3. Poor communication
4. Fear of the unknown
5. Connected to the old way
6. Low trust ,Temporary fa
7. Not being consulte

1. Stay stealthy and avoi conflict
2. Executive or Employee Coachin
3. Make your plans their idea
4. Renegotiation
5. Outflank Employee Resistance
6. The Enemy of my Enemy is my Friend
7. Fire Them

VES

Refor m

Ga p

chang e

Failure of change (irrationality--wicked problem

Teacher gap

Principles of effective change

mapping-resolution mapping implementation

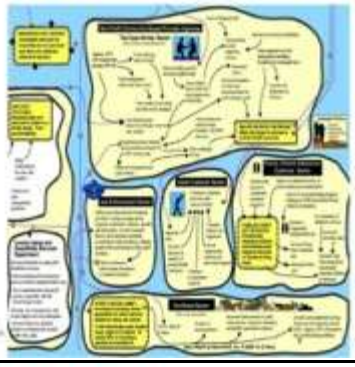
Teacher gap evidence Attributes and competency

SOCIAL MESSES- APPARENTLY INTRACTABLE PROBLEMS

AND MESS MAPPING PROCESSES

"C-level" executives, Boards of Directors, thought leaders, authorities, and change agents Combine to define ,analyze, and graphically presenting the problem

UNDERSTANDING SHARED DISPLAY - GROUP MEMORY



Participants must communicate well enough to "find the elephant"

RESOLUTION MAPPING

Note the direction of the arrows. They run from the future to the present. Endstates are written as if the future has already happened. As noted, Resolution Mapping is best thought of as a form of simulated hindsight: **The future is now; how did the world get to be this way**

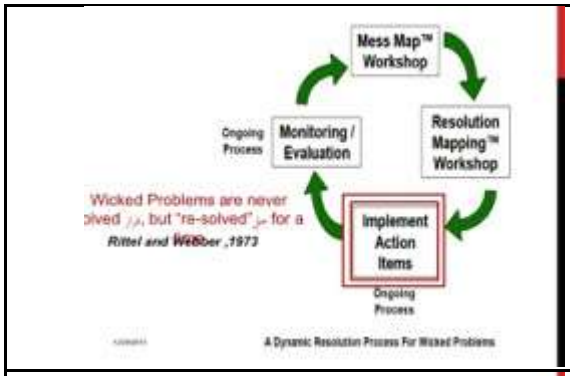
Endstates (alternative futures) are a form of Simulated Hindsight

A red slash indicate a "Must Not" happen event

For Back Brainers: Teams identify Key "Must Happen" Events

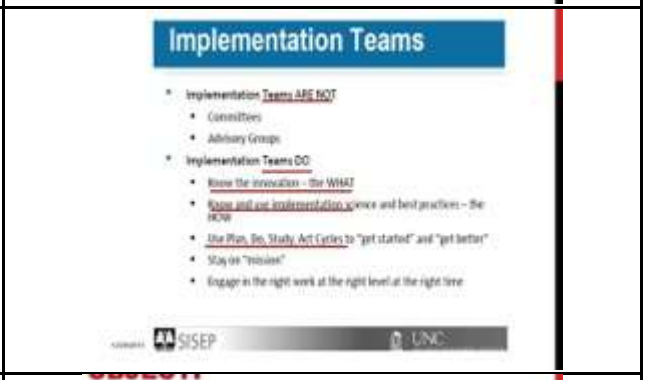
A Scenario Is A Narrative With A Plot, Actors, Motives, Drivers, Etc.

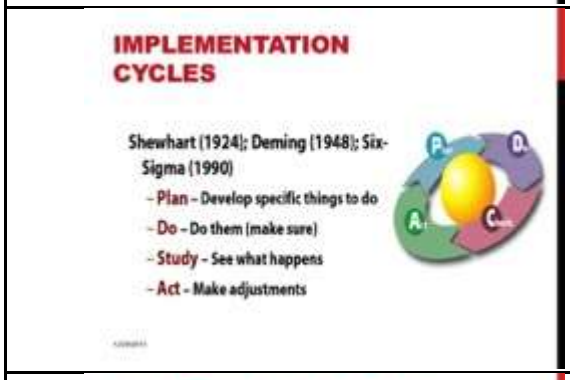
Common Events Appear In A Majority of Scenarios

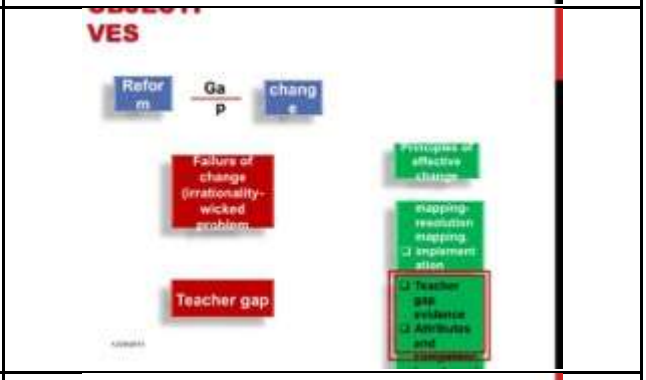

Mess Map™ Workshop
Resolution Mapping™ Workshop
Implement Action Items
Ongoing Process
Monitoring / Evaluation
Ongoing Process
Wicked Problems are never
olved ,, but "re-solved" for a
Rittel and Webber ,1973
A Dynamic Resolution Process For Wicked Problems

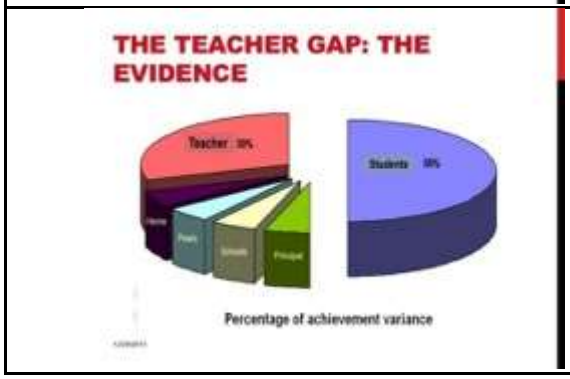

IMPLEMENTATION SCIENCE

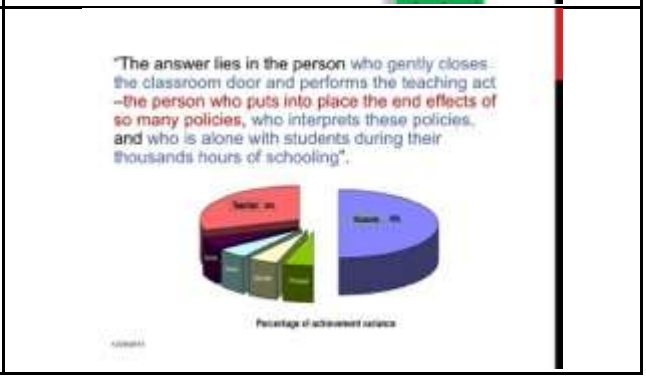

IMPLEMENTATION TEAMS
Organized, expert assistance to develop and sustain an accountable and effective structure


Implementation Teams
Implementation Teams ARE NOT
Committees
Advisory Groups
Implementation Teams DO
Know the innovation – the WHAT
Know and use implementation science and best practices – the HOW
Use Plan, Do, Study, Act Cycles to "get started" and "get better"
Stay on "mission"
Engage in the right work at the right level at the right time
SISEP
UNC


IMPLEMENTATION CYCLES
Shewhart (1924); Deming (1948); Six-Sigma (1990)
- Plan – Develop specific things to do
- Do – Do them (make sure)
- Study – See what happens
- Act – Make adjustments


VES
Refor m
Ga p
chang e
Failure of change (irrationality-wicked problem
Teacher gap


THE TEACHER GAP: THE EVIDENCE
Teacher 30%
Students 70%
Percentage of achievement variance


"The answer lies in the person who gently closes the classroom door and performs the teaching act –the person who puts into place the end effects of so many policies, who interprets these policies, and who is alone with students during their thousands hours of schooling".

The study conclusion

"…we should focus on the greatest source of variance that can make the difference – The teacher.

We need to ensure that this greatest influence is optimized to have powerful and sensationally positive effects on the learner".

The quality of teaching and learning provision are by far the most salient influences on students' cognitive, affective, and behavioral outcomes of schooling . Indeed, findings from the related local and international evidence-based research indicate that 'what matters most' is **quality teachers and teaching**, supported by strategic teacher professional development!

Learning outcomes

A framework for developing excellence as a clinical educator

E A Hesketh, G Bagnall, E G Buckley, M Friedman, E Goodall, R M Harden, J M Laidlaw, L Leighton-Beck, P McKinlay, R Newton & R Oughton

Medical Education 2001;35:555±564

The learning outcomes for the 'effective teacher', based on the three circle model						
Level 1	What the doctor as a teacher is able to do 'Doing the right thing' Technical intelligences					
Level 2						
1 Teach large and small groups	2 Teach in a clinical setting	3 Facilitate and manage learning	4 Plan learning	5 Develop and work with learning resources	6 Assess trainees	7 Evaluate courses and undertake research in education
1-Prepare a Lecture 2-Deliver a lecture 3-Use audiovisual aids, including electronic presentations [illegible]	1-Teach clinical and practical skills 2-Teach appropriate attitudes 3-Teach decision making Skills	1-Carry out appraisal of learner and Prepare report 2-Assist learners in achieving the stated [illegible]	1-Undertake an assessment of learners needs 2-Define the learning outcomes expected 3-[illegible]	1-Design instructional tool including handouts, handbooks and protocols 2-Make appropriate [illegible]	1-Choose appropriate assessment instrument 2-Use Portfolios 3-Use written [illegible]	1-Use arrange of tools for evaluating Courses 2-Use arrange of tools for evaluating teachers
4-Obtain audience participation 5-Choose appropriate small group teaching methods 6-Run a small group teaching Session 7-Organize and run video and teleconferences	4-Teach in the ward, theatre And related Areas 5-Teach in the clinic 6-Teach 'on-site' 7-Teach in the community 8-Teach in a clinical skills unit 9-Act as a role model	4-Direct learners to appropriate information and human resources 5-Assist learners in self-assessment skills 6-Develop learning Contracts 7-Motivate learners 8-Counsel learners on career 9-Counsel learners on personal Matters 10-Counsel learners on aspects of learning and study skills 11-Assist learners to organize their knowledge and experiences 12-Assist [illegible]	4-Design teaching strategies And learning experiences to match the outcomes 5-Prepare a learning plan with timescale 6-Create an appropriate learning environment 7-Integrate different elements of the programme 8-Implement Planned Course	4-Make appropriate use of videotapes 5-Contribute to the preparation of multimedia Learning packages 6-Use multimedia learning Resources 7-Use the Internet for Teaching 8-Plan and Advise learners on the effective use of library Facilities 9-Make appropriate use of clinical Simulators	4-Assess performance at clinical examination 5-Produce and interpret Learner profile 6-Set appropriate Standards 7-Facilitate learners' Self assessment 8-Make appropriate use of computers in assessment 9-Assess learners for admission to the educational programme	4-Encourage research in medical education Using sound educational research Technique s

How the doctor approaches their teaching 'Doing the thing right' Intellectual intelligence Analytical and creative intelligences. Emotional Intelligences			The doctor as a professional teacher 'The right person doing it' Personal intelligences	
8 With understanding of principles of education	9 With appropriate attitudes, ethical understanding and legal awareness	10 With appropriate decision-making skills and best evidence based education	11 The role of teacher or trainer within the Health Service and the university	12 Personal development with regard to teaching
1-Theories of learning 2-Learning styles 3-On the job learning 4-Opportunistic learning 5-Problem-based learning/task-based [illegible]	1-Enthusiasm 2-Empathy and interest in learners 3-Respect for Student 4-Openness 5-[illegible]	1-Use evidence-based medical education as the basis for teaching and learning strategies adopted 2-[illegible]	1-Understand teaching responsibilities 2-Maintain an acceptable balance between service commitments, research and teaching 3-Accept appropriate [illegible]	1-Reflect upon and be aware of own strengths and weaknesses as a Teacher 2-Accept and respond to [illegible]
6-Cooperative learning 7-Small group dynamics 8-Principles of instructional design 9-New learning technologies 10-Principles of curriculum planning 11-Outcome based education 12-Multiprofessional education 13-Distance learning 14-Principles of assessment and feedback 15-Principles of Change	6-Confidentiality 7-Impartiality 8-Respect for institutional goals 9-Values teaching role 10-Demonstrates intellectual curiosity 11-Training regulations 12-Grievance and disciplinary Procedures		6-Appreciate doctor as a teacher and learner of a multi professional Team 7-Encourage a Multi professional approach to clinical teaching 8-Appreciate and respect colleagues 9-Familiarity with teaching recommendations and requirements of the GMC, the specialities and the University	

101 competencies

الم علم ثالث الأبوين ؛
فلينظر كيف يأبو
حين ينظر كيف
يعلّم .

مصطفى صادق الرافعي

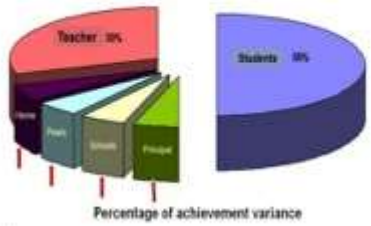
SUMMARY

Define what works: model change within your sphere of influence

Refor m | Ga p | chang e

Failure of change(irratio na/ity-wicked problem

Teacher gap



I suggest for the staff (Univ. and MOH) to be certified in:

- Medical education
- Educational psychology and:
  - to attend pertinent courses on social psychology
  - to attend pertinent courses/workshops on Resolution mapping and implementation science

- **Invite the appropriate stakeholders to utilize :**
  - the implementation science
  - resolution strategies for wicked problems
  - Change management tools
  - Performance improvement tools
- **Environment ,climate, fidelity and organizational alignment matter**

- **The teacher gap is wide and the infrastructure (competencies) of the appropriate educators should be appropriately formulated**

We need to define exactly who are the stakeholders specialized in designing the bridge of such a gap

Medicine and public Health in Ancient Egypt - A Historical and Pictorial Presentation

Dr. Amer El-Ahraf
Professor of Health Sciences and Vice President Emeritus,
California State University, Dominguez
aelahraf@csudh.edu

Dr. Shokry El-Kantiry
Assistant Professor of Egyptology,
Faculty of Arts, Aswan University
shokryhussin2000@hotmail.com

Abstract:

The main lesson of studying Ancient Egyptian medicine and public health is the recognition of the integral relationship between medical treatment and health promotion and disease prevention measures including recognition of the role of the ecological systems.

Ancient Egyptian medicine is well known for its achievements including its advances in the areas of differential diagnosis, the classification of more than 200 diseases and a robust arsenal of medicinal drugs and surgical skills. Egyptian medical papyri were among the important vehicles of recording such advances. Examples include the Edwin Smith Surgical Papyrus, Kahun Gynecological Papyrus and the Ebers Papyrus. The later covered a collection of medical conditions in an organized manner contained in approximately one hundred and ten pages. The role of "Midwives" in maternity care, a re-emerging concept in modern heath care, was well known in Ancient Egypt.

This excellence was not limited to the clinical aspects of medicine, but also it extended to the area of public health where advances were made in nutrition, hygiene, housing, water and waste disposal systems. Most significant was that the emphasis has extended beyond disease concerns into the concepts of health and well being. The later concepts are recognized today as an important development to the extent that these expressions are essential components of any definition of health.

Furthermore, respect for the environment and particularly protection of the Nile from pollution was enshrined in the ancient Egyptian religion and influenced individual behavior. Today's research in the health sciences support these ancient concepts where environmental health and health behavior are recognized among the significant components of public health and most important determinants of health in a human population. Additionally, the role of animals was recognized beyond their ecological and veterinary medicine significance and into their emotional impact on humans.

In this historical and pictorial presentation we integrate the authors combined expertise in ancient history and environmental and public health to produce an image of excellence and a model to be explored, studied and implemented by modern Egypt.

Future Directions of Environmental and Public Health Based on the Principles of Universality, Integration and Harmonization: Lessons Learned from History and Implications for Egypt

Dr. Amer El -Ahraf
Professor of health Sciences
Vice President Emeritus
California State University
&
President Emeritus, American –European University Consortium
Past President, National (US) Environmental Health Association
Former President, Association of Egyptian Scholars

Abstract:

The integrating and important fields of environmental and public health are examined from a historical prospective starting with the beginning of the twentieth century including assessment and forward looking into the future and its strategic requirements. Past trends are analyzed, challenges are identified and future directions are recommended. This is done within the context of prevailing forces and corresponding spheres of influence in the philosophical, technological and political arenas. While changes have been gradual, their impact has been profound on human societies. Great progress has been made ranging from broader philosophical foundation as expressed in the contemporary definitions of environmental health, public health and health itself to greater technological achievements particularly in the fight against most infectious diseases and the establishment of supportive public health policies and international mechanisms of cooperation. Yet, challenges remain formidable requiring new and innovative outlook on designing new directions. In the author's view, future directions will require the incorporation of the principles of "universality", " Integration" and "Harmonization" in future strategies. These principles are explained and examined by the author within the context of multigenerational environmental and public health work and how to build on past achievements to design a preferred future. Implications for Egypt are discussed.

About The Author: Dr. Amer EI-Ahraf

Named by the *Journal of Environmental Health* as one of the 15 Leaders of Environmental Health, Dr. Amer EI-Ahraf is Past President of the National Environmental Health (NEHA) as well as the California Environmental Health Association (CEHA) and Founding Chairman of The International Forum of Environmental Health Faculty. He is an Environmental Health Scientist who conducted pioneering research and developed strong academic environmental health programs at the Bachelor, Masters and Doctoral levels.
He is a strong believer in linking theory and practice. As a Registered Environmental Health Specialist, along with Mr. Don Hanson and others, he conducted innovative environmental health work in the Los Angeles Willowbrook Model Neighborhood Programs that involved the community in a meaningful manner and attracted national attention including a Commending Resolution by NEHA and an invitation to present the program before the US President's Committee on Health Education.

He established along with his colleagues the first comprehensive environmental Sciences Program at the Faculty of Engineering, Zagazig University and co-supervised the Doctoral Dissertations of its first faculty members in this field.
He worked with colleagues in the Institute of Near Eastern Civilizations at Zagazig University to incorporate environmental sciences in Ancient Egyptian History and graduated the first Ph.D. in this field. Additionally, he supervised the PhD and Post Doctoral work of Egyptian colleagues from the Faculties of Medicine and Veterinary Medicine and others in the areas of Environmental and Public Health.
He served as consultant to a variety of programs on local, state, national and international levels including WHO.
A recognized scholar in environmental and public health, Dr. El-Ahraf is a published author including a book entitled: " The Impact of Public Policy on Environmental Quality and Health".
He has received a number of honors and awards including the two most prestigious in the field: the Mangold Award and the Snyder Award for Excellence in Environmental Health
He has a number of appointments as an Honorary Professor in international universities.
Dr. EI-Ahraf obtained his Doctoral Degree in Public Health with " Distinction" from the University of California, Los Angeles. (UCLA)
He has held professional positions in Environmental Management, Los Angeles County and academic and administrative positions in the University of California, California State University. He is listed in WHO'S WHO in AMERICA and WHO"S WHO in HEALTH CARE.
His research interests cover contemporary issues in in public health and environment as well as the relationship of these fields to Ancient Egypt and the Arabic/Islamic civilization.
Currently, Dr. Amer EI-Ahraf is a Professor of Health Sciences and Vice President Emeritus, California State University, Dominguez Hills and a Registered Environmental Health Specialist.

Environmental & Public Health concepts and Definitions
Environmental and public health are two integrally related fields with immense influences on the human populations in developed and developing countries alike. When environmental forces (biological, chemical, physical, social and psychological) impact human health, the field of study is environmental health.

EL-Ahraf and Hanson defined it as follows: "Environmental Health is the field of science and art representing the interface between environment and health and the interaction between scientific endeavors and social conditions and their impact on human populations. It revolves around human daily needs and requirements for clean air, safe food and water, proper waste disposal and sound land use management through the attainment of aesthetically pleasing, healthful and sustainable residential, recreational and work environments. "

Additionally, the business of health care is public health. The field was defined by CEA Winslow as "The science and art of preventing disease, prolonging life and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing services for the

early diagnosis and preventive treatment of disease, and the development of the social machinery which will insure to every individual in the community a standard of living adequate for the maintenance of health."

Amer El-Ahraf defined Public Health as:
" A collective community action to prevent disease and disability, promote health and wellbeing and otherwise advocate for the right to health and healthful longevity within a socially just and health sustaining environment"

The overriding purposes of environmental and public health activities are to insure the integrity of environment and to improve the quality of life for every one. This is applicable in cases of developed countries such as the United States as well as developing nations such as Egypt. In spite of similarities, the priorities and methodologies may vary to meet different social, cultural and ecological conditions as well as the availability of resources and the way they are allocated within each country.

A Historical & Analytical Perspective on the Spheres of influence

This paper provides an analysis of past trends, identification of current and emerging challenges and recommendations for future directions into the twenty-first century and beyond. This examination takes place within the context of the gradual but profound changes that occurred within three major areas since the beginning of the twentieth century creating new situations and requiring new actions. These areas correspond to the Philosophical, Technological, and Political spheres of influence.

In the first sphere of influence, i. e. the philosophical foundation has moved from a narrow and negatively oriented definition of health as "the absence of disease" towards broader and ecologically oriented definitions. Building on the World Health organization's definition of health that expanded it from the physical into social and mental well-being, the author of this paper and his colleague Don Hanson have further expanded it into the environmental area and defined health in ecological terms. Thus, **EL-Ahraf and Hanson's ecological definition of health** is stated as follows; "Health is a complete sense of physical, psychological, social and environmental well-being. It is not simply the absence of illness, injury, disability or overt pathological conditions of the environment".

Furthermore, environmental and public health management practices have also moved from the concept of "control" of environmental and disease elements to an overall approach of "management" promoting quality of life and sustainable development as a philosophical base of operation. The challenges in this area include the requirement to continue to develop innovative and relevant philosophical foundation for environmental and public health that will serve it well into the future.

In the second sphere of influence, i.e. the technological changes have resulted in major historical events that included:
The first public health revolution waged mostly against communicable diseases and resulting in reduced infant mortality and increased life expectancy
Reduction of disability and death rates among patients suffering from chronic diseases

Recognition of the health threatening impact of the second industrial revolution with its chemical and other scientific sophistication and the unpredictable effects on human and animal heath
An unprecedented informational technology revolution; and
Recognition of the enormous cost and shortcomings of the latest medical, industrial and information technology revolutions. Challenges in this area include addressing continuing problems in an intelligent and cost-effective manner as well as addressing the issues of emerging and reemerging health issues particularly those of infectious diseases of zoonotic origin and the overarching eco-pathological condition of global warming

In the third sphere of influence, i. e the political arena witnessed the emergence of the environment as a public policy issue and the redefining public health in both scientific and social terms.

The sixties have brought an environmental revolution to the forefront of the American life.
The seventies have witnessed key environmental legislation with some dichotomy and fragmentation in the administration of environmental and health services at national and state levels.
The activities of the eighties have institutionalized the environment in the US and spread awareness across the globe including many developing countries such as Egypt.
The nineties were characterized by expressing environmental concerns in whole earth terms.
And, the beginning of the twenty-first century made sustainable development through environmental and health measures a new strategy for international efforts.

Parallel changes have occurred in the health care field. Building on the sanitary movement that emerged in the last half of the nineteenth century and continued to prevail in the first half of the twentieth century, the US built a health care system with science-based control measures, organized and largely implemented in the form of state and local health departments. It gradually drifted to become a mostly medical care system dominated by a treatment model that grew more technologically sophisticated and more expensive for the government and individuals to finance.
Thus, since 1950, gaps in medical care and its finance have accompanied an expanding agenda and a greater involvement by the government. While the hospital care level is among the best in the world, nosocomial infections remain at an unacceptable level and over forty million Americans entered the twenty-first century without adequate health insurance. These kinds of problems have, motivated seven r US presidents, numerous congressional sessions and the presidential candidates in the year 2008 to try to develop still an elusive optimum solution.
>President Obama's Affordable Care Act, to be fully implemented as of January 2014, is a new entry in medical care reform that contains a positive element of attention to preventive health measures.

The worrisome part of all of this is that several developing countries including Egypt have adopted such a costly treatment model at the expense of a preventive and a health promotion approach. With much poorer resources, future challenges can even be greater

for Egypt than those faced by the United States. The growing enormity of the environmental and public health fields, the current administrative models and the globalization of environmental and health issues are additional formidable challenges that will require reexamination of the determinants of public policy formulation on local, national and international levels.

Future Directions

*Considering the above noted trends and in face of identified challenges, we recommend the incorporation of the three principles of "**universality**," " **integration**" and "**harmonization**" as corner stones in formulating the conceptual framework for the future directions of environmental and public health and as they apply to the three spheres of influence that continue to shape these important fields of human endeavors.[7] [in] the philosophical sphere of influence, "universality " means accepting the universality of human rights to include the right of individuals to adequate health services and aesthetically pleasing, healthful and sustainable environment. The old wisdom stating that [11] an ounce of prevention is better than a pound of cure" is still valid and must take a prominent place in building the philosophical foundation of future directions?*

In the technological sphere of influence

***"Integration"** of environment and health requires close coordination of national environmental and public health services including the development of a truly comprehensive public health care system. Such a system would include a set of integral and interconnected components. These are:*
Medical care including surgery for those who need it.
Environmental management to strike at the roots of eco-pathological conditions,
Health education to develop proper health behavior to help individuals make decisions based on knowledge;
Research, education, continuing education and training to develop the knowledge base of the field and the competency of personnel; and
Effective laws and regulations

Within this context, the terms "medical care" and "health care" should be completely understood, differentiated and then integrated in a the public health and environmental continuum.
The strengthening of the infrastructure in terms of physical, technical, financial and human resources is overdue. Realizing the potential benefits of the system, these should not be viewed as expenses but rather as investment in the future.
On the international level, an intercultural approach to global environment and health management is most suited to the task of achieving results in multilateral and diverse situations.

In *the political sphere* of influence

"Harmonization" of public policy formulations regarding public health and environmental

quality on one hand and environmental quality and economic development on the other must take place at all administrative levels.
Concurrent with the implementation of these principles, the future of environmental and public health will depend in large measure on three prerequisites. These are:
Global cooperation on bilateral, regional and international levels and through the UN agencies and other international organizations. Environmental and health technology transfer combined with financial assistance to developing countries and wise utilization of natural resources by all are important corollary measures to meeting this prerequisite;
Recognition that the health and environmental conditions of any country is not only a matter of concern, within its own boundaries. Recent examples of spread or diseases such as SARS, West Nile Virus, Mad Cow Disease and Avian influenza or dispersion of pollutants from countries suffering from poor environmental and public health measures to others that are normally free of such problems illustrate this point, and
Improved environmental and health conditions are necessary prerequisites for sustainable economic development and vice versa

Therefore, it remains the sole responsibility of every country to design its own mechanisms to achieve these goals within an overall strategy to improve the quality of life of its citizens and to contribute positively to the local and global environmental and public health conditions. While benefiting from the experience of others, such a strategy should be indigenous to the country in question

Implication for Egypt:

The above noted findings and recommendations are of particular significance to Egypt and its role in the twenty -first century. Examples include:
Academic, Management, and Research

Academics:
A multifaceted academic approach where every Faculty/College has an environmental health orientation to its curriculum.
A community environmental service approach by multidisciplinary teams of university students representing different majors.
In addition to Departments of Public/Hygiene in Schools of Medicine and Veterinary Medicine, consideration must be given to establishing new independent Schools of Public Health.

Management:

Developing a model of international, intercultural environmental and public health management based on the principles of `universality `, `integration` and `harmonization`.
Training future managers in comprehensive environmental and health management programs.
Encouraging students and graduates of different majors to volunteer and to incorporate environmental and health orientations in their work.

Research:

Training of personnel for an ` **ecologically based** ` environmental and public health hazards research.
Establishing multidisciplinary cooperative models and research methodologies that allow for the study of complex interactions of all factors such as those identified in the El-Ahraf & Hanson's "Ecological Definition of Health" and in other contemporary concepts.

Egypt--Recent Achievements
Great strides made include: Creation of the first comprehensive approach to building a pioneering environmental Sciences department at Zagazig University. Other universities such as Monofia and Ain Shams have made strides in similar areas.
Establishment of the Faculty/Institute of Public Health at the University Alexandria.
Creation of a new Ministry of the Environment in addition to a well-established Ministry of Health.

Modernization of medical education in cooperation with AEAS.

Egypt-Past inspirations and future aspirations

While working on present day issues and aspiring for a bright future, Egypt can look to its glorious past for inspiration.
Egypt has a rich cultural history dating back to ancient times where personal hygiene, healthy disposition and care for the purity the Nile and the total environment were highly prized.
Ancient Egyptian physicians were recognized not only for their treatment and surgical skills but also for their awareness of the role of nutrition, hygiene and occupational health in preventing disease and promoting health of the total person.
Egyptian engineers pioneered innovative irrigation methods and developed advanced water and sewer systems.
Along with architects they designed formidable buildings and provided marvelous examples of city planning.
Today, Egypt is full of a new generation of talented professionals that we are proud to call them our esteemed colleagues. Among them is Dr. Moustafa Kamal Tolba, the first director of the United Nations Environmental program (UNEP) and the many professors, university presidents and key national and Arab World leaders attending today.
Conclusion

Egypt is a regional power with a leading role in promoting regional cooperation with other member states of the Arab League, the Nile Basin and the European Union.
Egypt is a founding member of the United Nations and has special relations with major world powers.
Egypt has a credible base in its academic and research institutions.
Therefore, Egypt has the capacity to be a world leader in environment and public health and their role in sustainable economic development and improving quality of life for all citizens.

It is important to note that in considering the principles of "universality", " integration " and " harmonization" as well as academic and research approaches to environment and public health that Egypt must design its own solutions and build its own model—based on quality education and home grown science and technology.
Egypt has a destiny and a place in history. A balanced approach to environment, health and economics is a sure way to secure it for now and future generations.

Thank You

Health Reform In Egypt – A Must For Current Recovery And Future Development

Tawfik Ayoub, MD
Assistant Professor of Clinical Anesthesiology
Keck School of Medicine, University of Southern California

Over the last few decades, due to convoluted reasons the medical service has deteriorated in Egypt. The issues becomes more complex with the approach of implementation of the General Agreement on Trade Services (GATS) and medical system that allows foreign medical doctors to practice in Egypt. The problem has obviously caught the attention of high authorities in Egypt to act on the subject. Among the various reasons for medical service deterioration is the deterioration of medical education and health services provided to people.

The supreme council of Universities has commissioned the medical sector committee leadership to investigate the problem, and the AEAS was contacted to contribute in the efforts to advance medical education in Egypt.

Following the January 25th revolution, it was quite obvious that Healthcare reform is a must, and not an option. Egyptian doctors revolted against the low salaries, poor work conditions, poor training and poor resources. All those combined require a major reform of the medical sector in its entirety.

In the mean time, the “Egyptian individual” is the mots valuable resource in Egypt; recovery from the current economical disaster and future progression of the country depends on maintaining health individuals to carry out the workload.

This paper discusses some of the important issues we see important to the advancement of medical education, amelioration of medical services in Egypt and hence promote faster recovery & future development of Egypt.

TAWFIK AYOUB, MD
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Keck School of Medicine, University of Southern California
Los Angeles, California - USA

HEALTH REFORM IN EGYPT
A MUST FOR CURRENT RECOVERY AND FUTURE DEVELOPMENT

Association of Egyptian American Scholars' 35th Annual International Conference - Cairo, Egypt 12/25 - 12/28/2014

"Report on Modernization of Medical Education in Egypt"

Submitted from the AEAS
to
The Medical Sector
Supreme Council of Universities
Ministry of Higher Education and Scientific Research

Introduction

- Medical care is an important aspect of Nations' Development
- It is complex and expensive even for the most Advanced Nations

Advanced Medicine

- Patients' Rights
- Generalized Good Health vs. poor health
- Evidence Based Medicine vs. Opinionated Med
- Advanced Medical research
- System Based Success vs. Individual Success
- No variation in Knowledge and skills across the different sectors of providers
- Small classes in Medical Schools
- Skillful Nursing care
- Knowledgeable Clinical Pharmacist
- Strong ancillary services
- Etc…

Why Reform?

- People's Right:
  - To a healthy life
- Medical providers Right
  - To an appropriate education
  - Better working condition
  - Appropriate income
- Egypt Right
  - To progress

Patients' Bill of Rights

- The Patient has the right:
  1. To a considerate, respectful care
  2. To obtain information
  3. To make decision about the plan of care
     - Accept & Refuse medical treatment
  4. To privacy
  5. Confidentiality of communication & records
  6. Review their records
  7. The right to ask and be informed
  8. To consent or decline proposed research studies

American Hospital Association Management advisory

Medical Reform

Components of Medical Service

- Qualified Medical Doctors
- Qualified Nurses
- Qualified Pharmacists & Clinical Pharmacists
- Qualified ancillary services
- Well equipped facilities
- Well implemented Medical Ethics
- Strong financial institution

Medical Education

Standard Education
&
Standard Outcome

Medical Student

- Selection of right candidates
- Appropriate Education
- Appropriate Training
- Maintenance of knowledge & skills

Medical Education

Lifelong Education

- Pre-University education
  - Elementary - High school
- College or Undergraduate Education
- Medical School Education
- Internship & Residency Training
- Continuous Medical Education

Medical School Admission

- Qualification criteria
  - High school Diplomat ... ثانوية عامة
  - Pre-medical Education
  - Medical School Admission test
- Selection Criteria
  - School performance
  - Test Score!
  - Personality dimension & extracurricular activities & interests

Pre-Medical Education

- Two years minimum.. Preferably a "Bachelor Degree"

The USC Keck school of Medicine Academic requirements

- 4 full years or 120 semester hours of academic work at an accredited college or university
  - General Biology + Lab 2 semesters/ 3 quarters
  - General Chemistry + Lab 2 semesters/ 3 quarters
  - Organic Chemistry + Lab 1 semester/ 2 quarters
  - Physics + Lab 2 semesters/ 3 quarters
  - Biochemistry 1 semester/ 1 quarter
  - Molecular Biology* 1 course
  - Social Sciences, Humanities, and English Composition 30 semester hours
  - * Molecular Biology requirement met by following courses: molecular genetics, cell and molecular biology, advanced cell biology or the equivalent
- Preference is given to applicants demonstrating leadership, service, humanitarianism and/or a strong interest in research and teaching

Number of Students, Interns, Residents & Fellows

- Should be based on the number of students the particular school can "properly" teach and graduate at an "international" level of knowledge and skills
- It should be based on assessment of:
  - Number of educational cases/patients available per student
  - Number of procedure performed per student
  - Number of qualified faculty (Professors, assistant etc…)
  - Available resources (libraries, labs, etc…)
- Education of one should not interfere with the education of others.

Standardization

- Medical Education & Basic Curriculum
  - Higher Authority for Medical Education
- Medical Education Outcome
  - National Board of Examiners

Higher Authority for Medical Education

- Standardizes Curricula
  - International up-to-date information
  - National health needs
  - Behavior sciences & Medical Ethics should be part of basic science medical years and should form a reasonable percentage of the basic science exam
- Revises the Curricula yearly to new information
- Egyptian Index Medicus
- National Electronic Medical Library

Medical School Role

- Prepares students:
  - for medical practice
  - to pass the National Medical Exam
- Insure that each student have the medical knowledge necessary to treat patients & pass the national exam
  - Able to perform all necessary medical exams
  - Graduates are Capable of appropriate patients' management
- Evaluate students
- Medical schools have the same responsibility towards interns and residents but at a higher level commensurate with the level and objectives of their training

Some Medical School Issues

- Educational tools need to revolve
  - Audiovisual technology should be the standard
  - Institution website:
    - Lectures could be reviewed at will (NOT SOLD)
    - Lectures Podcasting
- Students should take an active part in their own education process:
  - Opinions heard, discussed, and implemented as appropriate
  - They should be encouraged to prepare lectures and grand-rounds
  - Strongly involved in research
  - Student should evaluate Faculty, Programs & Schools
- Creative thinking should be strongly advocated and rewarded (NOT SUPPRESSED)

Evaluations

- Student Evaluation
- Residents/Interns Evaluation
- Program Evaluation
- Faculty Evaluation

All Evaluations should be anonymous, and should be taken seriously

National Board of Examiners

National Medical Science Exams

National Board of Examiners

- Formed of current and retired Physicians from all sectors:
  - Universities, Ministry of Health, Military & private sectors.
- In charge of creating & administering:
  - The National Medical Sciences Exams
  - Creates & collects exam questions
  - Evaluates questions for relevance & accuracy of information
- Oversees administration & correction of exam
- Determines the passing score based on scientific formulas & performance not market need

National Medical Sciences Exams

National Medical Sciences Exams

- Given to evaluate Medical students from all Universities
- Purpose is to standardize education:
  - Single Standardized Exam
  - Ranks Students on National level
  - Compare performance of Different Universities
  - Ranks Universities based on Student performance & other criteria

National Medical Sciences Exams

- Three Parts
  - National Basic Medical Sciences Exam:
    - Given after successful conclusion of the basic science years.
  - National Clinical Sciences Exam:
    - Given at the successful conclusion of Medical school
  - Clinical Case Management Exam:
    - Taken at the conclusion of Medical school
    - Requires advanced computer programming
    - May be replaced by an Oral Exam until computer programs are developed

National Medical Sciences Exams

- Basic & Clinical Science exams:
- Computerized Exams
  - 150 question in 3 hrs session
  - 2 sessions a day (300 Q per day)
  - 2 successive days (600 Q total)
- A pool of minimum 10,000 questions:
  - MCQ, extending matching & K type questions
  - Submitted by current and retired physicians from all sectors of medicine
  - Should evaluate different levels of knowledge and thinking process
- The national board of examiners should regularly review the pool of questions for validity & up-to-date content
  - Old questions should be retired and new questions introduced on yearly bases
  - Retired questions could be sold for a nominal fee to medical students, interns and universities to be used for training purposes

- Clinical Case Management Exam:
  - Requires advanced computer programming
  - May be replaced by an Oral Exam until computer programs are developed
  - Oral exam should consist of clinical cases
  - Administered by members of the medical board of Examiners
  - Given several times a year, in different major central cities
- Fair Exams:
  No examiner should be involved in testing of any family member, relatives, or student from his own University

Internship & Residency

- Under the supervision of a higher authority
- Pre-determined length of residency depending on the complexity of the training
- Detailed curricula per specialty
- Predetermined number of cases

Log Book of cases

- Interns and residents should maintain a "Log Book" of cases
- Residents who do not meet the minimum criteria should not graduate until graduation criteria are met.
- Programs that do not meet minimum number of cases/ intern or resident, should decrease the number of interns/ residents or should arrange with another teaching hospital where the residents/interns could achieve the number of cases necessary to complete residency.
- It should be noted that programs accepting visiting interns and residents should have enough cases to cover for their own interns/residents & the visiting ones.
- At the conclusion of residency graduating residents become specialist in the field of graduation. They should then take the "Specialty Exam" to become "Consultants".

Duty hours

- Definition:
  All clinical and academic activities related to
  - Patient care
  - Administrative duties relative to patient care
  - In-house during call activities
  - Scheduled activities, such as conferences
- Do not include reading and preparation time spent away from the duty site

Duty hours

- Limited to 80 hours per week
- 1 day in 7 completely free
- 10-hours time free period between all daily duty periods and after in-house call (rest and personal activities)

Duty hours

- **In-house call:**
  - No more than every 3rd night
  - Not to exceed 24 consecutive hours
  - 6 additional hours for didactic activities, transfer care of patients, conduct outpatient clinics, and maintain continuity of medical and surgical care
  - No new patients may be accepted after 24 hours of continuous duty
  - Residents and interns should be monitored for signs of fatigue
  - Should be allowed 2 hours of sleep during a 24 hrs period

Duty hours

- **At-home call (or pager call)**
  - Not subject to the every-third-night, or 24+6 limitation.
  - Must not be so frequent as to preclude rest and reasonable personal time for each resident
  - When called into the hospital:
    - hours spend in-house are counted toward the 80-hour limit

Medical License

National Medical Practice Examination

National Medical Practice Examination

- Administered by the Licensing Authority in Egypt
- To All Physicians seeking medical practice in Egypt
- To All interns without discrimination (University & Ministry of Health or other relevant organizations) during the internship year and before its conclusion
- Those who pass:
  - Illegible to apply for a medical license according to the rules and regulations of the ministry of health
- Those who do not pass:
  - Retake the test up to three times
  - After three times of failure have to redo one year of internship in General Medicine (Internal medicine, Surgery, Pediatrics and Obstetrics)

Medical License & Renewal

- All physicians practicing medicine should be licensed by the Egyptian licensing authority
- Licenses renewal:
  - Every two years
  - 25 hrs Continuous Medical Education (CME's) per year
  - 50 hrs total per 2years

Continuous Medical Education (CME)

CME's

- Should be developed in all medical disciplines, specialties and subspecialties
- Could be provided by different institutions
- Under supervision of an Accreditation Authority
- Role of the accreditation authority is to review all CME programs for the Educational Value and administration process
- Accreditation authority should provide a list of all accredited providers for physicians to access

CME's

- **Exemptions from yearly CME requirements:**
  - Physicians in residency programs and the immediate two years following residency
  - The Two years following passing specialty exam

Quality Assurance & Accreditation Process

Quality Assurance & Accreditation Process

- Independent quality assurance programs should be created to supervise and monitor all aspects of medical education programs.
- Areas of monitor and supervision should include the following Evaluations:
  - Medical School Evaluation
  - Faculty Evaluation
  - Medical student evaluation
  - Resident Evaluation
  - Residency Program Evaluation
  - Hospital Evaluation

Medical Research Training

- Evidence-based medical practice is the cornerstone of medical education, however, without proper training in research methodology this becomes a mute point
- The following are important courses to be taught:
  - research methodology, biostatistics, research ethics, critical appraisal of research studies, scientific writing skills, grant writing skills, etc...
- The idea is to provide the medical graduate with the skills necessary to perform and publish high quality research that guides their evidence-based practice

Medical Specialties & Specialty Degrees

Medical Training & Specialty Degrees

- Wide knowledge discrepancy between different medical Sectors:
  - University , Ministry of Health and private sectors
- Training during residency is incomplete
  - Residents graduate knowledge short of being consultants
- Need to bring all sectors to same level of knowledge
- Raise level of graduate residents to that of Consultant
- Should not accept semi-educated and semi-trained physicians

National Boards of Medical Specialties

National Boards of Medical Specialties

- Formation:
  - Consultants in the field from all sectors of medicine (Universities, ministry of health, private, etc...)
- Role:
  - Writes the detailed curricula for each specialty (In conjunction with the Higher Authority for Medical Education)
  - Determines the duration of residency in each specialty and fellowship in subspecialties
  - Administers the National Board of Medical Specialty exams
  - Bestows Board Certifications to qualified individuals

National Boards of Medical Specialties

- Residency need to be upgraded to graduate consultants
- At conclusion of satisfactory residency, each eligible candidate becomes a "Specialist"
- After passing the Board of specialties they become "Board certified Consultant"

Specialty Board Recertification

- Exams should be retaken every "10years"
- CME's should be maintained
- 3 attempts to take and pass the National Board of Specialty Recertification exams to maintain board certification
- After 3 failed attempts:
  - Candidates should spend 1 year at an approved supervised program to qualify to retake the exam
- All residents in training should be strongly encouraged to become board certified
- All board certified physicians should be strongly encourage to maintain board certification.

Doctorate and Master Degrees

- Are Research titles not Clinical titles
- Does not provide the capacity of specialist or consultant
- Given upon successful conclusion of research tracts
- Universities should offer research tracts to qualified candidates
- Could be a part of a Medical School Education, Residency and fellowship training
- If offered as part of medical school, residency or fellowship, residency or fellowship
  - Training should be extended by the amount of time necessary to take the Doctor or the Masters degree.

Examples from Keck School of Medicine

- Graduate Programs
  - Biochemistry & Molecular Biology Ph.D. & M.S. Programs
  - Biostatistics Ph.D. & M.S. Programs
  - Cell & Neurobiology Ph.D. & M.S. Programs
  - Epidemiology Ph.D. & M.S. Programs
  - Medical Education M.S. Programs
  - Molecular Epidemiology Ph.D. & M.S. Programs
  - Molecular Microbiology & Immunology Ph.D. & M.S. Programs
  - Pathology Ph.D. & M.S. Programs
  - Physiology & Biophysics Ph.D. & M.S. Programs
  - Preventive Medicine Ph.D. Program
- M.D. Programs
  - M.D. Program
  - B.A./M.D. Program
  - M.D./Ph.D. Program
  - M.D./M.B.A. Program
  - M.D./M.P.H. Program
  - M.S. Clinical & Biomedical Investigations


Edwin Smith Papyrus
Dynasties 16 – 17 of the Second Intermediate Period in Ancient Egypt – 1600 BC
• The birth of plastic surgery: the story of nasal reconstruction from the Edwin Smith Papyrus to the twenty-first century. (Plast Reconstr Surg. 2007 Jul;120(1):327-36)
• The Edwin Smith Papyrus: the birth of analytical thinking in medicine and otolaryngology. (Laryngoscope. 2006 Feb;116(2):181-8)
• The Edwin Smith surgical papyrus: description and analysis of the earliest case of aphasia. (J Med Biogr. 2003 May;11(2):114-7)
Breasted, J. H. The Edwin Smith surgical papyrus. Chicago: Univ. Chicago Press, 1930 (Vol. 1 & 2)

The price is high, and the outcome is poor

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*** Introduction:** Healthcare costs are a major concern for individuals, private and public employers, payers, and governments especially in the United States. The healthcare delivery system in the US is challenged with pressures to reduce costs while at the same time, not diminishing access to high quality care.

*** Study objective:** To determine impact of delayed diagnosis of OSA, on different co-morbidities, patient outcome and healthcare costs

***Method:** A retrospective review of 7150 patients' health records from four metropolitan, non-academic sleep centers. Non-OSA cases were excluded, 1644 (23%), with the diagnosis of insomnia.
Of the remaining 5506 cases, 3854 (70 %) were males and 1652 (30 %) were females. The cases were then broken down by AHI severity. More than half (55%) of the patients had moderate to severe sleep disordered breathing (SDB). The BMI was more than 26 in 3,578 (65%) in this group

We then further analyzed each group according to their co-morbidities , 65 % with frequency of nocturnal micturition,60 % hypertension,40 % depression,27 %headache ,24 % hypertension, heart failure and diabetes, 15 % chronic fatigue, and 12 % decreased sex drive.(the total percentage is above 100%,since patient may have multiple co morbidities) We then divided cases based on referral,43% were self refered,28 %by ENT ,15 % by internal medicine ,5 % by cardiology, 9 % by bariatric surgery , 6.5 % by neurology and 5 % by psychiatry. Our review revealed that, delayed diagnosis, and failure to screen results in significant healthcare costs and poor patient outcome.
Conclusion: Based on our review, it is evident that SDB is a very common condition. More importantly it plays a major role in some of the most prevalent and costly illnesses effecting the middle aged and elderly population, an example of that is Heart Disease. We also observed that, we are not diagnosing these patients early enough and are missing opportunities to save significant healthcare costs and result in better patient outcomes.

"Egypt: Hub of Preclinical and Clinical Pharmaceutical Research, Potentials and Challenges"

Rasmy Talaat, PhD*
Wyeth/Pfizer Fellow, Retired
Drug Safety and Metabolism

This presentation will discuss the potentials and challenges of the industrial and economical ramifications and the scientific impact of the establishment of the research and training center for preclinical and clinical studies. This center will be highly specialized Hub for Medical, Pharmaceutical and Allied Sciences research and services.

Although Egypt was the leader of Arab countries in quality Universities, Pharmaceutical Industry and Clinical Research, but nowadays other much smaller countries, e.g. Jordan and Saudi Arabia are ahead of us. Also, it is outmost importance to notice the lack of the well trained and disciplined experts and scientists in these fields. The proposed center when properly operated would negate these shortcomings via offering a systematic, well defined plan to establish such regulated laboratories and develop such expertise. The proposed center will be unique in the Middle East. The proposed unit is going to act as a catalyst for building strong foundation, personnel and technology infrastructure, to enhance Egypt's chances and improve Egypt's competitive edge as hub of drug discovery/development research in the region.

Like most industries, the pharmaceutical industry, Pharma, and allied research fields are becoming more and more global. Yet much of the world's basic drug discovery know-how still resides in the US. Concurrently, the established Pharma, known for its leadership in scientific innovation, is currently encountering serious challenges. Recent analyses indicate that despite a more than doubling of global pharmaceutical research and development budgets in the past decade, the number of drugs approved by the FDA has dropped from 24 in 1998 to 13 in 2006. Although the number of approved drugs by FDA in 2009 increased to 25, only 7 of them are new entities. These prompted the pharmaceutical and biopharmaceutical firms to rely on outsourcing to conduct their research to replenish their pipelines from early Discovery to Clinical Phases.

The total pharmaceutical and biopharmaceutical outsourced market was $36 billion in 2010 and is expected to reach up to $48 billion in very few years. Primarily, outsourcing allows pharmaceutical firms to ramp up the R&D operations at a fast pace with minimal capital outlay. Nowadays, it is almost reality that CRO partner works in symbiotic relationship with Pharma. Pharma companies provide their core competencies in marketing and commercialization and CRO partners supply new and innovative techniques to advance Pharma products. Successful CROs gain access to or located at low-cost clinical testing areas in Developing Countries. The proposed Center will allow Egypt to be a serious player in this lucrative market.

The Diagnosis and Management of Pectoralis Major Tears

Amr Elmaraghy, MD, FRCSC

Abstract:

Although historically felt to be relatively rare, rupture of the pectoralis major tendon is an injury which appears to be increasing in incidence and importance. Challenges to appropriate assessment and treatment include the fact that the anatomy of the Pectoralis Major muscle and tendon has often been misunderstood, the absence of effective evidence-based methods of clinical assessment, and inconsistency of existing classification; all of which frequently lead to missed inaccurate or delayed diagnosis. This reality is contrasted with the necessity for urgent surgical management of Pectoralis Major tears in order to achieve an optimal outcome.

In collaboration with the University of Toronto, Faculty of Medicine, Department of Anatomy, we have been able to publish a model of the three-dimensional architecture of the Pectoralis Muscle and tendon, enabling a thorough understanding of accurate anatomy, which is crucial for new insights into the accurate diagnosis of the pattern of injury, as well as surgical planning and repair.

Relying on our empiric observations and subsequent surgical experience, we developed a diagnostic physical exam technique, known as the Pectoralis Major Index. The Pectoralis Major Index is a simple, quantifiable and accurate clinical diagnostic test for structurally significant Pectoralis Major tears. Routine application of the Pectoralis Major Index technique by clinicians may improve accurate identification of structurally significant rupture and expedite referral to a surgical specialist for optimal treatment and outcome (publication pending).

Combining the results of our anatomical study with our own clinical experience and a systematic review of the literature, we published a complete injury classification system, taking into account the timing, location and tear extent in terms of both thickness and width. This contemporary classification of Pectoralis Major tears can not only empower surgeons to explore and repair injuries with confidence, but facilitate a consistent dialogue among clinicians by providing standardized terminology that reflects the musculotendinous morphology.

To gain greater insight into this patient population, we developed and are maintaining a prospective database of all patients who present to my practice with a suspected Pectoralis Major rupture. Currently, there are over 50 patients in this database over 12 years. All patients are male with an average age of 36 ± 9 years; the most common mechanism of injury is an eccentric contraction, specifically the bench press maneuver and the most common tear pattern is a chronic, partial-thickness (posterior tendon layer) complete width injury located at or within the musculotendinous junction and tendinous insertion.

There are many questions which still need to be addressed in order to better evaluate diagnostic methods, the various surgical repair techniques and expected clinical outcomes. We are striving to address many of these issues with our previous research and our ongoing database collection and research projects. The driving force behind our research efforts is a fundamental belief that a thorough understanding of anatomy, classification, and diagnosis is a necessity for any clinician treating Pectoralis Major tears, and can lead to

improved patient outcomes while minimizing treatment complexity and complications. A systematic review and comprehensive classification of pectoralis major tears

Papers, Abstracts & Presentations

Health - Human Disease & Animal Origin - Dental Medicine

Prevalence of *salmonella* and *staph. Aureus* in poultry and human in contact; With investigating the genetic relationship between some isolates

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Abstract

The objective of this study was to follow up the sources of *Salmonella* and *Staph. aureus* in poultry wastes and the potential of transmitting these organisms to human in contact with poultry. This aim was achieved by determining the genetic relationship of *Salmonella* and *Staph. aureus* isolated from human and poultry by molecular tools. A total of 100 faecal and 56 feather samples were collected from apparently healthy chicken and ducks. Moreover, 49 feed, 44 litter samples and 130 hand swabs were collected from poultry handlers. The results showed that *Salmonella* species were isolated from chicken dropping, feather, feed and litter with the percentages of 12.5%, 2.5%, 2.9% and 13.6%, respectively. While, the isolation rate from duck dropping, feather and feed samples were 11.5%, 6.3% and 20%, respectively. *Salmonellae* were also recovered only from human in contact with chicken with the percentage of 2.9%. The identified *Salmonella* serotypes were *S*. Newport (33.3%), *S*. Typhimurium (14.8%), *S*. Infantis (14.8%) and *S.* Papuana (11.1%). Moreover, *S*. Kentucty, *S*. Tshiongwe, *S*. Takoradi (7.4%, each) and *S*. Rechovot (3.7%) were identified. Genotyping of three *S.* Typhimurium isolates from different sources using ERIC-PCR showed three clusters, each formed a single separate cluster which means that there is no relation between the three isolates. The obtained percentages of *Staph. aureus* prevalence in chicken dropping, feather, feed and litter were 31.3%, 2.5%, 11.8% and 13.6%, respectively, while those in duck dropping, feather and feed were 26.9%, 50% and 20%, respectively. *Staph. aureus* were also recovered from human in contact with chicken and ducks with the respective percentages of 6.9% and 44.8%. SDS-PAGE was used for the genotyping of *Staph. aureus* isolates and revealed four clusters indicating homogeneity and possible genetic relatedness between the strains in the same cluster.

1. Introduction

Poultry and poultry products are an important source of human infection with different zoonotic bacteria such as *Salmonella* and *Sataphylococci*. The mode of transmission of such bacteria to human is mainly the consumption of poultry meat, which can be contaminated by those bacteria during processing when carcasses are exposed to contaminated feathers, skin or intestinal contents [1].

Enteric *Salmonella* infection is a global problem both in humans and animals, and has been attributed to be the most important bacterial etiology for enteric infections worldwide [2]. In most food animal species, *Salmonella*e usually establish a clinically inapparent infection of variable duration, which is significant as a potential zoonosis [3]. The detection of *Salmonella* in poultry production is an issue of great concern, since control of this zoonotic disease is in part based on the reduction of the prevalence at the farm level [4]. *Staphylococcus aureus* is a ubiquitous organism in poultry house environment and is considered a potential pathogen to humans [5]. The bacterium is a normal resident of chicken; located on the skin, feathers, respiratory and intestinal tracts and can be isolated from litter, dropping, feed, dust and feathers [6]. About 40 to 44% of healthy humans carry *Staphylococci* in the nose resulting in contamination of the back of hands, fingers and face. Human Staphylococcosis occurs in three significant forms: food poisoning, suppurative disease or as a carrier-state (subclinical commensal infection) [7].

Various molecular typing techniques have been employed to screen for common source outbreak or origins and relationships amongst different isolates [8]. Enterobacteria repetitive intergenic consensus (ERIC-PCR) and SDS-PAGE are considered useful for defining clonal relationships between strains and assess to elucidate the main source of contamination with such strains. [9, 10].

The aim of the current work was to follow up the sources of *Salmonella* and *Staph. aureus* in poultry and poultry wastes and the potential of transmitting these organisms to human in contact with poultry. Moreover, the study aimed to investigate the genetic relationship of the isolated *Salmonella* and *Staph. aureus* from different sources using molecular techniques.

2. Material and Methods

2.1. Sample collection

A total of 100 dropping and 56 feather samples were collected from apparently healthy chicken and ducks from poultry farms, shops, houses and markets in Damietta and Dakahlia provinces. Moreover, 49 feed and 44 litter samples were analyzed; in addition, 130 hand swabs were collected from poultry handlers.

2.2. Sample preparation

2.2.1 Poultry dropping

Forty eight samples from chicken and 52 samples from ducks were collected by the mean of sterile plastic bags.

2.2.2 Poultry feather

Forty samples from chicken and 16 samples from ducks were pulled from live birds and collected in plastic bags under aseptic condition.

2.2.3 Poultry feed

Thirty four chicken feed samples and 15 duck feed samples were collected from feeders. After through mixing, about 100 g of feed samples were collected by sterile spoon and placed in plastic bags.

2.2.4 Litter samples

Forty four chicken litter samples were collected directly into sterile plastic bag, while no duck litter samples were obtained.

2.2.5 Hand swabs

One hundred and thirty hand swabs from poultry handlers were collected. Samples were taken from the palm of hands, area between fingers, finger tips and nails by sterile cotton swabs [11]. Swabs were then directly inserted into sterile buffered peptone water (BPW) tubes under aseptic conditions.

2.3. Bacteriological and molecular investigation of *Salmonellae*

2.3.1 Isolation and identification of *Salmonellae*

The isolation and identification of *Salmonellae* were done according to ISO 6579 [12, 13] method. Samples were pre-enriched in BPW, enriched in Rapapport Vassilidis broth, and then streaked onto the surface of Xylose Lysine Deoxycholate (XLD) agar plates. The suspected *Salmonella* colonies were subjected to biochemical identification using Oxidase test, Hydrolysis of urea, H_2S production and Lysine decarboxylation [14].

2.3.2 Serotyping of *Salmonellae*

The biochemically positive *Salmonella* isolates were subjected to serotyping following Kauffman-White Scheme [15] with commercial antisera (Difco Laboratories Deteroeit, Mitchigeu, USA) for cell wall (O) and flagellar (H) antigen identification. Serotyping was done at the Animal Health Research Institute, Doki, Giza.

2.3.3 ERIC- fingerprinting for the isolated *S.* Typhimurium serotypes

Three serologically identified *S.* Typhimurium isolates obtained from duck dropping, hand swab of human in contact with chickens, and chicken litter during the current study were subjected to ERIC-PCR for molecular typing in order to investigate the genetic relation between the three isolates [16]. The three *S.* Typhimurium isolates were chosen for the molecular investigation because this serotype was the only one isolated from humans and other sources. This distribution of the serotype in human and poultry sources is valuable for studying the genetic relationship between the isolates.

DNA extraction

Cells from 1.5 ml overnight broth culture were centrifuged for 1 minute at 14,000 x g. The pellet was re-suspended in 200 µl sterile phosphate-buffered-saline. Genomic DNA was then extracted using the Easy-DNA kit (Invitrogen BNV Leek, The Netherlands) according to the manufacturer guidelines.

Primers and reaction conditions

A reaction volume of 50 µl contained 10 mM of each primer and 2 µl of the extracted DNA, the primers' sequences are ERIC1R 5'-ATGTAAGCTCCTGGGGATTCAC-3' and ERIC2 5'-AAGTAAGTGACTGGGGTGAGCG-3' [17, 18], and they were obtained from MGW-Biotech AG, 85560 Ebersberg, Germany. The reaction conditions were as follows: 1 initial cycle at 94°C for 4 min, 35 cycles of 95°C for 1 min, 50°C for 1 min and 68°C for 8 min with a single final extension step at 68°C for 16 min. Amplification products were resolved in 1.2% (w/v) agarose gels along with 100 bp molecular weight ladder (BioTeke Corporation, China). The

agarose gel was prepared in 1 x TBE (89 mM Tris- Borate, 2 mM EDTA, and pH 8.3) stained with 5 µM ethidium bromide. The gels were run in 1xTBE, 5 µM ethidium bromide for at least 45 minutes at 100 Volts and then visualized under Ultra Violet light of ultraviolet transilluminator (Spectroline).

2.4. Bacteriological and molecular investigation of *Staph. aureus*

2.4.1 Isolation and identification of *Staph. aureus*

For the isolation of *Staph. aureus* , samples were pre-enriched in BPW and then inoculated onto the surface of Baired parker agar medium [19]. The isolated bacterial colonies were subjected to biochemical identification using Catalase test, Coagulase test (Test tube method) and Oxidase test [20].

2.4.2 Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) for *Staph. aureus* isolates

The whole membrane proteins of *Staph. aureus* isolates were prepared according to Oconnor [21]. Polyacrylamide gel was then prepared and samples were applied for protein banding by SDS-PAGE. Protein visualization was performed by gel documentation system as the gel was scanned by Bio-Tek Ec 910 densitometer at 500 nm and the curve was analyzed using image quant TL-2005 soft ware (Amershame Bioscience) for molecular weight calculation of all used samples.

2.5. Molecular data analysis

Molecular data was analyzed using qualitative routine to construct a dendrogram using unweighted pair group method with arithmetic average (UPGMA) and sequential hierarchical and nested clustering routine. The cluster analysis and dendrogram construction were performed with SPSS version X.

3. Results

3.1 Prevalence of *Salmonellae* in different sources

The results in Table (1) show that *Salmonella* species were isolated with an overall percentage of 12.5% and 11.5% from chicken and duck droppings, respectively. The results show also that the isolation rate of *Salmonellae* from chicken and duck feather samples was 2.5% and 6.5%, respectively. In chicken and duck feed samples, *Salmonellae* were isolated with the respective percentages of 2.9% and 20%. Also, the prevalence of *Salmonella* species in chicken litter samples was 13.6%, while no duck letter samples were obtained during the study. The prevalence of *Salmonella* species from 101 poultry workers hand swabs in contact with chicken was 2.97%. While hand swabs collected from people in contact with ducks were *Salmonella* free.

3.2 *Salmonellae* serotypes identified from different sources

The results in Table (2) show that a total of 27 *Salmonella* serotypes were identified. The predominant serotypes were *S*. Newport (33.3%), *S*. Typhimurium (14.8%), *S*. Infantis (14.8%) and *S*. Papuana (11.1%). Other serotypes were also included such as *S*. Kentucty, , *S*. Tshiongwe, *S*. Takoradi (7.4%, each) and *S*. Rechovot (3.7%).

3.3 Genotyping of *S*. Typhimurium by ERIC-PCR

Three *S*. Typhimurium strains isolated from human hand swab in contact with chicken, chicken litter and duck dropping were analyzed by performing ERIC-PCR fingerprinting for investigating the relationship between the three strains. The results revealed that three profiles were obtained and referred to as E1, E2 and E3. The size of the obtained products

ranged from 150 bp and 1300 bp (Figure 1). Profile E1 was obtained from *S*. Typhimurium strain that was isolated from duck dropping. The profile showed five fragments of 150, 230, 350, 1200 and 1300 bp. Those fragments except the 1300 bp fragment were also found in the second profile E2 that was obtained from *S.* Typhimurium strain isolated from hand swabs of chicken handlers. Profile E3 showed only one conserved fragment with the other two profiles (230 bp fragment) and also has one additional 400 bp fragment. Profile E3 was obtained from *S*. Typhimurium strain that was isolated from chicken litter. *S*. Typhimurium isolated from human hand swabs, duck dropping and chicken litter, each forms a single separate cluster (Figure 2).

3.4 Prevalence of *Staph. aureus* in different sources

The obtained results in Table (3) show that on examination of 48 chickens dropping and 52 duck dropping samples, *Staph. aureus* was isolated with an overall prevalence of 31.3% and 26.9%, respectively. Regarding feed samples, Table (3) shows that *Staph. aureus* was isolated with the percentage of 11.8% and 20% from chicken and duck feed samples, respectively. The results show also that the prevalence of *Staph. aureus* in 44 chicken litter samples was 13.6%. While, in hand swabs of people in contact with chicken and ducks, *Staph. aureus* isolation rate was 6.9% and 44.8%, respectively.

3.5 Genotyping of *Staph. aureus* by SDS-PAGE

The electrophoretic separation verifying protein patterns of selected strains revealed protein bands with molecular weights ranging between 20 to 258 Kda (Figure 3). The results showed that there were four clusters of *Staph. aureus* strains isolated from different sources (Figure 4). *Staph. aureus* isolated from human in contact with chicken, chicken dropping and chicken feather formed cluster I, while cluster II consisted of human in contact with chicken, chicken feed and chicken dropping. Finally, human in contact with ducks formed clusters three and four, respectively (Figure 4).

4. Discussion

Poultry meat is a more efficient food converter with a shorter production cycle than red meat [22]. Therefore, in Egypt and worldwide, poultry industry is one of the fastest growing segments of the animal industry. Poultry, their feed and wastes are considered a major source of diseases acquired by human consuming or in contact with poultry. These diseases are zoonotic that constitute a public health problem throughout the world [23]. The current study aimed to determine the prevalence of *Salmonellae* and *Staph. aureus* in poultry, poultry wastes and human in contact, also to determine the genetic relationship between some isolated strains from different sources.

The isolation of *Salmonella* species with a percentage of 12.5% was consistent to previously conducted studies in Egypt, nearly similar results of 11.4%, 10.7% and 10.5% were obtained by Draz *et al*. [24] and Taha [25, 26], respectively. Lower percentages were reported in different areas in Egypt, for instance, Sadoma [27] and Mohamed *et al*. [28] isolated *Salmonellae* from chicken with a prevalence of 2% and 2.5%, respectively. Meanwhile, a percentage of 1.7% of *Salmonella* prevalence was reported by Ahmed [29] from chicken reared in rural houses. The difference in *Salmonella* prevalence from area to another could be related to hygienic measures in each area, season of conducting the study and the area of sampling. Regarding duck droppings, *Salmonellae* were isolated with a percentage of 11.5%, nearly similar percentage of 13.1% was reported in Bangladesh [30].

However, lower percentage of 4.6% and 4% were reported in Taiwan [31] and London [32], respectively.

The results show also that the isolation rate of *Salmonella* species from chicken and duck feather samples was 2.5% and 6.5%, respectively (Table 1). A previously conducted study reported that even after 40 consecutive rinses of the same carcass, *Salmonella* cells were recovered from feather follicles [33]. The possible role of feathers in bacterial contamination of carcasses is not limited to the follicle alone; the feathers themselves carry also a large bacterial population including *Salmonellae* [34]. Moreover, cross contamination of the carcass from contaminated feathers with *Salmonellae* was previously documented [35].

Although certain researchers have declared that feed is not an important source of *Salmonella* contamination in poultry [36], regulatory officials apparently disagrees with this assessment. Since, feed is considered to be the most common source of *Salmonella* contamination for poultry flocks [37]. *Salmonellae* were recovered from chicken and duck feed samples with the percentages of 2.9% and 20%, respectively (Table 1). The isolation of *Salmonellae* from poultry feed were previously recorded in different countries, for instance: Egypt (2%) [38], Saudi Arabia [2.9%) [39] Jordan (2.3%) [40] and Nigeria (22.2%) [41].

Poultry litter is an important source of contamination of poultry and consequently a source for poultry meat contamination and human infection [42]. The culturing of floor litter for the presence of *Salmonellae* was considered an established method of monitoring poultry house environment [43]. The isolation of *Salmonellae* from 13.6% of chicken litter samples (Table 1) was nearly similar to 12.3% percentage previously obtained from poultry litter for use in farm feeds for ruminants [44].

Direct contact with poultry and poultry wastes is considered a main route of infection with different organisms including *Salmonellae*. Therefore, it was of great concern to investigate *Salmonella* species in hand swabs of poultry handlers. The isolation rate of *Salmonellae* from poultry workers hand swabs in contact with chicken was 2.97%. Nearly similar percentage of 3.1% was obtained from hand swabs of households in contact with poultry in Sharkia province [29]. Higher percentages of 12.7% and 8.3% were reported also in Egypt, by Sadoma [27] and Mohamed *et al*. [28], respectively.

Serotypes of *Salmonella* are defined based on the antigenic structure of both somatic or cell wall (O) antigens and flagellar (H) antigens (Table 2). The purpose of serotyping is to determine which of the >2500 *Salmonella* serovars a specific isolate belongs. This is necessary for epidemiological purposes and for looking for evidence of links between cases. Numerous serotypes had been described, but seven of these (Enteritidis; Typhimurium; Newport; Javiana; Heidelberg; Montevideo) were responsible for 61.6% of human cases in the U.S. in 2007 [45]. The most common *Salmonella* serovars associated with gastroenteritis were *S*. Typhimurium and *S*. Enteriditis with other serovars such as *S*. Infantis being implicated but at much lower frequencies. Similarly to the current study, *S*. Typhimurium has been the most common *Salmonella* serovar isolated by the Australian *Salmonella* Reference Centre (ASRC) in Adelaide from 1997 to 2002 [46]. The obtained results in the present study were in agreement with Alshawabkeh [40] who isolated *S*. Infantis and *S*. Typhimurium from poultry feed samples collected from different regions in Jordan with the percentages of 13.9% and 11.1%, respectively. Higher percentage of *S*. Typhimurium (35.2%) was recorded in India [47] where the authors argued that the

isolation was higher than that reported by other workers due to the sampling of diarrhoeic birds.

Salmonella enterica serovar Infantis had been recovered in humans and animals of many species as well as animal products [48]. According to Centers for Disease Control and Prevention (CDC) data collected through the Public Health Laboratory Information System, *S.* Infantis has been one of the top 15 most frequently reported human serotypes in the last decade, although it had contributed only 1±2% of the human *Salmonella* isolates reported.

There has been a recent rise in the amount of foodborne *Salmonella* infections attributed to *Salmonella enterica* serovar Newport. For example, during 2001, nine cases of *S.* Newport infection were identified in England [49]. *S*. Newport is now recognized as the third most common *Salmonella* serotype in the US [50]. *S*. Tshiongwe has been reported in some European countries like Latvia and Moldova [51]. The emergence of this rare *Salmonella* serovar being responsible for food poisoning episodes indicated cross-contamination and poor hygiene in food practices. Also, *S.* Papuana was isolated from two chicken litter samples and one duck feed sample in the current study, the isolation was previously reported in 1945 from a human stool sample [52]. In 1998, the National Institute of Hygiene reported the isolation of *S.* Papuana from patients in Morocco. However, it was difficult to obtain more relevant data regarding the isolation of this serotype either from poultry or humans.

The detection of *Salmonella* in poultry production is an issue of great concern, since control of this zoonotic disease is in part based on the reduction of the prevalence at the farm level [4]. Therefore, typing of *Salmonella* isolates could be an important tool to trace the main sources of contamination. In the current study, the three *S*. Typhimurium strains isolated from human hand swabs in contact with chicken, duck dropping and chicken litter were analyzed by performing ERIC-PCR fingerprinting for investigating the relationship between the three strains. The ERIC sequences, also known as intergenic repeat units (IRUs), are present in many copies in the genomes of *Escherichia coli*, *Salmonella* Typhimurium, and other enterobacteria [17]. These elements are 126 bp long, highly conserved at the nucleotide level, and include a central core inverted repeat. The position of ERIC elements in enterobacterial genomes varies between different species and has been used as a genetic marker to characterize isolates within a bacterial species [17, 18]. The results revealed that three profiles were obtained and referred to as E1, E2 and E3 (Figure 1), each forming a single separate cluster (Figure 2) which means that there is no relation between the three isolates. This finding could be attributed to the limited number of *S*. Typhimurium isolates used for investigation, while, if the number of isolates was more than three, the probability of homogeneity could have been detected. However, these results indicated that ERIC-PCR is an efficient tool for strain differentiation because the reaction was able to discriminate *S*. Typhimurim isolates obtained from different sources [53, 54].

The obtained results were in agreement with those obtained by Wang *et al*. [54] who reported that the ERIC-PCR fingerprint maps of different *Salmonella* strains with different sources were different indicating heterogeneity. Also, the authors reported that ERIC-PCR is an efficient tool for epidemiological studies. Earlier studies of ERIC patterns indicated species-specific and also some strain-specific profiles [17, 55]. The results in the current study indicates that the three investigated strains shared 230 bp band which could be a strain specific band for *S*. Typhimurium.

Important populations of *Staph. aureus* were found to be present on the body surfaces of

live poultry originating from flocks without history of staphylococcal disease [56]. The origin of *Staph. aureus* contamination in poultry farms may be traced to their possible fecal or feed sources [57]. The obtained results in Table (3) show that *Staph. aureus* was isolated from chicken and duck droppings with the percentages of 31.3% and 26.9%, respectively. Nearly similar results were obtained by Cotter and Taylor [58] who reported 25% of *Staph. aureus* species obtained from healthy laying hens. In Egypt, Badr [59] reported that *Staph. aureus* was isolated from drag swabs from broiler and layer farms in different Governorates with the percentage of 20%. In chicken feather, *Staph. aureus* was isolated with the percentage of 2.5%, while in duck feather samples, *Staph. aureus* prevalence was 50% (Table 3). In Germany, 47% of the examined poultry feather swabs were positive for *Staph. aureus* [60].

Animal feed is at the beginning of the food safety chain in the "farm-to-fork" model. Therefore, methods of control should be conducted to minimize bacterial contamination of poultry feed in order to minimize the risk of poultry infection and consequently human infection. Nearly similar results to the obtained 11.8% isolation rate of *Staph. aureus* from chicken feed samples were obtained by Mohamed [61] who detected *Staph. aureus* from local concentrated ration (10%) and imported one (7.1%) in chicken farms.

Chicken litter is produced in large quantities from all types of poultry raising activities to be primarily used for land application. Therefore, it is essential to analyze the litter bacteriologically before it is released to the environment for use because it is considered as a source of contamination with different bacterial species [62]. In the current study, Table (3) shows that the prevalence of *Staph. aureus* in 44 chicken litter samples was 13.6%. Nearly similar results were obtained by Ogonowski *et al*. [44] who detected 12.3% of *Staph. aureus* from litter samples in commercial broiler farms.

The results in Table (3) show that the prevalence of *Staph. aureus* from 101 hand swabs of people in contact with chicken and ducks was 6.9% and 44.8%, respectively. Previously conducted studies to investigate the role of poultry handlers in transmitting the disease to human also reported the isolation of *Staph. aureus* from hand swabs of poultry handlers. In Egypt, *Staph. aureus* was isolated from 25% hand swabs of workers from Giza abattoirs and 24% from hand swabs of workers from broiler and layer farms in different Governorates [59]. Moreover, in Germany, 42% of hand and glove swabs collected from poultry handlers were positive for *Staph. aureus* [60].

It has been shown that under highly standardized cultivation conditions, SDS-PAGE of whole-cell proteins is an excellent and generally applicable method for defining relationships at the species level among large numbers of strains [63]. In the present study, the electrophoretic separation verifying protein patterns of selected strains revealed protein bands with molecular weights ranging between 20 to 258 Kda (Figure 3). The results showed that there were four clusters of *Staph. aureus* strains isolated from different sources (Figure 4). These results indicated homogeneity and possible genetic relatedness between the strains in the same cluster.

The obtained results are in agreement with those obtained by Rodgers *et al*. [10] who reported that the two *Staph. aureus* strains recovered from the hands of two broiler parent farm personnel could be grouped together with 12 strains recovered from broiler. Also, another study reported that *Staph. aureus* isolates from chicken were genetically related to human isolates [64, 65]. Moreover, indistinguishable PFGE patterns among a poultry isolate and human isolates were identified, indicating genetic relatedness [66].

5. Conclusion

In conclusion, the transfer of enteric bacteria can effectively be reduced with proper hygiene, husbandry, and disinfection. The heterogeneity of *S.* Typhimurium obtained in the current study recommends the evaluation of higher number of *S*. Typhimurium isolated from different sources in order to obtain a complete understanding about the genetic relationship of *S*. Typhimurium isolated from different sources. However, the study revealed that ERIC-PCR is an efficient tool for epidemiological studies. Cluster I and II of *Staph. aureus* isolates revealed a possible genetic relatedness between the isolates in the same cluster.

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Table 1: Prevalence of *Salmonellae* in different sources

Sources		Fraction*	Prevalence
Chicken	**Dropping**	6/48	12.5%
	Feather	1/40	2.5%
	Feed	1/34	2.9%
	Litter	6/44	13.6%
Ducks	**Dropping**	6/52	11.5%
	Feather	1/16	6.3%
	Feed	3/15	20%
Hand swabs	**Human in contact with chicken**	3/101	2.9%
	Human in contact with ducks	0/29	0

***Fraction indicates number of positive samples/number of examined samples**
****Duck litter samples were not obtained**

Table 2: Serotypes of *Salmonellae* isolated from different sources

Bird	Source	*S.* Typhimurium	*S.* Newport	*S.* Kentucty	*S.* Papuana	*S.* Tshiongwe	*S.* Rechovot	*S.* Takoradi	*S.* Infantis
Chicken	Dropping	-	2	2	-	-	-	-	2
	Feather	-	-	-	-	-	-	1	-
	Feed	-	1	-	-	-	-	-	-
	Litter	2	-	-	2	-	-	-	2
	Poultry handlers, swabs	1	-	-	-	2	-	-	-
Duck	Dropping	1	5	-	-	-	-	-	-
	Feather	-	-	-	-	-		1	-
	Feed	-	1	-	1	-	1	-	-
	Poultry handlers, swabs	-	-	-	-	-	-	-	-
Total number [%]		4 (14.8%)	9 (33.3%)	2 (7.4%)	3 (11.1%)	2 (7.4%)	1 (3.7%)	2 (7.4%)	4 (14.8%)

***A total of 27 *Salmonella* serotypes were identified**

Table 3: Prevalence of *Staph. aureus* in different sources

Sources		Fraction*	Prevalence
Chicken	**Dropping**	15/48	31.3%
	Feather	1/40	2.5%
	Feed	4/34	11.8%
	Litter	6/44	13.6%
Ducks	**Dropping**	14/52	26.9%
	Feather	8/16	50%
	Feed	3/15	20%
Hand swabs	**Human in contact with chicken**	7/101	6.9%
	Human in contact with ducks	13/29	44.8%

***Fraction indicates number of positive samples/number of examined samples**
****Duck litter samples were not obtained**

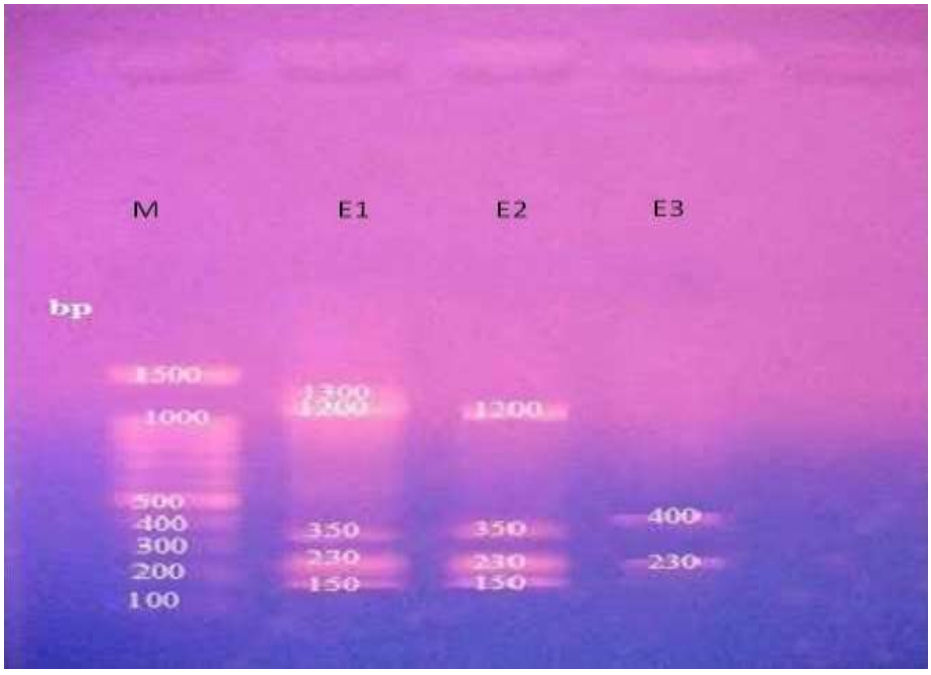

Figure [1]: ERIC-PCR results using 1.2% agarose showing the three profiles obtained for *S.* Typhimurium [M: 100bp marker, E1: first profile obtained from duck dropping, E2: second profile obtained from a hand swab, E3: third profile obtained from chicken litter]

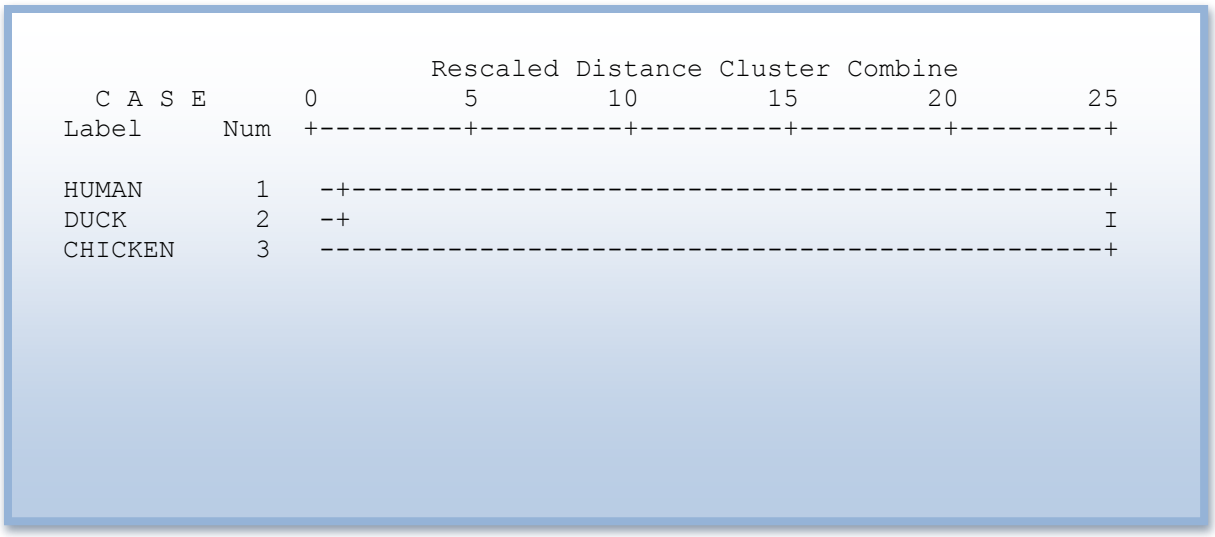

Figure 2: Phylogenetic tree [linkage dendrogram] of the isolated *S.* Typhimurium from human hand swab, duck dropping and chicken litter

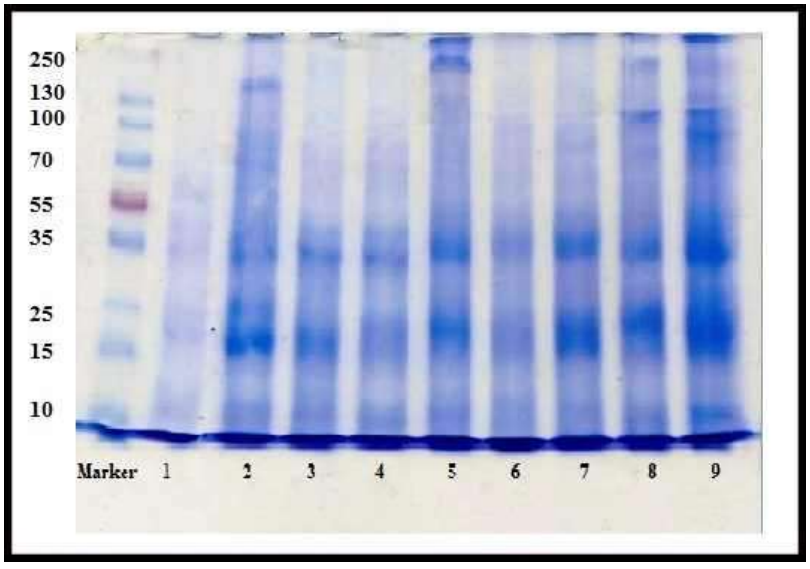

Figure 3: SDS-PAGE results using polyacrylamide gel electrophoresis showing the electrophoretic patterns of *Staph. aureus* isolates [M: marker, 1: Human in contact with ducks, 2: Chicken feed, 3: Chicken dropping, 4: Human in contact with duck, 5: Chicken feather, 6: Human in contact with chicken, 7: Human in contact with chicken, 8: Chicken dropping, 9: Reference strain]

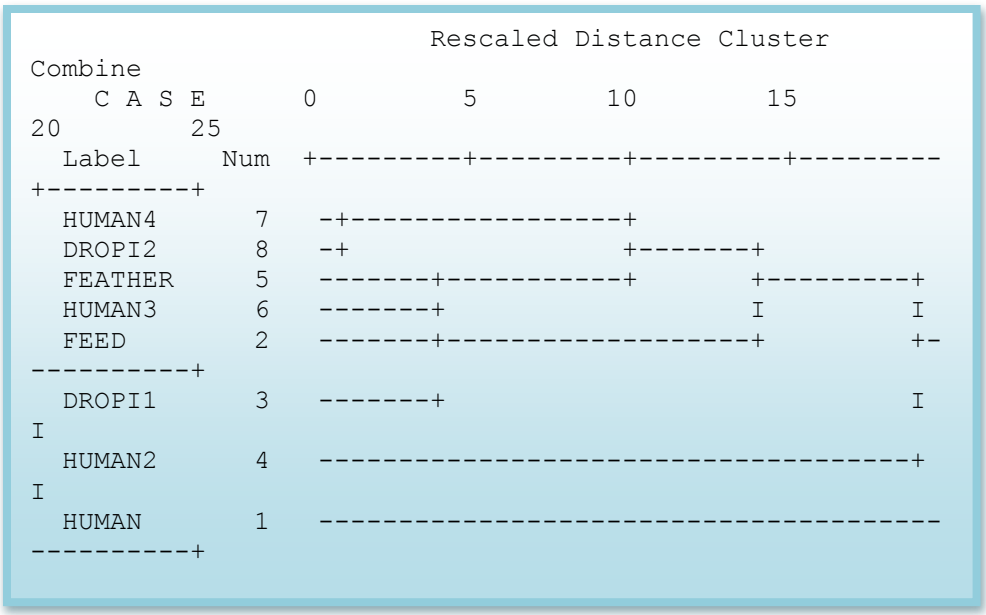

Figure 4: Phylogenetic tree [Linkage dendrogram] of the isolated *Staph. aureus* from different sources [1: Human in contact with ducks, 2: Chicken feed, 3: Chicken dropping, 4: Human in contact with duck, 5: Chicken feather, 6: Human in contact with chicken, 7: Human in contact with chicken, 8: Chicken dropping]

Comparative Study between Conventional and Translucent Zirconia in Dentistry

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Statement of the Problem: Conventional zirconia is known to be less translucent than other ceramic restorations. Newly introduced zirconia is claimed to be more translucent which may affect the esthetics and the clinicians' choice regarding zirconia-based restorations.

Objective: The aim of this study is to compare the translucency parameter (TP) of different dental zirconia.

Materials and Methods: Six specimens of each of two commercially available dental zirconia; Incoris as the translucent zirconia and Vita YTZ as the conventional zirconia. The zirconia blocks were cut into discs 15 mm in diameter and 1.2 mm in thickness. The specimens were sintered at 1500 °C for 7.5 hours. The translucency parameter was measured twice for very specimen over white and black backgrounds using a spectrophotometer.
Results: The results showed that the mean translucency parameter of the Incoris zirconia was 9.86 as compared to that of the Vita YTZ zirconia which was found to be 7.57.
Conclusion: Incoris zirconia was found to be more translucent than the Vita YTZ.

Understanding the Nature of Extended-Pour Dental Alginate Impression Material

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Introduction: Alginate impressions, being hydrocolloids, are not dimensionally stable. The recommended storage time for conventional alginate is maximum 30 minutes. However, extended-pour alginate exhibits dimensional stability up to 100 hours.
Objectives: To analyze the chemical composition of extended-pour alginate powder in a trial to understand its nature. The conventional alginate powder was used as standard for comparison.

Materials and Methods: Chemical analysis of the conventional alginate (CA37, Cavex) and extended-pour alginate (Vival NF, Ivoclar Vivadent) was performed by X-Ray Florescence Spectrometer (XRF). The XRF results were used to calculate Ca:Na; a ratio with direct relation to dimensional stability (*according to Fellows CM and Thomas GA 2009)*. The organic content in the alginate powders was determined by heating the sample at 650^0C for 2 hours.

Results: The Ca:Na ratios for the conventional and extended-pour alginate powder were 2.5 and 3.5 respectively. The organic contents for the conventional and extended-pour alginate powder were 16.2% and 14.7% respectively.
Conclusions: The higher Ca:Na ratio and lower organic content might contribute in increasing the dimensional stability of the extended pour dental alginate impression material.

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Spot Light on Accreditation impact on Egyptian hospitals, Challenges and benefits from its adoption and implementation

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Alexandria, Egypt

Egypt is a lower middle-income country; its macro-economy is heavily affected by the political instability in the region. The Egyptian healthcare system; as a part of this economy, is facing multiple challenges to improve and ensure the health of the Egyptians. The health care system in Egypt is made of a large number of public entities. Government-owned hospitals are the only choice available to low-income groups who constitute the majority of Egypt's population. However, this Governmental hospital's health policies and strategies are not supported by evidence and their regulatory mechanisms are not well developed. The health system remains lagging behind its peers in surrounding environment.

Purpose:
Egyptian healthcare systems require further improvement. Policies and procedures need to be supported by standards and regulatory mechanisms that should be implemented. Accreditation can be a milestone for such required improvement of health care systems and quality Services. It helps organizing patient safety efforts and it raises the community confidence in the quality and safety of care, treatment and services. Accreditation provides a competitive edge in the market place and improves risk management and risk reduction.

Problem:
Though Accreditation has plenty of benefits, Governmental hospitals participation in accreditation programs may be associated with high financial burden. Accredited hospitals have incurred increased expenses due to accreditation. Areas of highest increase included training of staff, consultants' costs and infrastructure maintenance. Such high expenses and the lack of incentives may act as obstacles against the adoption of an accreditation program. Out weighting the benefits against the costs, emerge an important Question; whether is it worthy to seek for Accreditation or not?!

Discussion:
Deeper look at the impact of accreditation, will analyze that it impacted certain areas, namely: personnel and staff, organization and management, clinical practice, and customers. By focusing on clinical practice, we will find that the identified impacts include patient safety, reduction of medical errors, and public disclosure. Accreditation may facilitate development of hospital quality management systems and standardize existing treatment and documentation procedures. Other areas were also improved significantly, like increased staff engagement and communication, multidisciplinary team building, and enhanced leadership and staff awareness.

Conclusion and Recommendation:

Accreditation can be the most important approach for improving the quality of health care structures. In order to adopt accreditation program, hospitals need to Plan and conduct an intensive awareness campaign to promote concepts of quality improvement and accreditation with a view that causes political commitment to accreditation. Firstly, adapt the regional accreditation guidelines, and use them to develop national plans for accreditation and quality improvement. Share accreditation experiences, including progress achieved and constraints faced, and refer to EJAC/WHO/JCI for relevant technical support.


ISQua
Membership
Accredited
Spot Light on *Accreditation* Impact on Egyptian Hospitals
BY: Reham Mokhtar
MBChB, CPHQ, LSSGB,MSc,MBA


Egypt and Economics


COST OF POOR QUALITY
Near Miss
Medication Errors


Waste
Customer Returns
Rejects
Inspection Costs
Testing Costs
Recalls
Rework
2-3%
20-40%
Complaint Handling
Customer Allowances
Premium Freight Costs
Incorrectly Completed Sales Order
Excessive Field Service Costs
Planning Delays
Excessive Overtime
Unused Capacity
Excess Inventory
Pricing or Billing Errors
Lost goodwill
Incorrect orders shipped
Overdue Receivables
Delays
Time with Dissatisfied Customer
Development Cost of Failed Products
Late Paperwork
Employee Turnover
Expediting Costs


Accredited
ACCREDITED
CERTIFIED
STANDARDS
ISO 9001
JCI
Joint Commission
Quality Management
System


"Hospital Accreditation"
Accreditation has been defined as a "system of external peer review for determining compliance with a set of standards."

"STANDARDS"

According to ISO is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.

Main purpose of Accreditation

Quality improvement

Accountability and regulation

Informing decision-making

HISTORY

1965 through the Ministry of Health and Population established a department for monitoring,

(QAP)
(CRHP)
(MOSA)

In 1993 this department was approved as a General Directorate at the central level

HISTORY

Quality Department was developed in **1997**, Started By developing accreditation program for the primary care. *Now, Accredited more than 2000 primary unit and centers!*

The department developed Egyptian Executive Committee for Accreditation in **2006**

Hospital, primary care and ambulatory care standards have now been finalized and ISQua accredited

- International Society for Quality in Health Care (ISQua), is an international organization that provides independent assessment of medical standards against international principles and practices

("Accreditor of Accreditors")

- Egypt is the first country in the Middle East, and the 11th worldwide to achieve this certification

INTERNATIONALY ACCREDITATED HOSPITALS

EFFECTIVE IMPLEMENTATION

1.It stimulates the improvement of care delivered to patients

2.It strengthens community confidence in its hospital.

3.It reduces unnecessary costs.

4.It increases efficiency.

What are the Major Challenges in implementation of Accreditation program ?

. The main challenge was **the staff resistance to change** .

. Change the **concept** of physician centered to patient centered are.

. Accepting the idea of continuous **performance evaluation.**

. **Staff Turnover** due to the fact that Preparing for accreditation equires more effort than what they were used to do.

. **Staff Communication**

Journey of a Hong Kong public teaching hospital in preparation of hospital accreditation 2008

There is no reason to ignore, the fear ,and resistance To hospital accreditation.But its important to believe our quality journey and accreditation is only the means, by which the ultimate target is to make a change in the culture of the health care system in Hong Kong!

Today

We succeeded in making quality of care is part of our daily work

Projects of Improvement

1. **Reduction of nursing turnover.**
2. **Reduce patient complaint from food service.**
3. **FMEA for ward pharmacist medication service.**

The following concepts are important in accreditation methodology:

1. Accreditation is not the goal; the goal is to improve the quality of each hospital service
2. The emphasis is on the total hospital system (and its processes)
3. Educational programmes are essential
4. Exert all possible effort to include accreditation in strategic national health plans.
5. Determine the requirements for financing and sustainability of the national accreditation program.

Papers, Abstracts & Presentations

Engineering, technology and Egypt infrastructures related issues, Shore & Environmental Protection, Traffic management systems & techniques and Ports development

Desalination of Red Sea Water Using Hybrid System of Electrodialysis and Ion Exchange

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Abstract

There are many techniques applying for producing deionized water for many purposes. This paper introduces a combined system from these techniques to obtain deionized water from surface water sources in Egypt with high quality to be used in electric power production through thermal power plants. Electrodialysis (ED) and Ion Exchange Resin (IX) were used as a combined technique. Red Sea water was used as feed water for the combined technique. Electrodialysis was used as a prime part in the combined system followed by ion exchange. It was found that, the highest Removal Efficiency (RE, %) of electrodialysis was achieved by application high levels of the studied parameters (electrodialysis time and potential difference). The achieved removal efficiency was 99 % for Red sea water after about 60 minutes of electrodialysis operation time and under its optimum conditions. Then, the produced water from ED system was passed through two types of strong cation (Amberjet 1500H) and strong anion (Amberjet 4400Cl) ion exchange resins. The obtained water has conductivity of 0.9 µS. cm^{-1} after 2.64 minutes contact time between water and resin beads.

Key words: Electrodialysis; Ion Exchange Resin; Adsorption; Red Sea water.

Introduction

"Deionization" means removal of ionizable (soluble) constituents and silica from a solution by applying desalination technique such as Electrodialysis (ED), Ion Exchange resin (IX) or Reverse Osmosis (RO). So, deionized water had all dissolved ionic constituents removed. Demineralized water is another name for deionized water [1, 2]. Deionized water has a range of its conductivity values depending on the technique applied and the need of use. Production of ultra pure water (conductivity lower than 0.1 µS cm^{-1}) is of interest for the electronics and pharmaceutical industries. Water having a conductivity ranging from 5.0 to 20 µS cm^{-1} is usually obtained by RO units to be further directed to deep purification [3]. Electro-deionization with Ion Exchange resin (EDIR) which commercialized by Millipore leads to water of very low conductivity [4, 5].

There are many different methods and technologies for deionization and desalination of saline water including but not limited to membrane, electrodialysis, adsorption and ion exchange. The choice of technique is mainly depends on the feed water and the quality of obtained water required [6].

Electrodialysis (ED) is used to transport ions from one solution through ion exchange membranes to another solution under the influence of an applied electric potential difference. The electrodialysis cell consists of a feed (dilute) compartment and a concentrate (brine) compartment formed by an anion exchange membrane and a cation exchange membrane placed between two electrodes. In almost all practical electrodialysis processes, multiple electrodialysis cells are arranged into a configuration called an electrodialysis stack, with alternating anion and cation exchange membranes forming the

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multiple electrodialysis cells. Electrodialysis processes are unique compared to distillation techniques and other membrane based processes (such as reverse osmosis) in that dissolved species are moved away from the feed water stream rather than the reverse. As e the quantity of dissolved species in the feed water stream is far less than that of the fluid, electrodialysis offers the practical advantage of much higher feed recovery in many applications. [7-12].

Adsorption using ion exchange resin is one of the popular methods for the removal of ions and heavy metals from the water and waste water [13-15]. Ion exchange is defined as a mechanism or process for mass transfer of ions, usually between two phases. The ion exchange process consists of a chemical reaction between ions in a liquid phase and ions in a solid phase [16-17]. This process or mechanism of mass transfer is frequently used in water treatment. Ion exchange resin has been developed as a major option for treating water and waste water over the past few decades [18-20]. The influence of the complex formation on ion exchange sorption equilibrium and on the distribution of ions and metal ions between the liquid and resin phase has been extensively studied [21-24].

The aim of this work is to study the deionization of water of Red Sea water of high TDS using a combined system of Electrodialysis (ED) and Ion Exchange resin (IX). Determination of the ions removal efficiency for each technique is another important objective of this study.

Experimental

Pretreatment of Feed Water

The feed saline sample of high TDS (high conductivity) is collected from Red Sea at Sharm El-Sheikh Region, Egypt. The collected water sample was pretreated by three stages filtration. The first stage filtration was carried using sedimentation filter to remove suspended materials such as sediments, insects, asbestos fiber and particles down to 5.0 micron. Granular Activated Carbon filter was used in the second stage to absorb heavy chlorine and chlorine by-products such as chloramines and Tri-Halo Methane (THM). In addition, Carbon Block filter was used in the third stage to remove any additional chlorine and organic matter from water without release of fine carbon. This primary filter was operated with maximum pressure 80 psi and maximum temperature 100 F / 38 ^{o}C. So water sample after 3 stages filtration is ready to go through Electrodialysis membrane.

Electrodialysis System

Electrodialysis system contains three compartments, compartment 1 contains 2 L untreated water (dilute), compartment 2 contains 2.5 L Na_2SO_4 solution of known concentration or water used as electrode rinse (electrolyte) and compartment 3 contains 2 L distilled water, tab water or sea water (concentrate). Under the influence of direct current, ions in the input source (dilute) migrate towards the anode. They leave the dilute compartment, move through the anion exchange membrane and stopped by the cation exchange membrane in the concentrate compartment. This circulation of water was assured by pumps. Table 1 show the specifications and operation conditions of Electrodialysis membrane used in this work. For Electrodialysis operation, two liters from the feed water source of ED system is placed in the dilute compartment for the desired electrodialysis time interval at the required potential difference. The variables which are studied are potential difference, concentration of electrolyte and electrodialysis time.

During the test, water samples are taken periodically from dilute and concentrate streams at the desired electrodialysis time and the total dissolved solids (TDS), conductivity and salinity were measured.

Table 1. Specifications and operation conditions of electrodialysis membrane

Ion Exchange membrane (NEOSPTA-TOKUYAMA SODA)		
Cationic membrane	CMX Sb	12
Anionic membrane	AMX Sb	10
Effective area	2 dm	
Anode	Ti/Pt	
Cathode	Stainless Steel	
Dilute compartment:	180 L/H	
Concentrate compartment:	180 L/H	
Electrode chamber_Anode	150 L/H	
Electrode chamber_Cathode	50 L/H	
Current	10 A Max.	
Voltage	1V/Cell Max	

Ion Exchange Resin System

In this work, two types of ion exchange resins are used namely AMBERJET 1500H as strong cation and AMBERJET 4400Cl as strong anion resins. Specifications of these resins are given in Table 2.

Table 2. Specifications of Amberjet 1500H and AMBERJET 4400Cl Ion Exchange Resins[a]

Specifications	Value	
	Amberjet 1500 H	**AMBERJET 4400Cl**
Matrix	Styrene divinylebenzene copolymer	Styrene divinylebenzene copolymer
Functional group	Sulphonates	$-N^+(CH_3)_3$
Physical form	Dark amber beads	Insoluble light amber beads
Ionic form as shipped	H^+	Cl^-
Total exchange capacity	≥ 2.0 eq/L (H^+ form)	≥ 1.40 eq/L (Cl^- form)
Moisture holding capacity	45 to 51% (H^+ form)	40 to 48 % (Cl^- form)
Specific gravity	1.28 to 1.32 (Na^+ form)	1.075 to 1.110 (Cl^- form)
Harmonic mean size	650 ± 50 µm	580 ± 50 µm
Fine contents	< 0.425 mm = 0.5% max	< 0.425 mm = 0.5% max
Maximum reversible swelling	Na^+ to H^+ = 10%	Cl^- to OH^- = 30 %

[a] Manufacture supplied

Chemical Analysis

Samples of produced deionized water were chemically and physically analyzed according to the standard methods for the examination of water and wastewater (APHA, 1995).

Results and Discussion

Physical and Chemical Characterization of Sea Water Sample

Table 3 and 4 show the physical and chemical characterization of Red Sea water sample, respectively.

In deed, sea water sample, in contrast with tab water sample or other sources, it's not in need for primary treatment. As shown in Table 4, which show the physical characterization of sea water, the turbidity value was very low (0.1 NTU) so, in this case, ED can be considered as a primary treatment stage in addition to deionization stage.

Table 3. Physical characterization of Red Sea water sample before and after pretreatment with 3 stages filtration

Physical parameter	Value	
	Before Treatment	After Treatment
pH	7.7	7.7
Conductivity, $mS.cm^{-1}$	60.1	60.1
Turbidity, NTU	4.0	0.1
Temperature, ^0C	29	29

Table 4. Chemical analysis for Red Sea water sample

Constituents	Value, ppm	Constituents	Value, ppm
Total hardness as ($CaCO_3$)	8375	Ammonium (NH_4^+)	0.39
Total alkalinity as ($CaCO_3$)	98	Silica (SiO_2)	9.72
Sodium (Na^+)	12339	Total dissolved salts	42070
Potassium (K^+)	287	Salinity	40.6
Magnesium (Mg^{++})	1570	Nitrite (NO_2-)	0.41
Hydroxide alkalinity as ($CaCO_3$)	0	Sulfate (SO_4^{--})	1260
Chloride (Cl^-)	23608		
Carbonate alkalinity as ($CaCO_3$)	0	Manganese (Mn^{++})	0.35
Calcium (Ca^{++})	738	Nitrate (NO_3^-)	12.44
Bicarbonate alkalinity as ($CaCO_3$)	98	Iron (Fe^{++})	0.58

Electrodialysis of Sea Water

Effect of potential difference

Various potential differences ranged from 6 to 18 volt were applied to study its effect on salts removal efficiency with time. The obtained results are given in Figures 1-3. Decreasing of conductivity (mS.cm^{-1}), TDS (ppm) and salinity means high salts removal efficiency. The optimum potential difference is 15.0 volt.

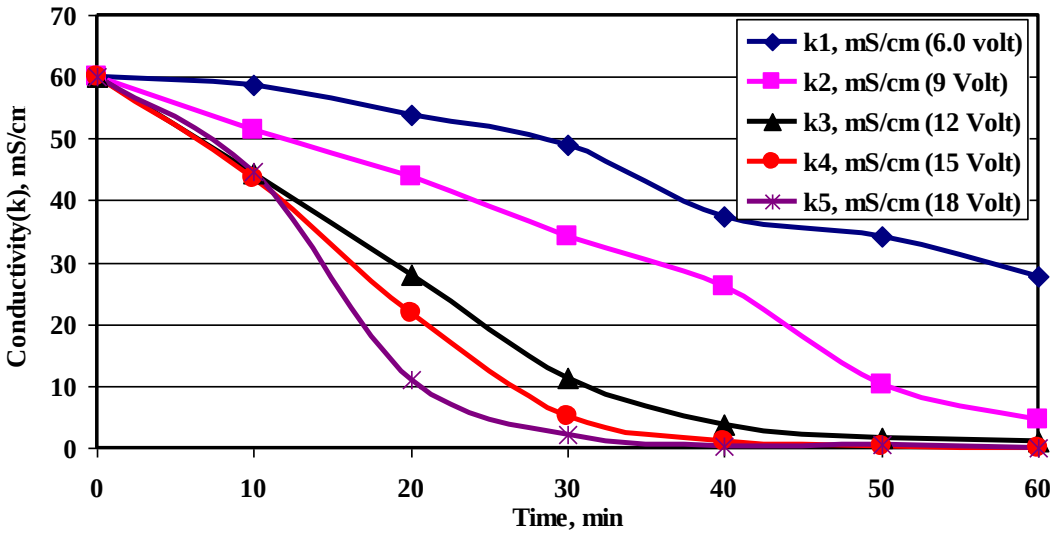

Fig. 1. Effect of potential difference and time on conductivity

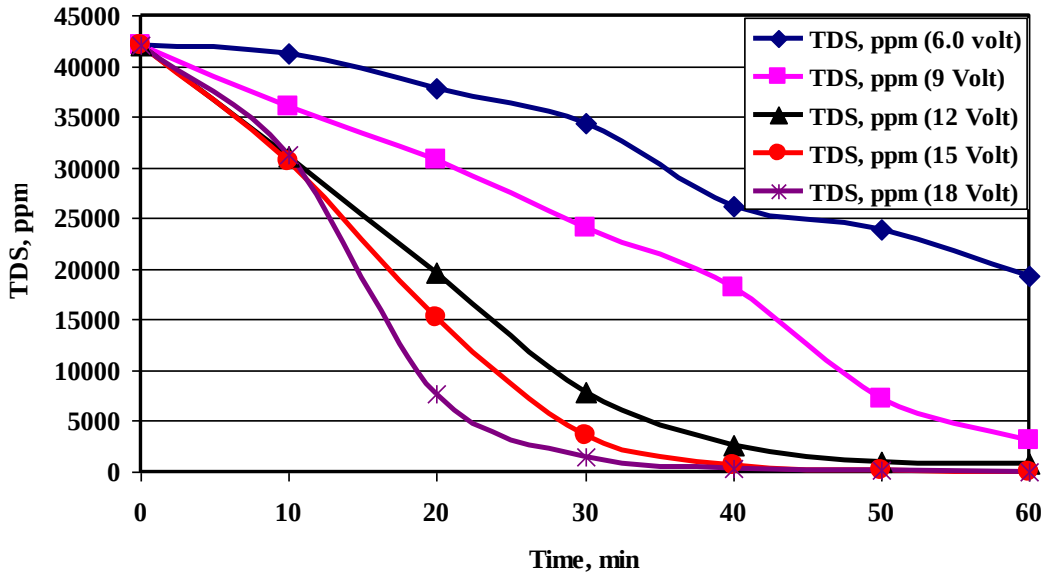

Fig. 2. Effect of potential difference and time on TDS

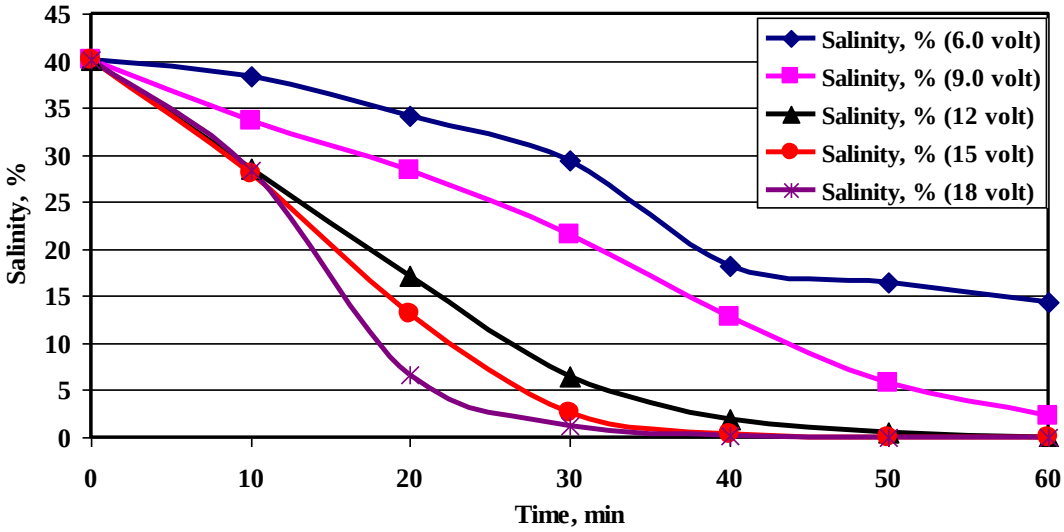

Fig. 3. Effect of potential difference and time on salinity

Effect of Electrolyte Concentration

A series of experiments was carried out using different sodium sulfate solution concentrations as an electrolyte ranged from 0.1 – 0.7 M. The obtained results are given in Figures 4-6. Decreasing of conductivity ($mS.cm^{-1}$), TDS (ppm) and salinity means high salts removal efficiency. The optimum sodium sulfate electrolyte concentration is 0.5 M at applied potential 15 volts.

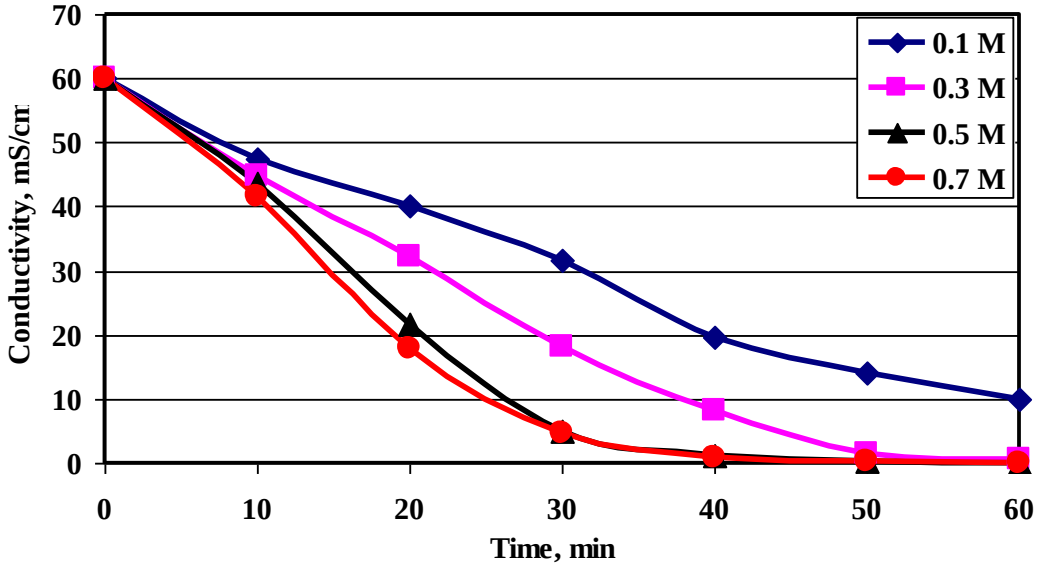

Fig. 4. Effect of sodium sulfate electrolyte concentration and time on conductivity

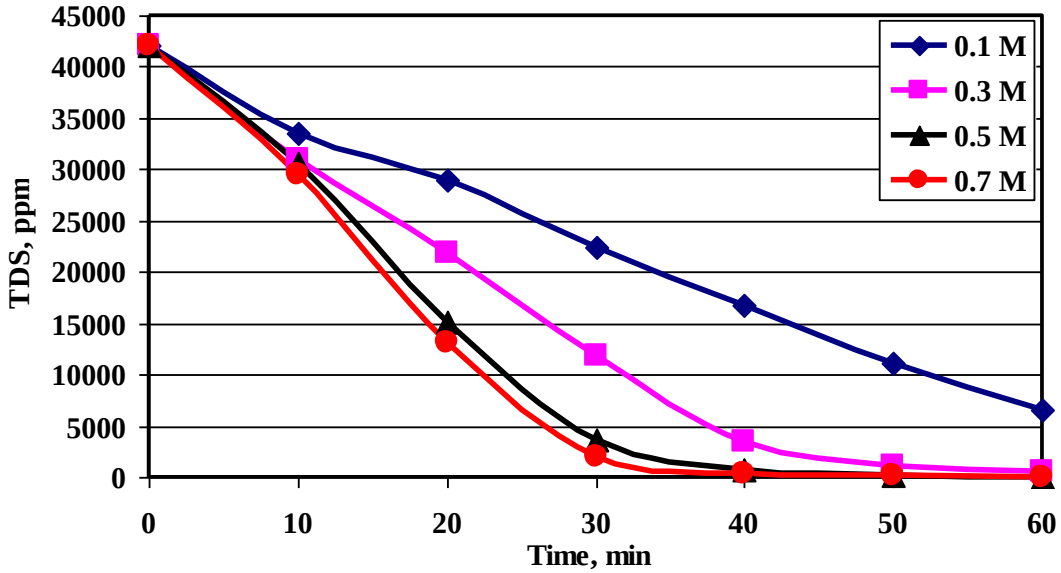

Fig. 5. Effect of sodium sulfate electrolyte concentration and time on TDS

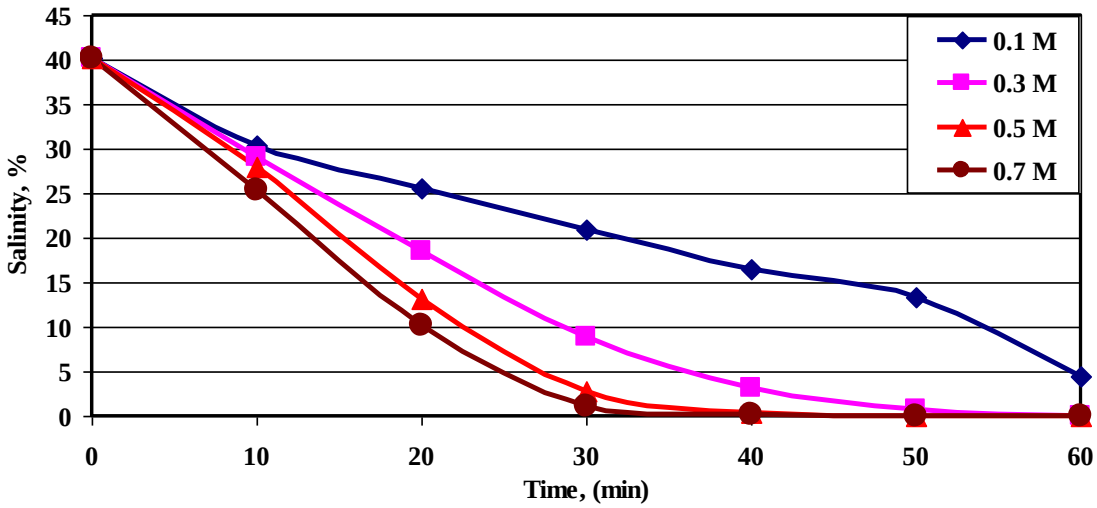

Fig. 6. Effect of sodium sulfate electrolyte concentration and time on Salinity

Quality of produced desalinated water from ED

Electrodialysis system is operated at the optimum coditions to collect large volume of desalinated water. The applied conditions are 15 v potenial difference, 0.5 M sodium sulfate electrolyte concentration and 60 minutes operation time. The conductivity obtained was 99 $\mu S.cm^{-1}$ and no any salinity measured. The quality of produced desalinated water is given in Table 5. The quality is much suitable for drinking water but for power generation it needs almost full deionization.

Table 5. Quality of produced desalinated water with ED

Constituents	Value, ppm	Constituents	Value, ppm
Total Dissolved Salts (TDS)	69	Silica (SiO_2)	4.42
Sodium (Na^+)	53.1	Ammonium (NH_4^+)	0.13
Sulfate (SO_4^-)	36.18	Nitrite (NO_3^-)	0.1
Total alkalinity as ($CaCO_3$)	31.5	Carbonate alkalinity as ($CaCO_3$)	0
Chloride (Cl^-)	30.4	Hydroxide alkalinity as ($CaCO_3$)	0
Calcium (Ca^{++})	27	Nitrate (NO_3^-)	0
Total hardness as ($CaCO_3$)	18	Iron (Fe^{++})	0
Magnesium (Mg^{++})	13.8	Manganese (Mn^{++})	0
Potassium (K^+)	4.8		

Ion Exchange (IX) of ED produced water

The produced desalinated water after electrodialysis operation was subjected to two types of strong ion exchange resins namely cationic (Amberjet 1500H) and anionic (Amberlite 4400Cl) in H and OH forms, respectively. Continuous operation was applied using discharge pump of 1.52 L/min flow rate and control valve to set the required contact time. The contact (retention) time (R_t) is calculated according to the following equation. The contact time was 2.63 minutes which gives 0.5 $\mu S.cm^{-1}$ conductivity of deionized water.

$$R_t = \text{Volume} / \text{Flow Rate}$$

The obtained water was considered as ultra pure water with very low conductivity. Some traces of ions such as Na^+ and SiO_3^{--} which escaped from IX resin system in a part per billion concentration ranges (ppb) are presented.

2.0 g of Amberjet 1500H IX regenerated form (H-form) was immersed in 1.0 L of ED produced water for one hour. Then, the resin was subjected to SEM investigation. Figure 7 and Table 6 show EDX chemical analysis of resin beads after ion exchange process. The results show that, the resin has C, O and S as main components and other adsorbed species of sea water cations as minor components. This resin is sulfonated styrene divinyle benzene copolymer and sodium ion has high adsorbed contents on resin bead surface. In addition, Figure 8 shows SEM images for Amberjet 1500H resin beads.

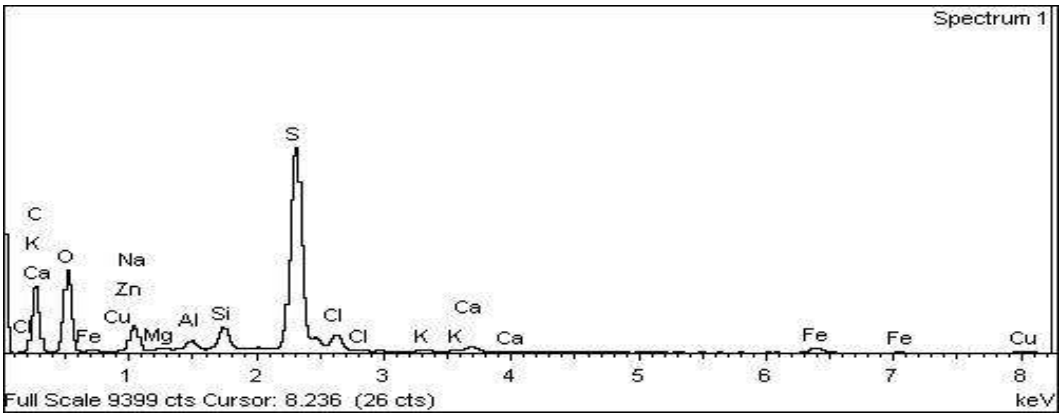

Fig. 7. EDX of Amberjet 1500H Ion Exchange Resin after Ion Exchange Process

Table 6. Contents of EDX analysis for Amberjet 1500H Ion Exchange Resin after Ion Exchange Process

Element	Weight, %	Element	Weight, %	Element	Weight, %
C	48.68	Si	0.76	Ca	0.15
O	39.18	S	6.66	Fe	0.37
Na	2.58	Cl	0.59	Cu	0.25
Mg	0.12	K	0.06	Zn	0.23
Al	0.35				

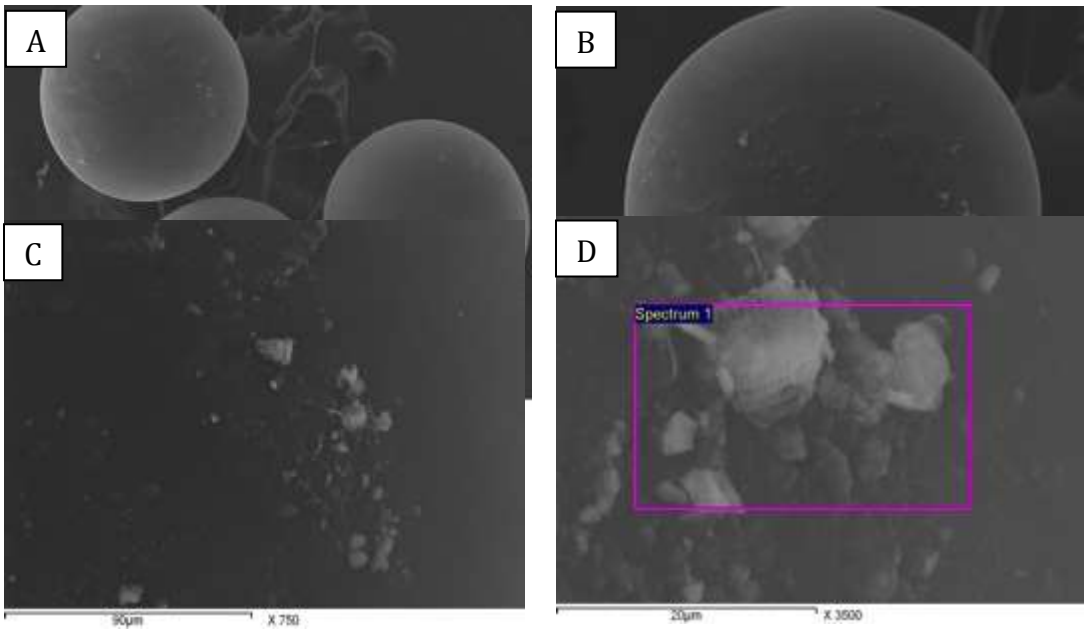

Fig. 8. SEM of Amberjet 1500H Ion Exchange Resin after Ion Exchange Process (Magnifications: A 100X, B 200X, C 750X and D 3500X)

Conclusion

Red sea water has the highest salts content among all the open seas. The conductivity of red sea water is about 62 mS. cm^{-1}. Deionization of this saline water was successfully achieved using combined system of ED and IX. The deionized water has 0.9 µS. cm^{-1} conductivity. This water can be used for thermal power generation plants as well as for many other industrial uses.

It is so easy to produce potable (drinking) water from this combined desalination system. It is just a matter of controlling the conductivity of produced water.

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Preparation and Coating of Hydroxyapatite for Medical Applications

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ABSTRACT

Hydroxyapatite (HA) is extensively used as an ideal substitute for bone. Novel technique for preparation of nanocrystalline Hydroxyapatite using mechanochemical-hydrothermal method was applied. Mean particle size, particles size distribution and particles shapes are critically influence the hardness of HA and its mechanical properties. Statistical design was used to correlate the preparation conditions, using mechanochemical-hydrothermal procedure, with the hardness of prepared powders. The process factors were reaction and milling time, speed of milling as well as the quantity of surfactant. Reaction and milling time as well as milling speed are the most significant parameters in their effect on the hardness of prepared HA. The average hardness value for each pellet was calculated from 5 to 8 indentations on each specimen using a load of 1 kilogram with a 10 second loading time. The Vicker's hardness of HA obtained was in the range of 23 – 262 kg/mm^2 which exceeds three times, in average, the hardness of human bone (50 kg/mm^2).

Keywords: ***Hydroxyapatite, Mechanochemical, Hydrothermal Synthesis, Hardness, Shrinkage***

INTRODUCTION

Hydroxyapatite (HA) is a calcium phosphate compound $\{Ca_{10}(PO_4)_6(OH)_2\}$ that is frequently used as a bone graft material substitute due to its biocompatibility with bone [1] and its higher strength compared to other calcium phosphate compounds [2]. It has several applications in the medicine and dentistry fields, including substitution by the fully dense sintered material or it acts as a coating to other bioinert metallic implants [3]. In the latter case it promotes the adhesion between prostheses and bone [4]. HA general uses include biocompatible phase, reinforcement in composites, coatings on metal implants as well as granular filler for direct incorporation into human tissues [5 - 7]. Improving of HA mechanical properties is essential for its usage as bone graft replacement. In this regard, methods of preparation and the applied conditions have significant effect on HA properties.

Hydroxyapatite can be prepared using different methods such as hydrothermal method [8 - 9], solid-state reaction [10], precipitation [11 - 12], sol-gel [13 – 14], sputtering [15], mechano-chemical [16], mechanochemical-hydrothermal [5, 17], microemulsion [18], and others.

As proposed by Suchcanek et. al. [5], synthesis of HA via the mechanochemical-hydrothermal method, using a zirconium ring mill, provides advantages in comparison to mechanochemical and hydrothermal processes. No need for high temperatures, which is not applicable in hydrothermal method, when forming the HA powder, thus lowering energy costs [5]. It is also more convenient than mechanochemical procedure since mechanochemical-hydrothermal method presents an aqueous phase that is not available in the mechanochemical method. Presence of aqueous phase can accelerate kinetic processes that commonly limit the rate of reaction, such as dissolution, diffusion, adsorption, reaction, and crystallization [5].

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Mazaheri et al. [19] applied two-step sintering to improve the mechanical properties of hydroxyapatite. They found that the average grain sizes with conventional sintering and with two-step sintering 1.7 µm and 190 nm, respectively. Also, they found that the fracture toughness was increased from 0.98 to 1.92 $MPam^{1/2}$ and the hardness was increased from 7.06 to 7.8 GPa by applying the new sintering technique compared to the conventional one. New sintering technique helps to suppress rapidly increasing grain growth of hydroxyapatite.
Different conditions for of HA nano-particles preparation are applied. Suchcanek et. al [5] milled the slurry at a rotation speed of 1500 rpm for 1 hr and then at 800 rpm for 4 hr at room temperature for preparation of carbonated HA powders in the range of 0.35–1.6 microns with a specific surface area between 82 and 121 m^2/g. Scanning and transmission electron microscopy confirmed that the produced powders consisted of mostly submicron aggregates of nanosized, about 20 nm crystals. In addition, Nakamura et al. [17] milled a mixture comprising of $Ca(OH)_2$, an aqueous solution of H_3PO_4 and a dispersant, an ammonium salt of polyacrylic acid at 1250 rpm for 3 hr. The average crystallite size of prepared HA was below 20 nm.
The aim of this research is to determine the optimum conditions of HA preparation that provides the optimum mechanical properties. So, Box-Behnken statistical design with 3 levels and 3 variables is applied to correlate the hardness of prepared HA to the operating variables.

EXPERIMENTAL

Materials

Calcium hydroxide powder [$Ca(OH)_2$], and solid diammonium hydrogen phosphate [$(NH_4)_2HPO_4$] were used as reactants for synthesis of HA**.** All the chemicals used are analytical-grade from Fisher Scientific.

Methods

HA was prepared using the mechanochemical-hydrothermal method according to the following chemical equation:

$$\mathbf{6(NH_4)_2HPO_4 + 10Ca(OH)_2 \longrightarrow Ca_{10}(PO_4)_6(OH)_2 + 12NH_4OH + 6H_2O} \quad \mathbf{(1)}$$

Ca/P ratio of 1.667 is kept constant so 5M $Ca(OH)_2$ and 3M $(NH_4)_2HPO_4$ are used. 25 grams of $Ca(OH)_2$ were added to 350 ml of de-ionized water. Then 26.756 grams of $(NH_4)_2HPO_4$ were added gradually while magnetic stirring. The slurry was mixed for 1 hour then it was transferred to MICROS reactor.
15 runs were carried out applying Experimental Box Behnken Design with the 3 levels and 3 variables utilized in the experiment (Table 1). Each run was done independently while the amount of surfactant varied according to the design. A run without surfactant, volume of de-ionized water was 350 ml. In the 50 ppm surfactant runs, volume of de-ionized water was 340 ml and mixed with 10 ml of Aminotris (methylenephosphonic acid) [$N(CH_2PO_3H_2)_3$] surfactant from Pfaltz & Bauer Incorporation (NTMP) 0.18 %. Also, in the 100 ppm surfactant runs, volume of de-ionized water was 330 ml and mixed with 20 ml of NTMP surfactant 0.18 %.

The samples were reacted and milled using the MICROS^{TM} MIC-O (NARA Machinery Co., Tokyo, Japan) laboratory-scale fine particle grinder under the specified conditions (Fig. 1). The mill has controllable speed rpm and can be time programmed.
After reaction and milling, the sample was poured into eight 50 ml centrifuge tubes to be centrifuged (Induction Drive Centrifuge, Model J2-21M, Beckman Instruments, Fullerton CA) at 15000 rpm for 30 minutes. Measuring pH of the separated liquid was conducted and found to be in the range from 11.0 to 11.3. The solid precipitate particles were mixed 6 times with de-ionized water (Barnstead Nanopure Infinity distiller) and then were centrifuged at 2000 rpm for 10 minutes (the liquid phase appears clear). The pH of sixth wash liquor was measured and found to be in the range 9.2 to 9.8.

Characterization of the materials

Coulter Laser Diffraction Analyzer model LS 230 was used for determination of size distribution of the hydroxyapatite particles. JEOL Scanning Electron Microscope model JSM-6400 was used for investigation of crystal morphology. X-ray crystallography (Phillips APD 3720, Cu k_{α} radiation) analysis was conducted for samples number 4 and sample number 5. Sample number 4 has the lowest hardness while sample number 5 has the highest hardness.

Statistical analysis

A statistical design, Box–Behnken design [20], was used to study the effect of studied variables on the mean diameter of the produced hydroxyapatite particles. The design-matrix of different runs, 15 experiments, is shown in Table 1.
According to this design, the optimal conditions were estimated using a second order polynomial function by which a correlation between studied factors and response (mean diameter) was generated. The general form of this equation is:

$$\mathbf{Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{12} X_1 X_2 + \beta_{13} X_1 X_3 + \beta_{23} X_2 X_3 + \beta_{11} X_1^2 + \beta_{22} X_2^2 + \beta_{33} X_3^2}$$

Where Y is the predicted response, X_1, X_2 and X_3 are studied variables; β_i are equation constant and coefficients. Software package, Design-Expert 6.1, Stat-Ease, Inc., Minneapolis, USA, was used for regression analysis of experimental data and to plot response surface. Analysis of variance (ANOVA) was used to estimate the statistical parameters. The extent of fitting the experimental results to the polynomial model equation was expressed by the determination coefficient, R^2. F-test was used to estimate the significance of all terms in the polynomial equation within 95% confidence interval.

Pellet formation and sintering

Pellets were made using HA powders obtained by taking 3 g of each sample and put into a 25 mm die (ICL, Macro/Micro KBr Die) for dry isostatic pressing. The cylinder was then set up with the base and the first metal pellet was inserted with the polished side up then the powder was added and settled with plunger. The second metal pellet was then introduced with the polished side down, subsequently adding the plunger with the plunger seal around it. The completed die was then set to be pressed at 5.5 tons that is gradually decreased to 4.5 tons with

pressing time being 45 minutes for all the samples. To remove the samples, the base was detached and the extraction ring was put in its place while the die was placed upside down in the press.
15 cylindrical pellets with about 3 mm height were obtained. Then, all the pellets were placed in a ceramic crucible and then subjected to heat treatment in a furnace (Barnstead/Thermolyne Corporation type F6000 Furnace). The furnace temperature was increased to 800 °C at a rate of 2 °C per minute. The samples were left for an hour at 800 °C and then the temperature was increased at the same rate to 900 °C, where they dwelled for two hours. The temperature was increased again at the same rate to 1200 °C and set to dwell at that temperature for one hour before settling down to room temperature at a rate of 2 °C per minute.

Hardness measurement

Vickers hardness of the obtained material is conducted on pressed and sintered pellets of the HA material. All the pellets were subjected to a Vickers micro hardness tester (Micromet 3, Buehler LTD., Lake Bluff, IL). The pellets were indented on their polished surfaces. The Vicker's hardness of the pellets (H_V) was calculated according to equation (2), where, L, is the indentation load in Newtons, 2a, the average diagonal length of the indentation in meters [3]. From 5 to 8 indentations were done on each specimen using a load of 1 kilogram with a 10 second loading time. Then average hardness value for each pellet was calculated.

$$H_V = \frac{L}{2a^2} \qquad (2)$$

RESULTS AND DISCUSSIONS

Characterization of HA Precipitate

XRD patterns of sample number 4 (low hardness) and sample number 5 (high hardness) are given in Figures 2 & 3, respectively. The crystals are single phase hydroxyapatite. Sample 4 has lower intensity compared to sample 5.
SEM photomicrographs of sample number 4 (low hardness) and sample number 5 (high hardness) are given in Figures 4 & 5, respectively. Sample 4 has individual particles ranged in size from about 5 to 20 μm while sample number 5 has individual and agglomerated particles ranged in size from about 5 to 30 μm. Despite the crystallized hydroxyapatite particles are in micron size, however their crystallite sizes ranged from 5.6 to 23.9 nm [21].

Effect of Operating Conditions on HA Mean Diameter and Vickers Hardness

Figures 6 - 8 show the particle size distribution of the samples from run 1 to 5, 6 to 10, and 11 to 15, respectively. Table 2 shows operating conditions for each run with the corresponding mean diameter and Vicker's hardness. It was noticed from the experimental results of the runs, reported in Table 2, that with increase in reaction time and speed the hardness was reduced.
Figure 9 (A - C) shows the effect of reaction time and milling speed with and without surfactant on HA mean Vicker's hardness. The contours show that with increasing reaction time, the mean Vicker's hardness is decreased without surfactant. Reaction time seems to be most influential especially at low surfactant concentration. Mill speed shows a slight effect in decreasing hardness. It is clear from Fig. 9,

that with increasing the surfactant concentration from 0 ppm to 100 ppm passing through 50 ppm, effect of time on the hardness was less significant whereas effect of milling speed was more significant.

Figure 10 shows a decreasing in hardness of HA as both reaction time and surfactant concentration increase. High hardness values (≥ 60 kg/mm^2) can be obtained at high reaction time (5 hr) and about 50 ppm surfactant concentration.

Effect of HA Particles Mean Diameter on Vicker's Hardness

The experimental statistical design results showed that most hardness measurements had a higher value than that of human bone, which is 50 kg/mm^2 Vicker's hardness [22]. Most important finding is that the mechanochemical-hydrothermal method can produce a HA powder with hardness about 262 kg/mm^2. This can be achieved at 1 hour reaction time, 1500 rpm mill speed without surfactant.

Figure 11 shows relations between mean diameter and the Vicker's hardness. It seems no direct correlation can be found. This can be attributed to changes in particle size due to pressing, calcination and sintering. Hardness can influenced by other material properties that do not rely on particle size. Thangamani et al. [23] mentioned that powder properties such as particle size distribution, density and morphology could have affected densification behavior, mechanical and micro structural properties of the powder compact. For example, many limiting micro structural heterogeneities stem from agglomerates that may form during powder preparation can affect mechanical properties. Also, the presence of agglomerates with different bulk densities could have been responsible for forming crack-like voids during pellet formation. In addition, the samples present a wide range of particle size distribution, which can cause poor packing that result in exaggerated grain growth during sintering [23]. These defects could have a significant effect on the mechanical properties of hydroxyapatite thus limiting the possibility of developing a trend of hardness with particle size distribution of powders before pressing and heat treatment.

However, Fig. 6 shows particle size distribution of Sample No. 5 of high hardness. It has the highest mode (3 % by Volume) at 20 microns particle size. This specific particle size distribution with good crystalinity (high intensity) as well as high shrinkage (high compact) may be reasons of high hardness.

Correlation between Shrinkage % and Vicker's Hardness

Figure 12 shows correlation between shrinkage % and the Vicker's hardness. % shrinkage is calculated as the following equation:

% Shrinkage = (Diameter of Pellet after Sintering / Diameter before Sintering) x 100 (3)

Figure 12 shows a good correlation between the hardness and the shrinkage of the HA pellets as indicated from the correlation coefficient (R^2) = 0.9256. The decrease in shrinkage with increasing the hardness can be attributed to the good compactability of the powder which resists the forces applied by the hardness tester. It is worth noting that for very fine-grained ceramics, fracture usually occurs from preexistent process or surface flaws in the material, and thus the strength becomes relatively grain-size-insensitive [24].

In general, it can be stated that hydroxyapatite of hardness can be obtained under the following conditions:

When the mode of 20 microns particle is high (3 % by Volume).
When the formed powder is well crystalline.
When the sintered powder has good compatibility.

CONCLUSION

The mechanochemical-hydrothermal method proved to be a promising technique for production of HA powder in micron-size ranged from 6 to 25 µm. The optimization of the process using statistical design indicated that the powder with an overall Vicker"s hardness of 262 kg/mm^2 can be produced in comparison with that of human bone (50 kg/mm^2). This can be achieved at 1 hour reaction time, 1500 rpm mill speed without surfactant. Hardness did not show any signs of dependence on particle size of HA. Time of milling and speed of milling slightly affect on hardness values. Low milling speeds showed a wider hardness value distribution as reaction time and surfactant concentration increased.

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Table 1. Experimental Box Behnken Design with 3 levels and 3 variables

Run No.	Coded Factor Levels		
	Time	Speed	Surfactant
1	-1	-1	0
2	-1	+1	0
3	+1	-1	0
4	+1	+1	0
5	-1	0	-1
6	-1	0	+1
7	+1	0	-1
8	+1	0	+1
9	0	-1	-1
10	0	-1	+1
11	0	+1	-1
12	0	+1	+1
13	0	0	0
14	0	0	0
15	0	0	0

Levels

Variables	-1	0	+1
Time, hr	1	3	5
Speed, rpm	1000	1500	2000
Surfactant, ppm	0	50	100

Table 2. Run Conditions with Mean Diameter and Mean Vickers Hardness
(using a load of 1 kilogram with a 10 second loading time)

Run No.	Time, hr	Speed, rpm	Surfactant, ppm	Mean Diameter, μm	Mean Vicker's Hardness, kg/mm^2
1	1	1000	50	25.0	140
2	1	2000	50	17.9	56
3	5	1000	50	6.7	67
4	5	2000	50	5.9	23
5	1	1500	0	12.0	262
6	1	1500	100	15.5	114
7	5	1500	0	6.2	53
8	5	1500	100	6.7	50
9	3	1000	0	12.6	139
10	3	1000	100	14.3	92
11	3	2000	0	16.9	41
12	3	2000	100	14.3	48
13	3	1500	50	13.8	88
14	3	1500	50	12.1	88
15	3	1500	50	12.9	97

Fig. 1. MICROS MIC-O fine particle grinder and its interior part

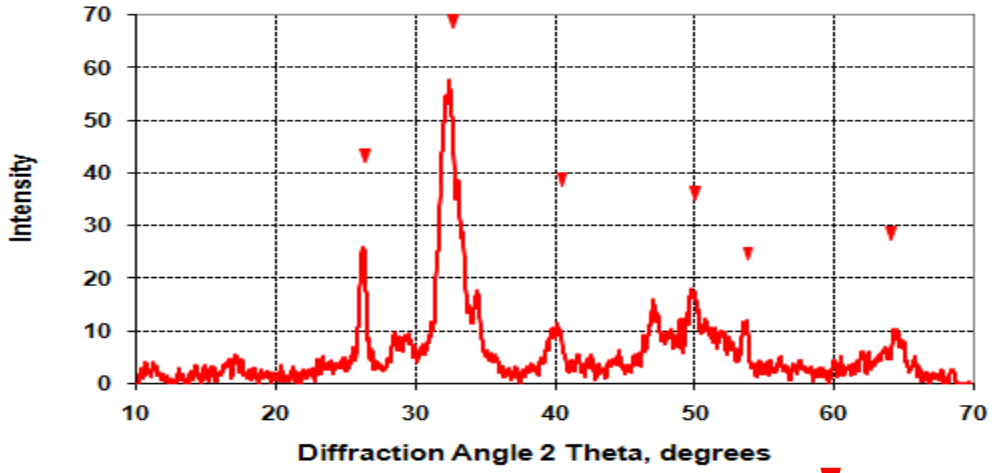


Fig. 2. XRD Pattern of Sample Number 4 (Low Hardness), ▼Hydroxyapatite

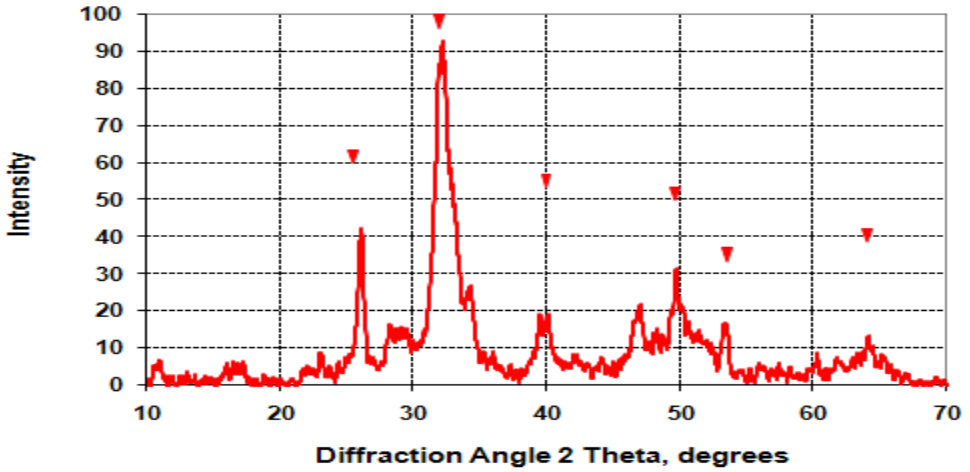


Fig. 3. XRD Pattern of Sample Number 5 (High Hardness), ▼ Hydroxyapatite

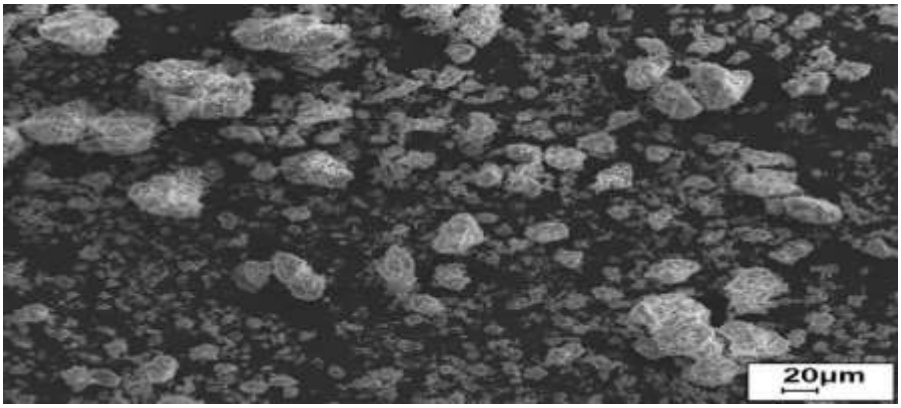


Fig. 4. SEM Photomicrograph of Sample Number 4 (Low Hardness)

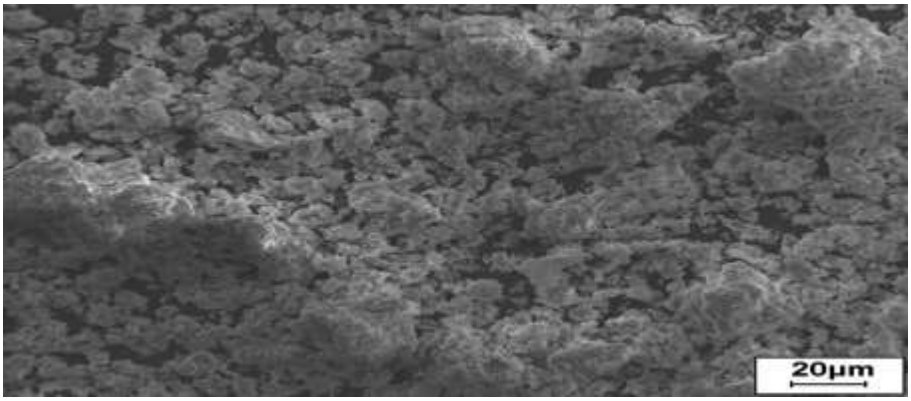


Fig. 5. SEM Photomicrograph of Sample Number 5 (High Hardness)

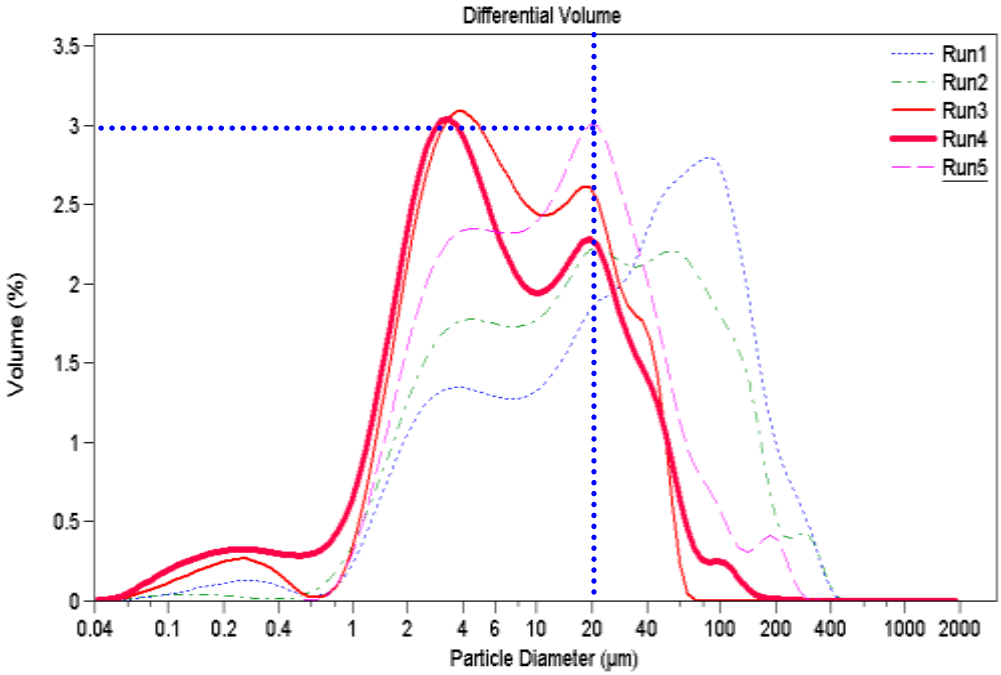


Fig. 6. Particle Size Distribution analysis for Run 1 thru 5

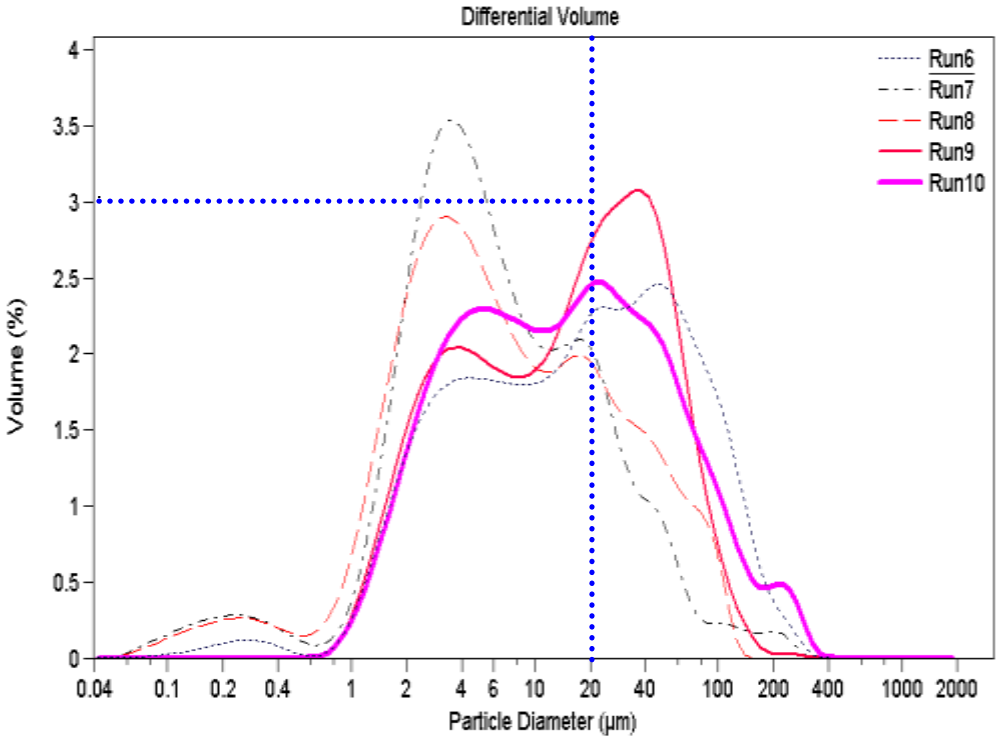


Fig. 7. Particle Size Distribution analysis for Run 6 thru 10

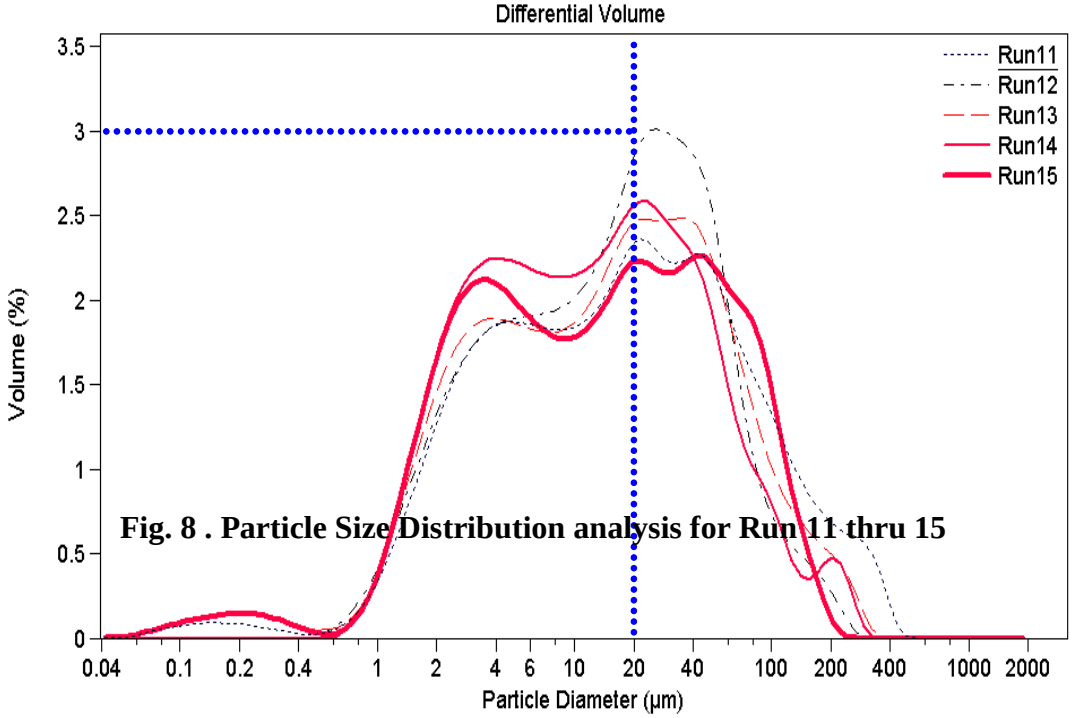
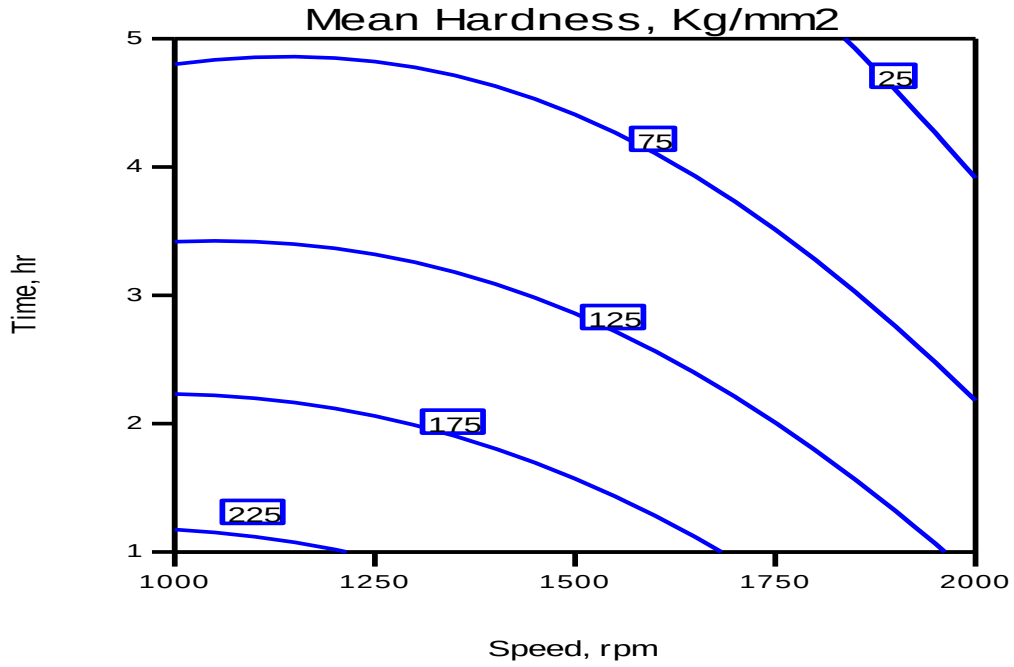
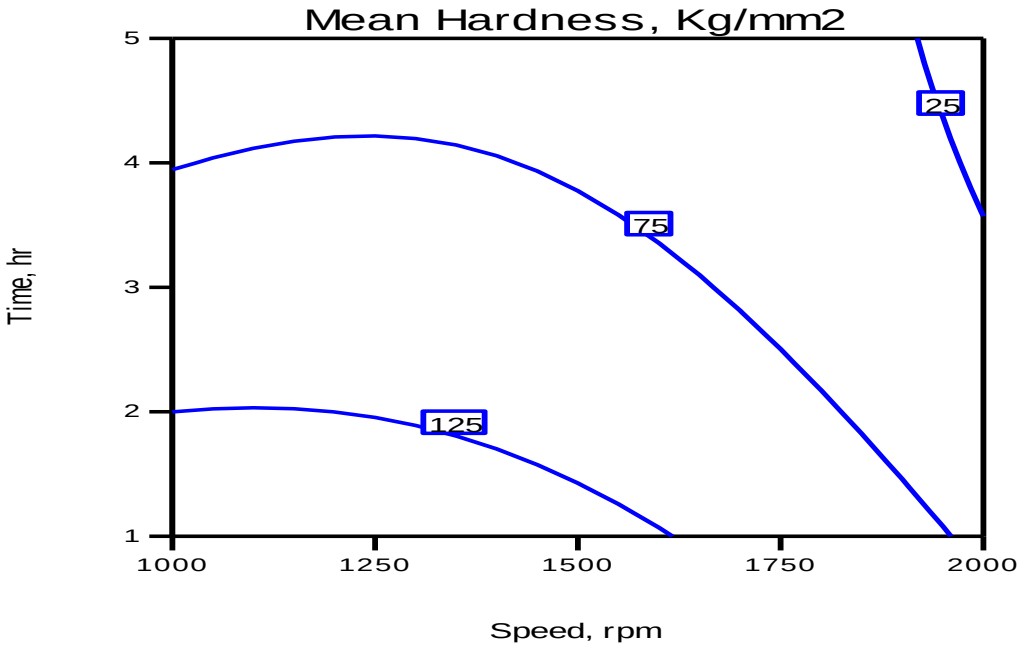


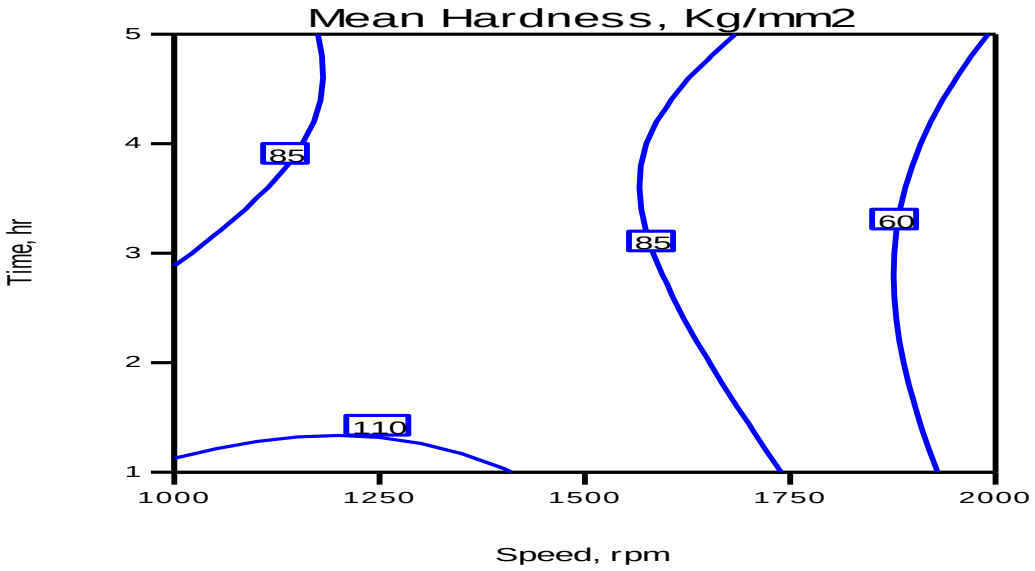
Fig. 8 . Particle Size Distribution analysis for Run 11 thru 15


Mean Hardness, Kg/mm2
Time, hr
Speed, rpm
25
75
125
175
225
1000
1250
1500
1750
2000
1
2
3
4
5

(A)


Mean Hardness, Kg/mm2
Time, hr
Speed, rpm
25
75
125
1000
1250
1500
1750
2000
1
2
3
4
5

(B)



(C)

Fig. 9. Effect of Reaction Time and Mill Speed on Mean Vickers Hardness (A) No Surfactant, (B) 50 ppm surfactant, (C) 100 ppm Surfactant

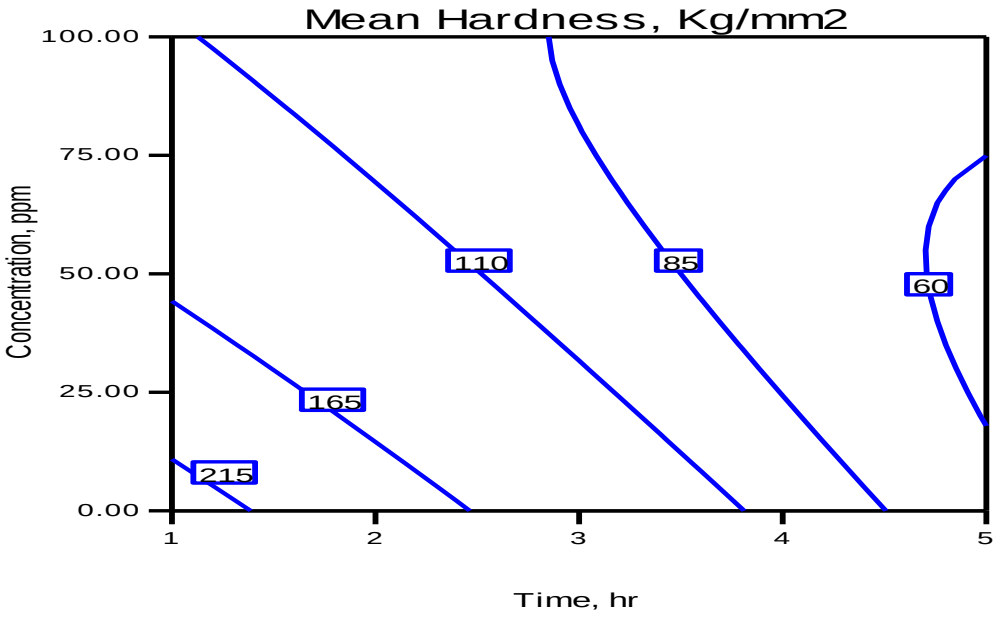


Fig. 10. Effect of Reaction Time and Surfactant Concentration on Mean Vicker's Hardness at 1000 rpm mill speed

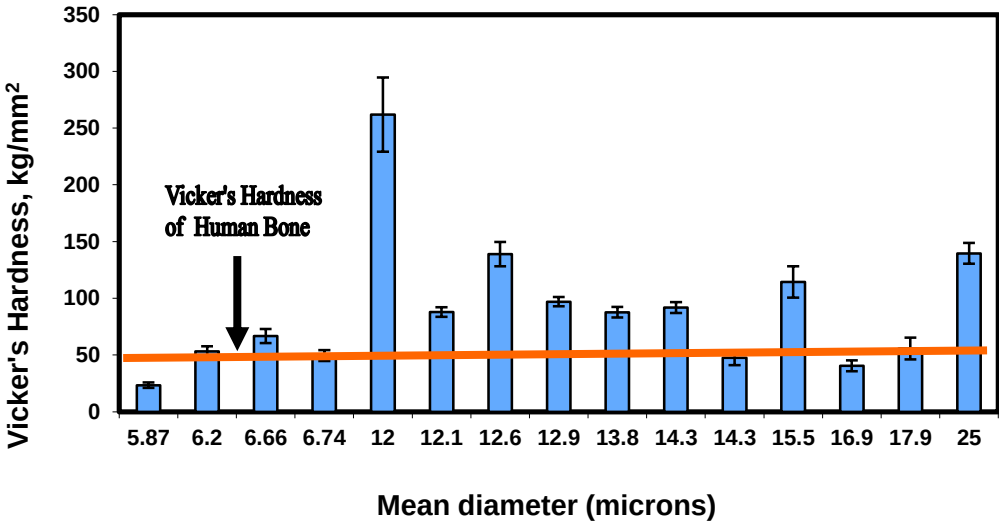


Fig. 11. Mean Diameter vs. Vicker's Hardness

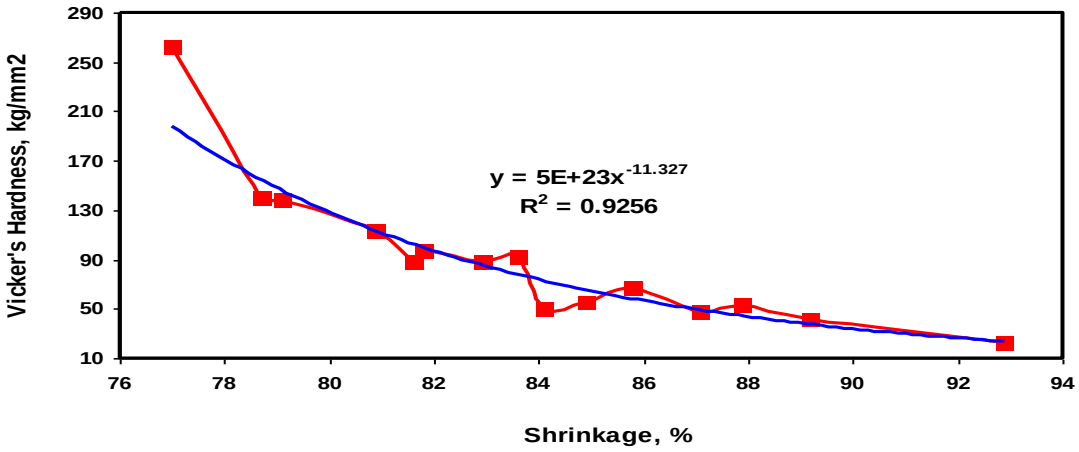


Fig. 12. Shrinkage Percentage vs. Vicker's Hardness

Potentials of Alternative Energy Sources in Egypt

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Abstract

So far, thermo-electric and hydro-electric powers are the main energy sources in Egypt. Oil, and gas, being the main energy materials are gradually depleting. The power generated from the hydroelectric power station of the high dam at Aswan, Upper Egypt generates only 10% of Egypt's need from Energy. In view of the rapid development plans and the increasing rate of population, Egypt may face energy crises within 2-3 decades unless alternative energy sources are explored and utilized. Nuclear energy is an alternative, and contacts with developing countries are being made to establish the first power generating nuclear reactor in Egypt.

Solar energy which is based on silicon metal is an important energy source, Egypt is blessed by having sunshine almost year around. In addition, huge reserves of naturally occurring white sand and quartzite rock were discovered in various localities in Egypt, mainly Eastern Desert and Sinai. These ores are characterized by low sulphur and phosphorous contents which are the most deleterious elements for silicon production from these raw materials.

The Central Metallurgical Research and Development Institute (CMRDI) of Egypt started an ambitious plan for the development of silicon industry in Egypt. The raw materials were successfully processed for the production of the first grade of silicon metal, namely metallurgical grade (MG) with SiO_2 content of 98%. The process was conducted in a locally fabricated pilot scale arc furnace with 50 kg capacity. The second stage of converting Metallurgical grade silicon to solar grade is rather complicated and requires considerable technical and financial assistance from developing countries.

Despite the sophistication and restriction of technology, CMRDI is seeking for a foreign partner for establishing a unit for the production of 2.4 ton/year solar grade silicon from metallurgical grade silicon. It is believed that establishment of such a unit will help in mastering the technology and its gradual dissemination to investors

and countries of the region suffering from energy deficiency and having similar resources namely, quartzite and white sand.

On the other hand, Egypt possesses huge reserves of oil shale in different locations along the Red Sea coast and in the Western Desert. These shales are rich in its oil content and could be utilized as source of energy just by direct burning. However, the colorific value of the crude ore is low due to the contamination of the ore with calcareous and siliceous gangue minerals. CMRDI is intending to carry out a research program for beneficiation of oil shale to increase its oil content. The beneficiation process is indispensable to decrease the dead weight and consequently increase the effective volume and capacity of the burning furnaces. In addition, the impurities, if not removed, will generate considerable amounts of wastes which decrease the burning efficiency of the furnace and deteriorate furnace lining. The overall productivity of the burning process will be greatly improved by upgrading the crude shale.

Coal is conventionally used as a source of energy. It is present in various localities in Sinai; however its high sulphur content limits its application as energy source, CMRDI developed in collaboration with US partner, a technology for reducing the sulphur content of one of these localities. However, the developed technology has to be demonstrated on pilot plant level.

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Introduction

Oil, gas and hydropower stations are the main sources of energy in Egypt. Limited numbers of wind stations are also available. Although Egypt is classified as one of the oil and gas producing and exporting countries, these sources are gradually depleting, and sooner or later the country will face problems related to the increasing demand for energy for the development plans. Among the sources available are solar energy, oil shale and coal. The paper presents the efforts made by

the Central Metallurgical Research and Development Institute (CMRDI) of Egypt to explore the suitability of these sources for energy production.

In addition, great efforts are being made by the institute to reduce enormously the running costs of the already existing hydro-and thermo-electric power stations based on the local experience. This is demonstrated by the production of sensitive spare parts used to be imported and also carrying out inspection, non-destructive testing and failure analysis in these stations used to be performed by foreign companies.

The review covers the following items
Production of solar grade silicon from local quartz and white sand
Upgrading of local oil shales
Rehabilitation of coal industry
Derivation of technologies for manufacturing of spare parts for power stations
Introduction of world class experience for inspection, non–destructive testing and failure analysis in power stations.

I. Production of Solar Grade Silicon from Local Quartz and White Sand

Silicon is the basic material in solar energy stations. The metal is produced from high purity quartz and white sand in addition to silicon scrap. The raw material should be of a very high purity especially the contents of phosphorous, sulphur and boron which should be extremely low. Egypt is blessed by having huge reserves of quartz and white sand located in the Eastern Desert and Sinai. There is also a plenty of sunshine all year, which is an important economic factor.

Prices

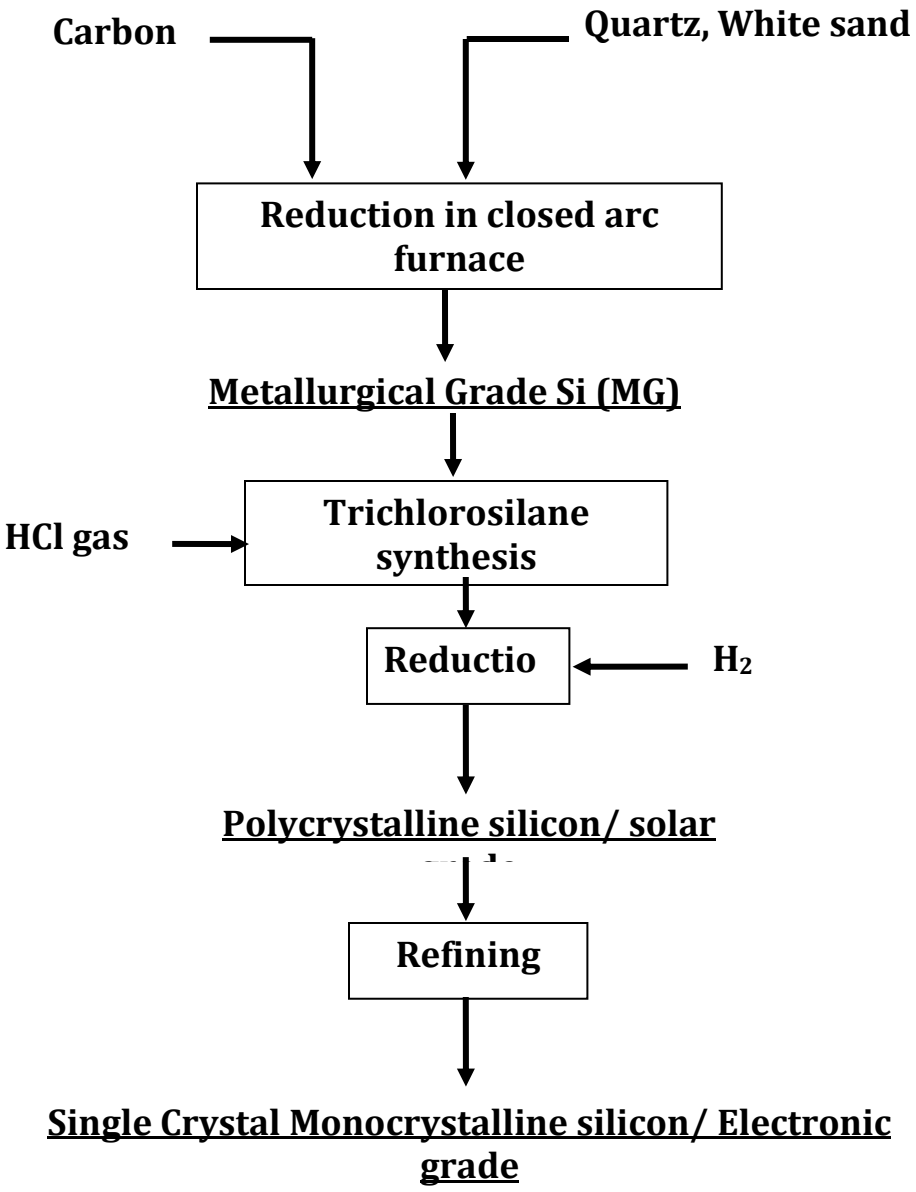
The prices of silicon metal are enormously increasing based on its grade as follows

Metallurgical grade MG	2000	$/ton
Solar grade	80,000	$/ton
Electronic grade	400,000	$/ton
Wafers	900,000	$/ton
Polished wafers	1,300,000	$/ton

The purity of silicon ranges from 99% for metallurgical grade to 99.9^{-4} for solar grade up to 99.9^{-10} for electronic grade.

Technology

The technology of silicon production is rather complicated and restricted to few developed countries e.g. USA, Germany, Norway, Japan, France, Russia and others. A simplified flowsheet of silicon is shown



The Central metallurgical Research and Development institute (CMRDI) carried out extensive studies for evaluating the suitability of local quartz and white sand for silicon production. The studies were carried out on laboratory, bench scale and pilot plant level. The following table shows the chemical composition of high purity quartz and white sand.

Chemical composition of quartz and white sand

%	Quartz	White Sand
SiO_2	99.80	99.94
Al_2O_3	0.14	0.04
Fe_2O_3	0.01	0.002
TiO_2	0.018	0.001
CaO	0.007	0.004
MgO	0.002	<0.001
Na_2O	0.013	0.01
K_2O	0.003	0.005
LOI	-	0.017
P	ND	ND
S	ND	ND

ND: Not detected

Achievements

The results obtained so far are summarized in the following
The ores were technologically evaluated and proved to be suitable for metallurgical grade silicon production and 98% Si was successfully produced.
CMRDI established laboratory, bench scale and pilot electric arc furnace 50 Kg/run simulating the closed electric arc furnace technology conventionally used for the production of metallurgical grade silicon.
CMRDI recently established a pilot scale fluidized bed chlorination furnace which could be used for chlorination of metallurgical grade silicon. The unit is supplemented with condensation system.
The institute negotiated with a foreign partner to establish a pilot plant for production of solar and electronic grades silicon from metallurgical grade silicon.

Establishment of 2.4 ton/year pilot plant

Despite the sophistication of technology and unavailability of technology transfer to developing countries, CMRDI succeeded to negotiate with a foreign partner to carry out conceptual design and cost estimate of a pilot plant producing 2.4 ton/year monocrystalline silicon from metallurgical grade silicon.

The technology proposed is based the following steps.

Hydrogen chloride production

$$H_2 + Cl_2 \longrightarrow 2HCl$$

The reaction is explosive and safety measures should be taken

Trichorosilane synthesis

Metallurgical grade silicon is the feedstock in this step which reacts with HCl in a fluidized bed reactor.

$$Si + 3HCl \longrightarrow SiHCl_3 + H_2$$

The produced vapour mixture is dedusted and cleaned through gas cleaning system.

Polycrystalline Si production

Trichlorosilane is reduced by hydrogen

$$SiHCl_4 + H_2 \longrightarrow Si + 3HCl$$

Polycrystalline silicon bars are used as seeds to deposit silicon on it. The process is conducted at high temperature 1200°C. The produced polycrystalline silicon bars are calcined and cleaned. This is the grade used for solar cells.

Monocrystalline silicon

The type of silicon known as single crystal is used mainly for electronic industry. The technology used is known as Chokralsky process after name of the inventor. A seed monocrystalline Si is used under vacuum and the charge is melted while seeding proceeds.

Establishment strategy

The proposed production capacity of this pilot plant is as follows

4.2 ton/year polycrystalline silicon
2.4 ton/year monocrystalline silicon 100 mmØ
75 ton/year silicon tetrachloride byproduct

The estimated time frame is 2 year with approximate budget of 10 million US$. The strategy of establishment of this pilot plant comprises the following steps.

Preliminary feasibility study
Training on the different steps of technology in already existing operations.
Specifying equipment and site preparation
Pilot plant installation by experts
Training on quality assurance
Plans for technology dissemination

It is foreseen that establishment of this pilot plant will help in transferring technology to investors and cooperating countries. In addition, development plans on various down stream products could be undertaken.

II Upgrading of Oil Shales

Oil shales (black shales) are sedimentary clay deposits with layers containing a black organic matter that may be a polymer called kerogen or carbanecious matter (coal). The kerogen containing shales are known as oil shales whereas those containing coal are known as carbonaceous or black shales. If the kerogen or carbonaceous matter content exceed 50%, the ore could be considered as source for energy.

In Egypt huge reserves of both oil and black shales are present in Sinai, along the Red Sea coast and in the Eastern Desert associated with phosphate ores. The kerogen content of crude oil shale as well as the carbonaceous matter content in black shale is around 30%. The major gangue minerals are clay, quartz, calcite, silica and apatite.

The Central Metallurgical Research and Development Institute (CMRDI) carried laboratory scale studies to beneficiate the two types of clays aiming at increasing the organic matter content to > 50%. Several techniques were used and it was found that best beneficiation process for upgrading oil shale from Sinai is a combined of jgging, hydrocyclone and flotation process whereas for carbonaceous shale from Red Sea hydro-cyclone is quite enough. For the two types of ores the following ratios were obtained.

	Organic matter, %
Carbonaceous shale (Sinai)	55.2
Oil Shale (Red Sea)	64.5

The beneficiation process is indispensable for the retorting process to recover oil as the effective volume of the retort will be increased. In addition, solid wasted discarded from the retort will be also less.

Oil shale in the Eastern Desert is intercalated with phosphate deposit. Huge reserves were found in this area and geologic prospection is going on. Preliminary analysis showed that the oil yield from this ore is ranging from 20 – 45 gal/ton with gas amount around 6%. Further geologic prospection requested. The ore beneficiation pilot facilities of the institute will encourage derivation of the proper benefication flowsheet suitable for each type of ore.

III Rehabilitation of Coal Industry

Egypt, so far, is the only country in north Africa which mine coal. The ore is of a bituminous nature and is located mainly in Sinai in two localities namely Maghara – near Al-rish City and Ayun Mousa facing Suez City. The Maghara coal has been mined for long time mainly for export as its high sulphur content does not alters its utilization as energy source. The composition of the ore is as follows

Fixed carbon	40%
Volatile matter	51%
Ash	6.7%
Total sulphur	3.3%

Sulphur is present in two forms, namely inorganic (pyritic) amounting 1.5% and organic 2.1%.

The Central Metallurgical Research and Development Institute (CMRDI) carried out joint project with the Center of Energy of the University of Kentucky, USA, aiming at decreasing the sulphur content to < 1% rendering the ore suitable as energy source. The technology to be developed should not significantly disturb the operation of the plant already existing in Sinai. The US Center developed a technology based on grinding coal to – 0.1 mm and feeding this fraction to centrifugal falcon concentrator a technology which already applied with different coal ores in USA.

The results proved the suitability of this technology to decrease the sulphur content in the – 0.1 mm fraction to 0.9% with a weight % (recovery) about 82%. Utilization of this technology is advantageous as the unit has high capacity and does not require additional water. In addition, operation attention is minimal.
For economic, financial and managerial problems the operation in Sinai was shut down. However, plans for rehabilitation are being prepared. In this regard demonstrating the falcon technology on a pilot plant scale is indispensable.

Ayun Mousa ore is not sufficiently explored; its composition is as follows:

Fixed carbon	12 – 40 %
Volatile matter	21 – 43%
Ash content	9 – 56 %
Total sulphur	1 – 6%

Further geologic and beneficiation studies are thus required.

IV Derivation of Technologies for Local Manufacturing of Spare Parts

In power stations (hydro-, thermoelectric) spare parts represent a bottle neck in the operation of these stations. Most of these spare parts are imported against hard currency.
The Central Metallurgical Research and Development Institute established with the cooperation of the Dutch Government (Institute TNO) an experimental foundry with a capacity of 800 ton/year. The foundry consists of induction melting furnaces and sand molding lines. Various types of spar parts from different ferrous and non ferrous alloys could be produced reaching a weight of 250kg. Spare parts for power stations are regularly produced in the foundry such as bearings, glands, heat exchangers, burners and turbine blades.

V Introduction of World Class Experience for Inspection, Non-destructive Testing and Failure Analysis in Power Stations

Inspection, non destructive testing and failure analysis are extremely essential in power stations. Normally these studies were carried out by foreign companies against a great amount of hard currency paid regularly. During the last two decades and with the assistance of Japan, the Central Metallurgical Research and Development Institute established a world class department for welding, inspection, non-destructive testing and failure analysis. The department is providing valuable assistance to power stations in welding maintenance, failure analysis, repair welding, non-destructive testing, shutdown inspection, maintenance checkups and accident maintenance.

In addition, the department being accredited by the International Institute of Welding (AWI) is providing training and qualification programs in all areas of welding and non-destructive testing. The certificates issued by the institute are accredited by the Austrian Welding Institute and the International Institute of Welding.

VI Framework of Cooperation

The Central Metallurgical Research and Development Institute (CMRDI), Egypt is welling to cooperate with the International Energy Foundation and Middle East and North Africa countries (MENA) in the following areas

Regional project for the establishment of pilot plant (prototype unit) for the production of solar grade silicon from quartz and white sand.

Regional project for evaluation and beneficiation of oil and black shales.

Extending CMRDI experience for MENA countries in

Manufacturing of spare parts for power stations
Repair welding, failure analysis, non-destructive testing for power stations
Training and qualification on both issues

Acknowledgement

Thanks are due to the staff members of the following departments of the Central Metallurgical Research and Development Institute (CMRDI) of Egypt for providing information

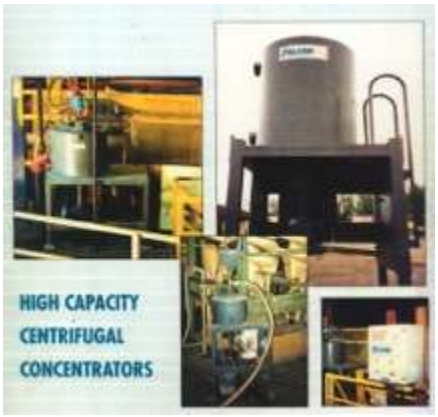
Pyrometallurgy
Ore beneficiation
Melting and Casting
Welding and inspection

Appendix 1
Pilot Facilities at CMRDI

Silicon Furnace

Silicon Chlorinator

Oil Shale Beneficiation Pilot Plant



Falcon Concentration for Coal Beneficiation

Appendix 2
Facilities for spare parts production and inspection in power stations

Experimental Foundry for production spare parts

Spare parts for power stations

Inspection of power stations

Failure cases in power stations

IRON CASTING – THE MAJOR PLAYER IN EGYPTIAN WIND ENERGY DEVELOPMENT PROGRAM

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ABSTRACT

The wind power industry has experienced fantastic growth in recent years. It is expected that the present wind power share of about 1% of global power consumption will grow to at least 10% by 2020. The targets for renewable power in the EU and China will account for 20% and 15%, respectively, in 2020 and the US is expected to adopt similar targets. Over the past few years, Egypt has been in the midst of a wide debate over energy policy, an important part of that debate has been concentrated on whether and how best to accelerate the development of renewable energy. The Egyptian resources of fossil fuel are questionable and there are some indicators that they may become scarce in the near future. A logical approach has been, therefore, recently adapted by the Egyptian Government to launch an ambitions plan to add, by 2020, new 8.000-10.000 MW of electrical energy generated from wind, to be doubled in the next decade. Since 2009, two companies have already been established in Egypt to manufacture the wind turbines (based mainly on assembly of the turbine components) and other companies are expected to follow in the near future. While the economic benefits produced by the construction and operation phases of wind development are important and significant, a substantial portion of the benefits the new investment will result from manufacturing the equipment and will flow to these companies that either have or can develop their technical capabilities to supply the subcomponents of the wind turbines.

This report is divided into four parts; the first will identify the wind turbine components with a technical description of each ductile iron casting used in the manufacturing of wind turbine components. The increase in power and size of the modern wind turbines has resulted in the optimization of structural materials used in the fabrication of the wind turbines, and it is now clear that lighter weight materials, meeting the required mechanical performance would be needed. Ductile iron (DI), which offers a 10% weight reduction compared to steel, therefore becomes the best choice for the designers for many components. The modern wind turbines contain 15-20 tons of ductile iron castings per each one MW power generated. The target wind mill installations in Egypt will, therefore, require around 200.000 tons of heavy and medium DI castings over the coming few years. This represents for the Egyptian foundry industry a remarkable opportunity, yet a very serious challenge. Main components to be manufactured from DI casting include rotor system (hubs, blade adapter, bearings), turbine frame (nacelle, bed plate, haw ring), gearbox (housing support, bearings) and shafts.

The third part of this report will survey the metallurgical requirements and specification of DI castings utilized in wind turbines and factors influencing their performance under severe operating conditions of those turbines.

The last part of the report will identify the technical potential of different Egyptian foundries to enter the wind turbine market. The production facilities and expertise available at these foundries will be assessed in the light of the rather strict quality requirement of the produced castings.

The last part of the this report outlines a current research project at submitted by CMRDI to STDF Program at the Egyptian Academy for Scientific Research, aiming at developing a technology package for the production of high quality DI heavy castings, characteristic of wind turbine parts (up to 20 t/piece). The production of these casting is usually associated with critical structural problems such as the formation of degenerate forms of graphite, which seriously detracts from the performance of DI casting and may lead to catastrophic accidents during operation.

1. INTRODUCTION

Wind power is a renewable, predictable and clean source of energy. Substantial capacity can be quickly built up, offering the energy independence indispensable for the world's largest and fastest-growing economics. The wind power industry has experienced fantastic growth in recent years. It is foreseen the today's wind power share of about 1% of global power consumption will grow to at least 10% by 2020. Today, the global capacity is approaching 100,000 MW, but the International Energy Association (IEA) is estimating that by 2020, there will be installed 200,000 MW wind power globally. The average annual growth rate of 17-20% is expected over the coming years for new installed capacity, compared to 30% growth rate on average during the last 6-years. Technically speaking, wind power can deliver 53,000 TWh per year-enough power to cover the global electricity demand several times (Wind Force 12, Edition 2005). Wind power resources on shallow water in the ocean around Europe may cover the entire European demand for electricity several times (www.windpower.org). In a recent publication [1], there are approximately 253 thousand MW potential wind power resources in land in China and 750 thousand MW in the sea. The actual total wind power generation in China was 1270 MW in 2005 and it was estimated that there will be 5-6 thousand MW wind power generation in 2020.

Currently, wind power is the cleanest and best option for reducing CO_2 emissions. Just one of V90-3.0 MW wind turbines can save the atmosphere from more than 5,000 tons of CO_2 emissions every single year [2]. Wind power is on the course to be competitive on the liberalized market. Production cost per kWh has been reduced by more than 80% within the last 20 years and this trend is expected to continue resulting in a fully competitive technology in 7-10 years [3]. Today, wind turbines on good wind sites can already compete with new combined heat and power plants (CMP). However, wind power would be currently fully competitive if health and environmental costs are calculated into the kWh-price for the different energy technologies [4].

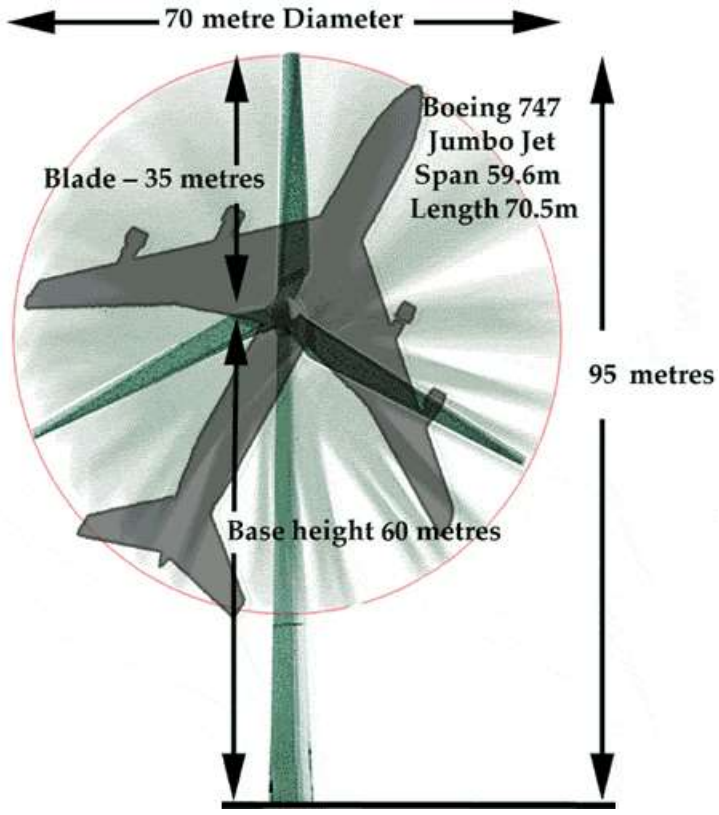


Fig. 1. 1.5 MW turbine's size compared to a 747 Jumbo Jet [5].

Typical utility scale wind turbines (1 MW rated power output and above) are of considerable sizes. Land based turbines typically range from 1 to 3 MW with tower heights from 50 to 100 m and rotor diameter from 60 to 120 m. Figure (1) shows that the size of 1.5 MW turbine is comparable [5] to a 747 Jumbo Jet. Offshore turbines are even larger with up to 5 MW+ and designs for up to 10 MW are in development.

In the wind turbine generators, the kinetic energy of the wind inflow is converted into rotational kinetic energy via the wind turbine rotor. This is typically achieved thanks to the aerodynamic lift via wind turbine blades mounted on a horizontal axis rotor, and fixed to a central rotor "hub" (Fig. 2). The wing shaped blades on the rotor actually harvest the energy in the wind stream.

The rotational kinetic energy of the generator shaft(s) is converted into electrical energy via generator magnets (permanent or electro) and conductors using the electromagnetic induction principles. Electrical energy is conditioned as necessary and put into the local electrical grid or stored in energy storage systems for later input to the grid.

The Egyptian reserves of fossil fuel (oil and gas) are questionable and there are some indicators that they may become scarce in the near future. A logical approach has been, therefore, recently

adopted by the Egyptian Government with ambitious plans to rely more and more on the wind energy. It is planned to add by 2020 new 8000-10,000 MW of electrical energy generated from wind to be doubled in the next decade. A new Egyptian company (SWEG) has already been established in 2009 to manufacture the wind turbines and others are expected to follow in the very near future.

2. WIND TURBINE (WT) DUCTILE IRON COMPONENTS

The increase in power and size has also resulted in the optimization of the structural materials used in the fabrication of the windmills. It became rapidly clear that lighter weight materials meeting the required mechanical performance would be needed. Ductile iron, which offers a 10% weight reduction compared to steel was then considered by the designers for many components. Figure (2) presents a schematic of a wind power unit with a gearbox. Gearless machines are also available and represent about 20% of the world market.

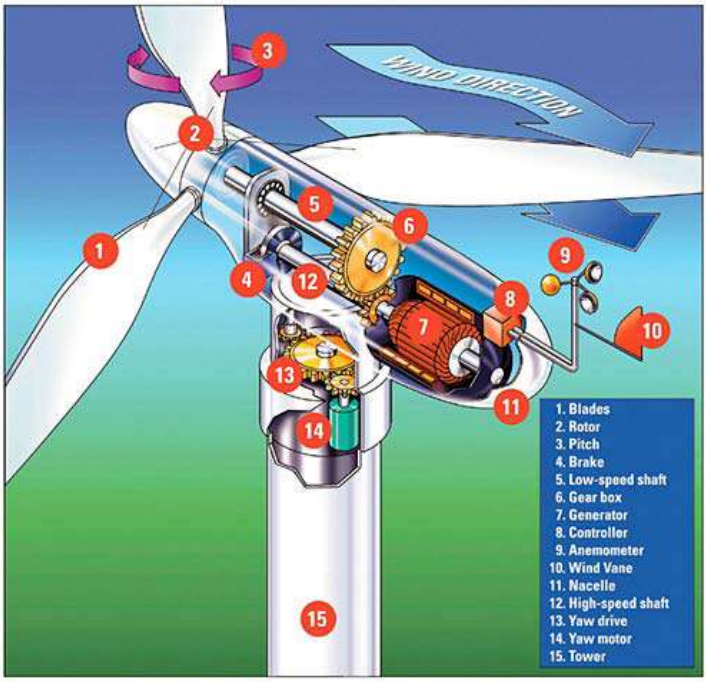


Fig. 2. Components of the wind turbine generator (WTG).

Ductile iron is a relatively new member of cast iron family, born in 1949 simultaneously in U.K. and US. It took 34 years before CMRDI could introduce the technology of ductile iron (DI) production to the Egyptian foundry industry, where it is currently a major part of the production of many Egyptian foundries, producing in total around 100,000 tons/year, i.e. more than 35% of the total casting production in Egypt. This alloy is produced from rather pure iron melt, treated with 0.04-0.06% magnesium, which will lead to the formation of spheroidal rather than lamellar graphite, typical of the conventional gray iron. Graphite spheroidization will result in dramatic increase in strength, ductility as well as toughness properties of cast iron, reaching those of steel; meanwhile, maintaining the well-known advantageous properties of cast iron, e.g. good machinability, higher thermal conductivity, thermal shock resistance as well as better vibration damping capacity. Ductile iron has found, and is still finding, more and more applications as a replacement for steel castings, forging and weldments.

More recently, a new member of the cast iron family, the austempered ductile iron (ADI) was born in the early seventies of the last century. Through simple heat treatment process of high quality ductile iron, superior strength (up to 1600 MPa) properties together with excellent wear resistance with good fatigue and machinability properties could be produced. The development of strength properties of cast iron over years is illustrated in Fig. (3), where it is shown that over the period 1949-1972 (which represents only 2% of the age of cast iron, its

strength could be doubled more than 6 times (from 250 to 1600 MPa). Figure (4) represents the excellent potentials for this very prospective material, ADI as it offers significant weight and cost savings compared to all other cast or forged alloys.

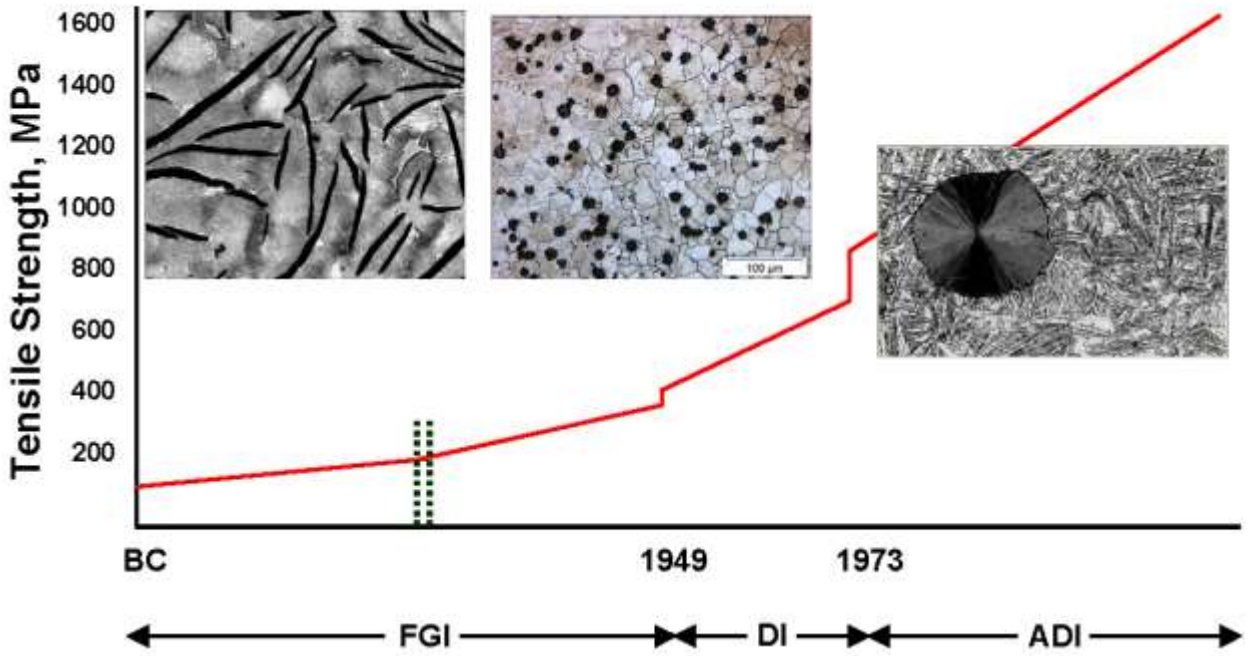
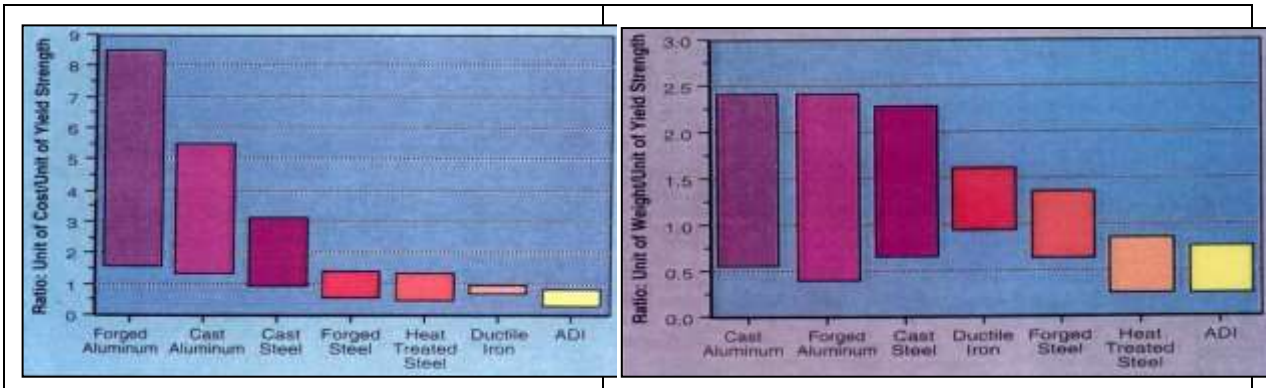


Fig. 3. Strength development of cast iron over years.



(a) (b)

Fig. 4. Comparison of the cost (a) and weight (b) per unit of yield strength for different materials [6].

Ductile iron made to German specification DIN 1693, Grade GGG 40.3 is the material of choice for many of the world major wind turbine manufacturers such as for the range of hubs and rotor housing castings. The need to ensure optimum, consistent and safe

performance of these units makes it imperative that only ductile castings of the highest integrity and in complete compliance with the specification can be accepted. The requirements for high impact properties in DI at low temperatures for the burgeoning wind energy market are part of the European Standard EN-GJS-400-18U-LT commonly referred to as GGG 40.3. This standard not only has the normal mechanical requirements for ferritic iron but also specifies V notched Charpy impact requirements at -20°C (-4°F) (Table 1). To meet low temperature impact properties the foundry must produce ferritic ductile iron components that need to be free of cell boundary phases such as phosphides and carbides, otherwise the impact properties will not be accepted.

Table 1. Typical ductile iron (DI) characteristics for windmills castings.

Test Coupons	**DI Grade [ISO 1083/ SREN 1563]**	**Charact. Casting Section, t/e [mm]**	**Tensile Strength MPa (min)**	**Yield Strength MPA (min)**	**Elongation, A, % (min)**	**Impact*, J**	
						+23°C [-//RT]	**-20°C [L/LT]**
Separately Cast [Y_{25}]	400-18 EN-GJS-400-18		400	250	18	14 (11)	12 (9)
Attached to Castings	400-18A EN-GIS-400-18U	t ≤ 30 30 < e < 60 60 < e < 200	400 390 370	250 250 240	18 15 12	14 (11) 12 (9)	12 (9) 10 (7)

Those wind power ductile iron castings are assembled and work on the top of a high tower and must endure low temperatures in the winter. Maintenance is very difficult and maintenance costs are very high as they often are installed in remote areas or offshore. In order to ensure safe operation for more than 20 years without maintenance, strict requirements for casting quality, mechanical properties and fatigue strength should be maintained.

Figure (5) lists the major Ductile Iron components utilized in the construction of wind power plants and the average weight of the parts per MW. Certain windmill designs contain significantly more Ductile Iron than others. For example, the nacelle frame may weigh up to 10 tons, which results in 19t of Ductile Iron castings in this particular 1 MW design. However, this ratio is usually not valid for large units (5 MW) for which bigger castings are required. All parts must meet the EN-GJS-400-18 LT specification, the impact toughness requirement being 12 J (8.8 ft-lb) (Charpy V-notch) at -20°C (-4°F).

As indicated in Fig. (6), the annual demand for ductile iron castings for wind turbine generators is expected to reach 450,000 t by the year 2015 [7].

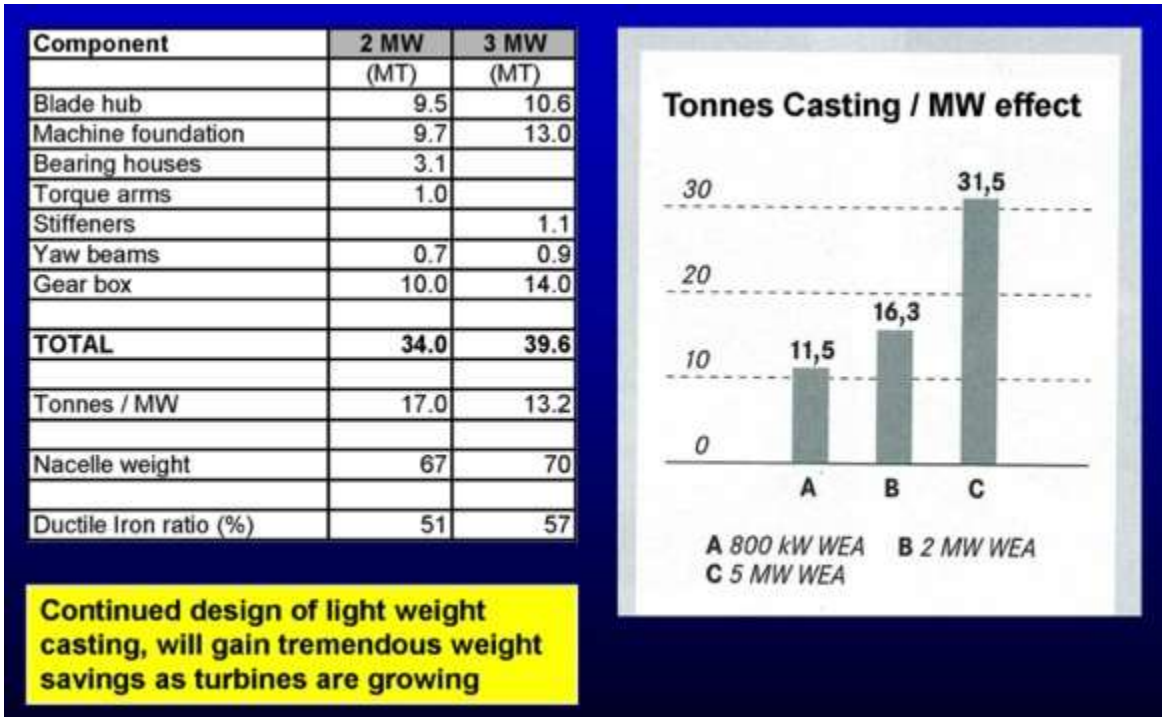


Fig. 5. Ductile iron wind turbine components.

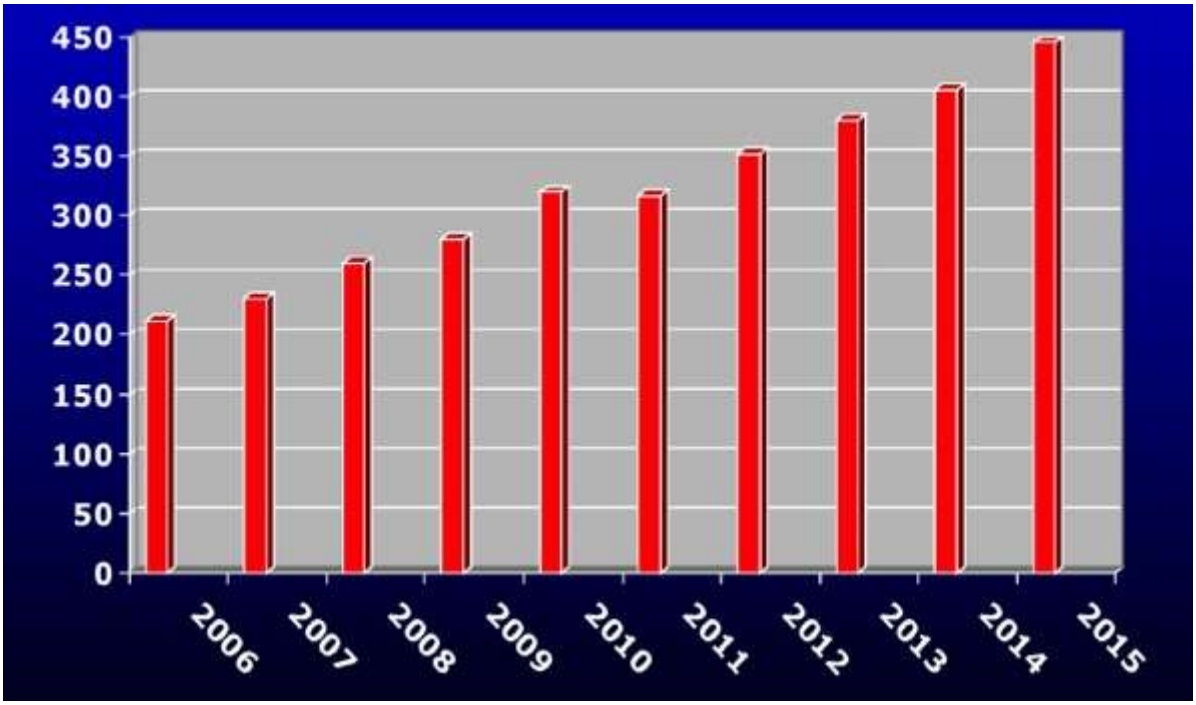
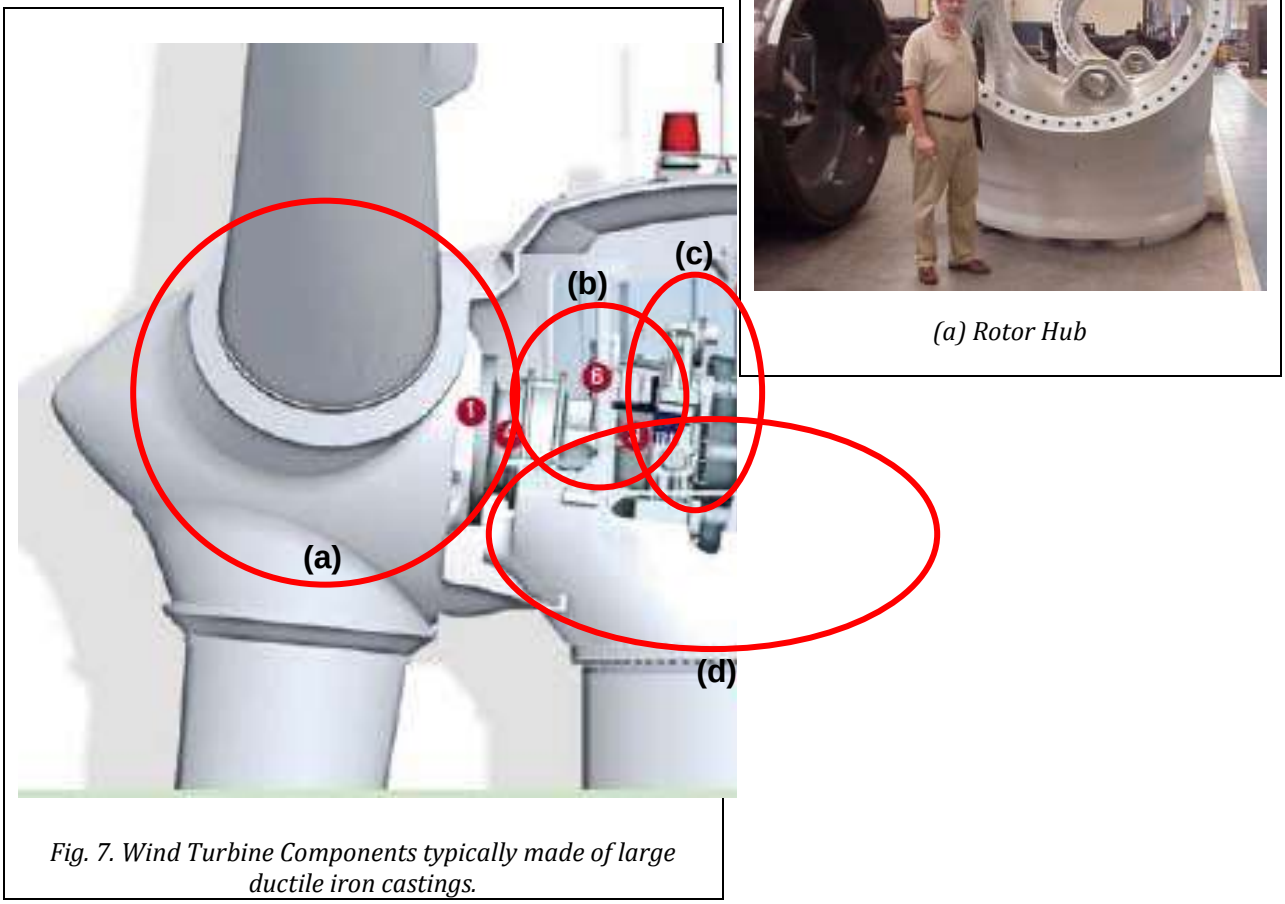


Fig. 6. Wind Turbine Generator (WTG) annual demand for ductile iron (1000 t)

The main ductile iron components (Fig. 7) of the wind turbine generators may be described in the following [5]:



(a) Rotor Hub

Fig. 7. Wind Turbine Components typically made of large ductile iron castings.

(a) Hubs: are the interface between blades and the main shaft, include features for blade pitch system and contain considerations for mounting hub enclosure components, e.g. spinner. For 1.65 MW wind turbine generator, which is expected to be the prevailing size in the Egyptian wind farms, the dimensions may reach 2800 mm OD and 2250 mm ID with up to 13 tons and maximum wall thickness of 200 mm. Hubs must meet the following operational conditions:

- adequate support/stiffness for pitch bearings and other pitch system components.
- all dynamic loads from blades, self loading, etc. for at least 20 years design life (gravitational, aerodynamic and system dynamic loads)
- extreme loading/survivability; as one single blade may load as large as 5000-6000 KN-m at the root for the 1.65 MW wind turbine generator, the hub should be, therefore, designed to avoid material yielding under all extreme load events
- single blade equivalent fatigue loads on the order of 2000 KN-m and 1E7 cycles for the same size wind turbine generator. Hubs, therefore, should be designed to assure

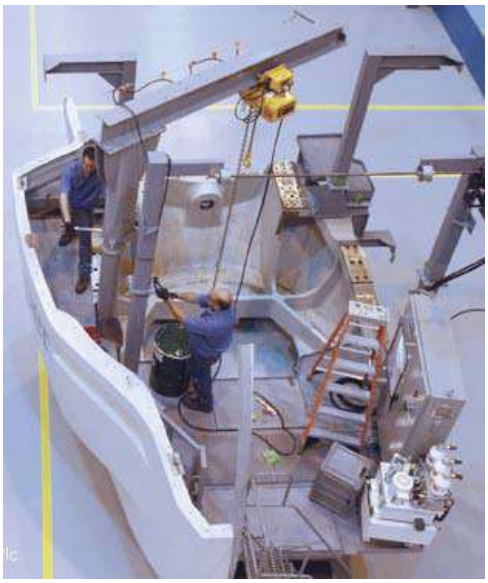
that fatigue crack initiation does not occur within design life, taking wide fatigue loading spectrum.

(b) Main Shaft Bearing Housings: represent the interface between the main shaft and gearbox and support structure and houses the large bearings supporting the main shaft. For 1.65 MW turbines, the main shaft bearing housing may reach 3800 mm OD and 650 mm ID with maximum wall thickness of 170 mm and around 5t weight. It must provide adequate support/stiffness for main shaft bearing as well as other drive train components. It must, as well, be capable of withstanding all dynamic loads from rotor through the main shaft for up to 30 years design a life loads as large as 6000 KN-m at hub centre for the 1.65 MW wind turbine generators are to be expected, and the housing should be designed to avoid material yielding under all extreme load events. Equivalent fatigue loads of the order of 2500-3000 KN-m at the hub centre and 1E9 cycles for 1.65 MW turbine generators are usually experienced and the housings should be designed to guarantee that fatigue crack initiation does not occur within design life considering these severe fatigue loading circumstances.

(b) Main Shaft Bearing Housing

(c) Gearbox Housings: represent the interface between main shaft housing and generator(s) as well as the support structure and houses gears, shafts, bearings, lubrication, etc. The housing size may reach 2.0 m tall, 3 m wide x 0.8 m deep for the 1.65 MW wind turbine generator and should provide adequate support/stiffness for gears and bearings. Its weight may be up to 10,000 kg and must be capable of reacting the same loading and fatigue life experienced by the hub and the main shaft bearing housing.

(c) Gearbox Housing



(d) Support Base

(d) Support Bases: are usually long and tub-like with large ribs/stiffeners with circular opening at the bottom for nacelle access and yaw system configuration. They have mounting feet for drive train interfacing and work platform, walkways, cranes, nacelle support structures, etc.

3. METALLURGICAL CONSIDERATIONS WITH THE PRODUCTION OF HEAVY DUCTILE IRON CASTINGS

Ductile cast iron is an important construction material within the cast iron family. Due to expansion of the windmill and the heavy automotive industry as well as the production of canisters for terminal storage of nuclear waste, the production of heavy section ductile iron castings is increasing. Future applications seem to require even larger wall-thicknesses. The demand for good mechanical properties will be even more pronounced in these castings. Spherical morphology of the precipitated graphite is the most important factor to achieve the required mechanical properties.

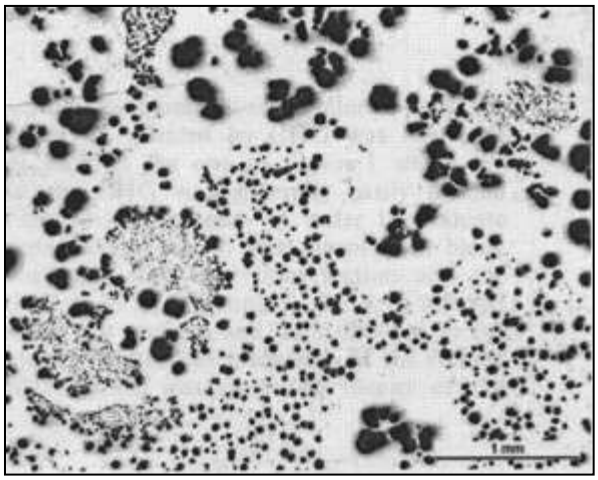


Fig. 8. Optical micrograph of a heavy-section SG cast iron block showing dendritelike ex-austenite with large nodules embedded in it, cells of CHG, and areas of usual SG microstructure.

The formation of degenerate graphite in heavy section ductile iron is influenced by chemical composition including elements

such as C, Si, Ce and other trace elements as well as production factors such as inoculation and pouring temperature. However, a key factor seems to be the long solidification time [8]. Several different graphite morphologies such as vermicular, spiky, coral, exploded and most importantly chunky graphite have been observed to form in the thermal center of heavy ductile iron sections during solidification [9]. The location of chunky graphite (Fig. 8) normally, but not exclusively, indicates the location of the thermal center of a casting [10]. Degenerate graphite morphologies (i.e. non-spherical morphology) in ductile iron leads to deterioration of mechanical properties.

The literature regarding chunky graphite often concludes that this degenerate graphite is caused by high purity charge materials and excess rare earth additions [10,11] in heavy section castings or at high carbon equivalents [11]. Attempts have been made to classify some significant alloying and trace elements according to its tendency to promote or alternatively counteract the formation of chunky graphite. Elements that promote chunky graphite formation include Ce, Ca, Ni, Si, Al and rare earths. Elements that counteract chunky graphite include As, Bi, B, Sb, Sn and Pb.

A foundry is often able to produce castings without chunky graphite by having a balanced composition of the elements in the two groups, lowering the carbon equivalent [10] and by using chills [12], thereby locally increasing the cooling effect of the mould. These guidelines can be considered as good rules of thumb. However, they do not always work since the formation theory of chunky graphite is still not fully understood. There have been many studies of chunky graphite but no generally accepted theory for its formation has yet been proposed.

There are disagreements weather chunky graphite forms early during the eutectic solidification or in the residual liquid during later stages of solidification. Different conclusions regarding the timing of chunky graphite formation during the solidification sequence have been drawn by different researchers [8,10,12-14].

The melt quality of heavy section ductile iron includes the melting and later treatment processes, primarily including such indexes as chemical composition, temperature, efficiency of inoculation and nodularization, tendency of graphite degeneration, etc., which determine the microstructure and mechanical properties of heavy section ductile iron castings.

Although enormous mass and the extended and complex solidification process of heavy section ductile iron are predisposing factors of graphite degeneration, the melt quality is an essential factor in its determination. To eliminate graphite degeneration and improve mechanical properties of heavy section ductile iron, it is necessary to evaluate melt quality and to predict graphite degeneration before the melt is poured into mold. Although many researchers have studied the mechanism and control methods of graphite degeneration in heavy section ductile iron [15] there is still no effective method to evaluate melt quality and to predict graphite degeneration before pouring.

The most recent review on the formation of chunky graphite (CHG) [13] presents some attempts to rationalize the experimental knowledge on CHG formation. As a matter of fact, it shows that many results reported about this phenomenon seem contradictory, e.g.,

i) importance of purity of the initial charge, particularly the Ce, Sb, Pb traces (Fig. 9)

ii) effect of pouring temperature

iii) timing of the formation of CHG during the solidification sequence

iv) effect of inoculation

In a more recent work, Lacaze and co-workers [16,17] comprehensively studied the effect of antimony and cerium on the eutectic reaction of heavy section spheroidal graphite castings (Fig. 9). The effect of post-inoculation of the molten iron before pouring on the formation of CHG seems to be rather controversial; Loper [18] reported that post-inoculation is beneficial to avoid CHG formation, whereas other more recent publications refer to the risk involved with post-inoculation on the formation of CHG [19].

Figure (10) illustrates the Root Cause Analysis (RCA) for the potential causes of chunky graphite formation. It is evident that almost every step of ductile iron manufacturing should be strictly controlled to avoid this detrimental graphite morphology [7].

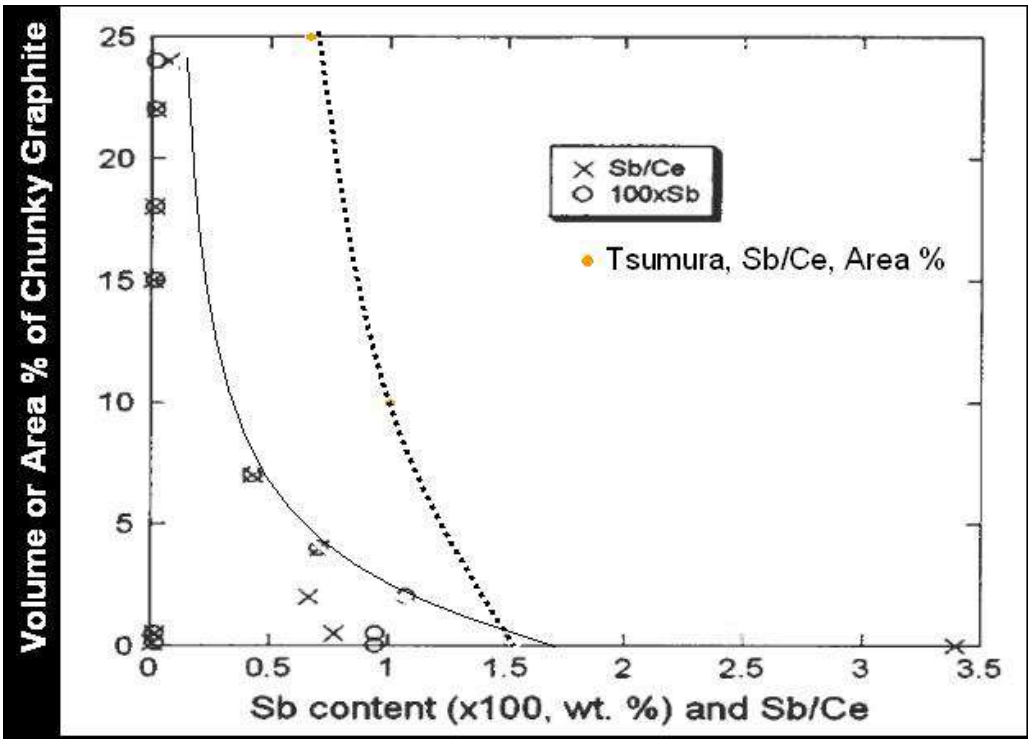


Fig. 9. Control of chunky graphite in heavy-section ductile irons by controlling Sb/Ce ratio through inoculation process.

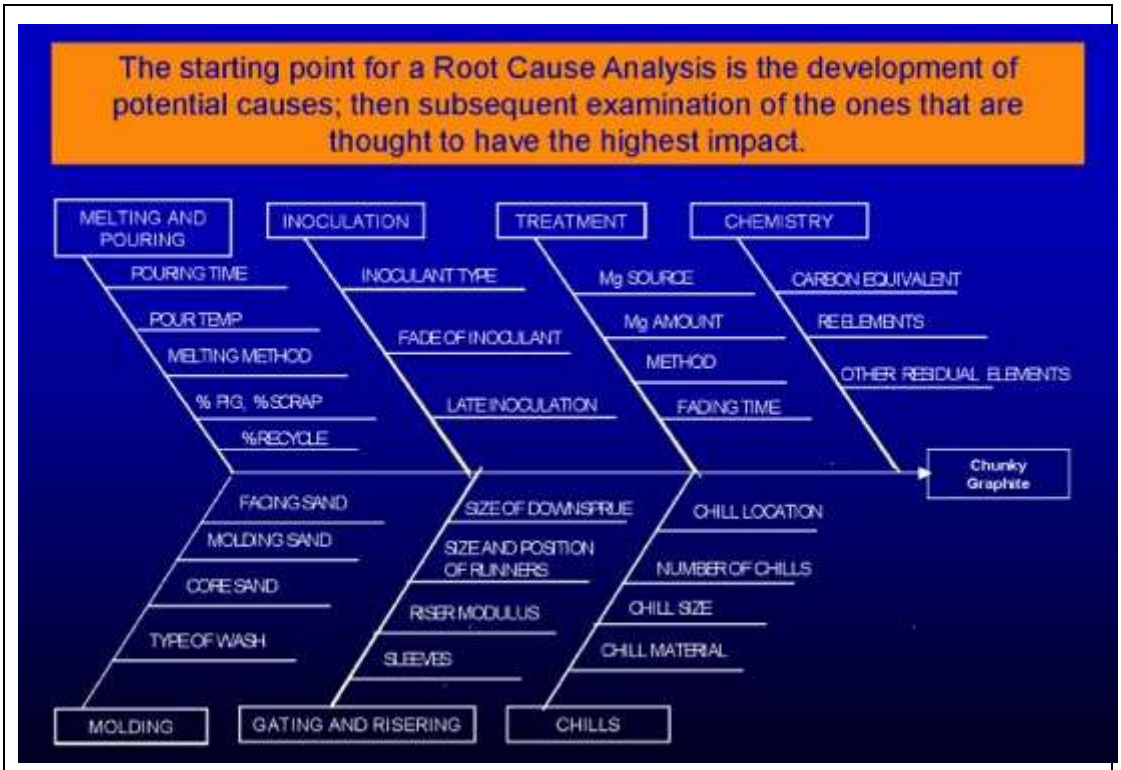


Fig. 10. Root cause analysis of the potential causes that may have the highest impact on chunky graphite formation [7].

4. THERMAL ANALYSIS AS A TOOL TO CONTROL MOLTEN METAL QUALITY

The main methods used in industrial practice to control the quality of the molten metal are indicated in Fig. 11 [20]

Thermal analysis is the process of determining the temperature at which a phase transformation takes place by observing aberrations, that heat content changes impose on the rate of temperature change of a sample. An example of thermal analysis is the cooling curve. The cooling curve is a temperature-time curve. Two main factors are influencing the final shape of the cooling curve, as follows:

- Heat transfer from mold to surroundings
- Phase transformations occurring in the sample (casting)

The information obtained from cooling curve analysis (CCA) can be used not only for the control of molten metal processing but also for the quantitative understanding of solidification phenomena. The type of information that can be obtained from CCA is summarized in Fig. 12 [20].

The standard equipment necessary consists of sand cup instrumented with a thermocouple connected to a microcomputer. The characteristic parameters of a typical cooling curve are shown in Fig. 13. Use of cooling curve analysis as a compositional control tool stems from

the relationships developed between distinguishable features of a cooling curve and the chemical composition of the melt.

As a main method of evaluation of melt iron quality in the foundry floor, the thermal analysis technique is used more and more widely due to its advantages of rapidness, flexibility and reliability. In the early studies, many researchers tried to establish the relationship between the characteristic temperatures on a thermal analysis cooling curve and the induces of the melt iron quality by using regression analysis or the artificial neural net work method, and some relations between them have been set up and used for the prediction of melt iron quality [20,21]. However, the regression relationship is always obtained under some special experimental or production conditions, so it has less sensivity to casting conditions and is difficult to adapt to various production conditions of different foundries. Also, it is impossible to evaluate melt quality and predict graphite degeneration of heavy section ductile iron.

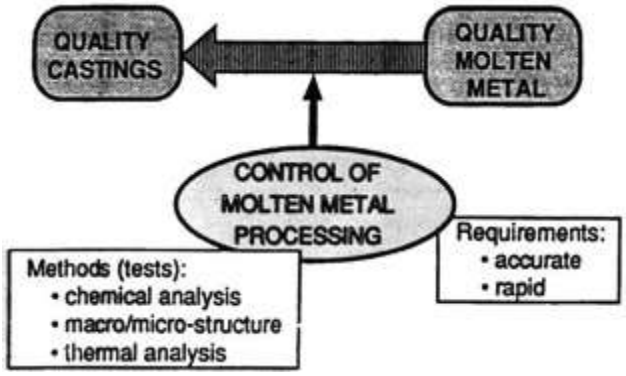


Fig. 11. Methods and requirements of control of molten metal processing.

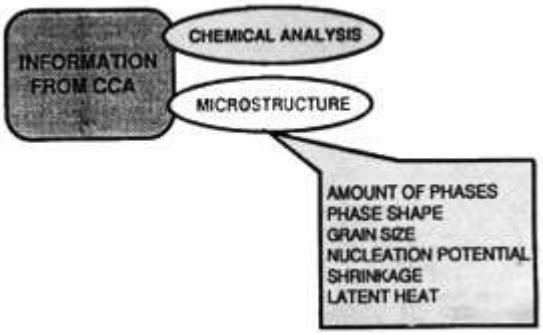


Fig. 12. Typical information that can be obtained through computer analysis of cooling curves.

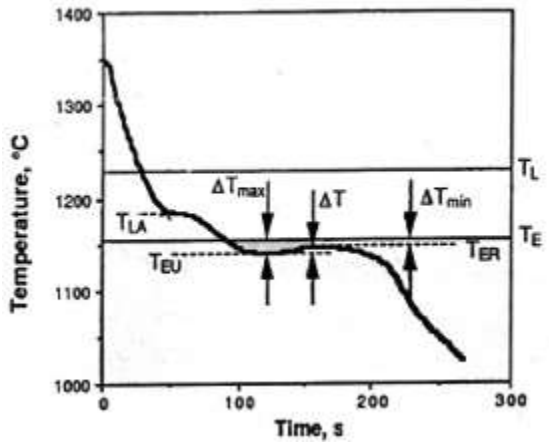


Fig. 13. Typical cooling curve for hypoeutectic SG iron with characteristic, notations:

- T_L = *liquidus temp.;*
- T_{UA} = *temp. of liquidus arrest;*
- T_{EU} = *temp. of eutectic undercooling;*
- ΔT_{max} = *maximum undercooling;*
- T_E = *equilibrium eutectic temp.;*
- ΔT = *recalescence;*
- T_{ER} = *temp. of eutectic recalescence;*
- ΔT_{min} = *minimum undercooling*

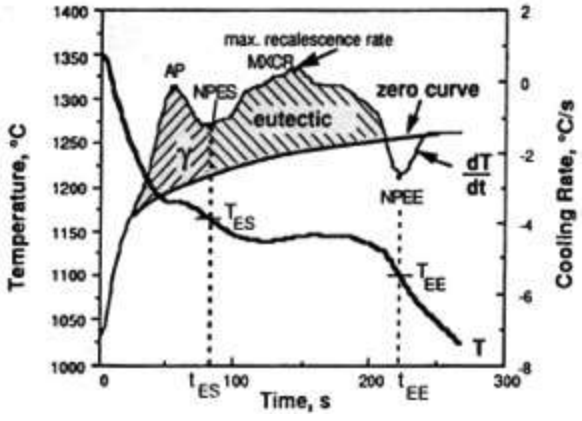


Fig. 14. Cooling curve, first derivative of the cooling curve and zero curve for a hypoeutectic SG cast iron.

Over the years, many attempts have been made to use traditional cooling curve analysis for the control of ductile iron production. Various studies have produced nodularity and nodule count predictor charts utilizing time and temperature information. Other investigators developed overlay comparators for microstructure determination based on the relative shape of cooling curves.

More rigorous thermal analysis techniques include differential thermal analysis, dilatometry, calorimetry and thermal conductivity. Differential thermal analysis (DTA) is highly sensitive to the temperature changes during a phase transformation. However, classic DTA sampling and equipment are not practical for the foundry floor.

To circumvent the inadequacy of DTA for foundry use, some investigators developed techniques that mathematically differentiated cooling curve data by means of analog and digital computers. These studies provided the impetus for Computer Aided Cooling Curve Analysis (CA-CCA), which uses a computer to simulate the neutral reference utilized in classical DTA. A typical example of a cooling curve and its first derivative is given in Fig. 14. The theoretical background of the method was discussed in the literature.

The first derivative of the cooling rate is, in fact, the evolution of cooling rate during solidification. Its interpretation allows us to obtain more information on the metal poured in the cup. Consequently, this technique can also reveal microstructural information that could not be obtained from standard metallographic techniques.

Recently, the computer-aided intelligence technique was introduced to recognize the thermal analysis cooling curves and to control the melt iron quality [22,23]. Also, experiment results indicated that, it was an effective means for evaluating the melt quality of iron melt and for predicting the microstructure of common castings. A typical example is illustrated in Fig. (15) [7].

WTG Ductile Iron - Advanced Thermal Analysis

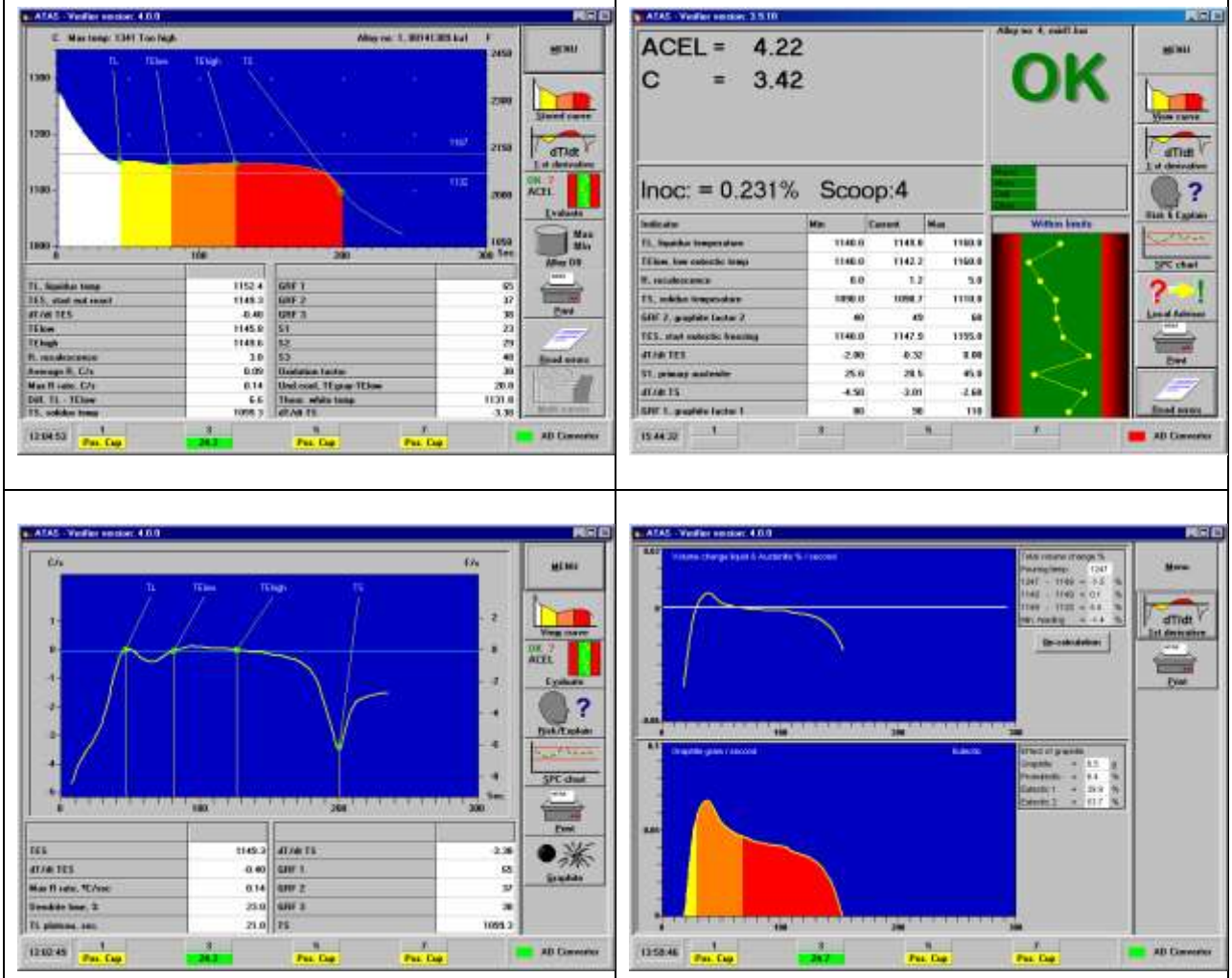


Fig. 15. An example of the application of advanced thermal analysis to predict the quality of molten metal used in the production of heavy ductile iron wind turbine casting.

5. ADI - THE FUTURE MATERIAL FOR WIND TURBINE GEAR MANUFACTURING

Although gearless wind turbines are now available and represent about 20% of the world market, gears still represent a vital component of the turbine machine, Fig. (16).

The production of gears and power train components is a vast industry, that is recently tackled by ADI. Carburized and nitrided steels still dominate this field and it is only recently that the SAE and ISO have produced standards that recognize the properties of ADI. ADI has significant advantages that are, as yet, unexpected and some of them, related to gear performance are reported in the following:

The production of gears and power train components is a vast industry that is still largely untapped by ADI. Carburized and nitrided steel dominate this field, and it is only recently that the SAE and ISO are producing standards that recognize the properties of ADI. ADI has significant advantages that are, as yet, unexpected and some of them, related to gear performance, are reported in the following:

Fig. 16. ADI components for large gearboxes, including wind turbines.

i) Bending Fatigue:

The machining of ductile iron produces compact, discontinuous chips that is 100% recyclable. When components are machined before austempering they can be subsequently ground, shot peened or fillet rolled to produce significant increase in surface compressive stresses and, thus, increased bending fatigue for gear applications.

Figure (17) shows a comparison of tooth root bending fatigue in various materials. This figure demonstrates that ADI is competitive with cast and through hardened steels, moreover, shot-peened ADI has improved fatigue strength that is comparable to gas-nitrided and case-carburized steels. Shot-peening can improve the allowable bending fatigue of carburized and hardened steels by 30%, while it increases the allowable bending fatigue of ADI by 75%.

ii) Contact fatigue

ADI leads itself to increased contact fatigue strength. Figures (18) and (19) compare the allowable contact stress behavior of ASTM Grade 2 and 5 (ASTM 1050-700-7 and 1600-1300-00). Contact fatigue properties of various grade of ADI are comparable to gas nitrided steels and competitive with carburized and hardened steel.

iii) Abrasion resistance

Good wear resistance is usually obtained in any material by ensuring a high hardness. Low austempering temperatures (235-250°C) produce hard ADI (~480-550 BHN) and such grades would be selected when good wear resistance is the main requirement. As the austempering temperature increases, the hardness decreases, resulting in more wear. However, the softer grades of ADI (typically 280-320 BHN) contain large amounts of retained austenite and this can work harden and/or transform to martensite when subjected to mechanical strain at the surface. This results in the wear resistance being significantly better than would be expected. This is illustrated by the results of abrasive and impact-erosion wear tests in Fig. 20. Although this effect is a disadvantage when machining, it can be very beneficial for certain ADI components since as the surface is worn away, it is continuously replaced by a freshly formed, hardened layer.

iv) Noise reduction

ADI can greatly reduce the noise found in gears made of other materials, ADI reduces the noise by over 2 db compared to carburized and hardened 8620 steel gears. The presence of graphite nodules in ADI creates a dampening effect that significantly reduces the vibration. Gears manufactured to lower AGMA classes could, therefore, be as quiet as those machined to more precise grades. A study made on a hypoid gear set showed an improvement in noise level when both the ring gear and pinion are made of ADI (Fig. 21).

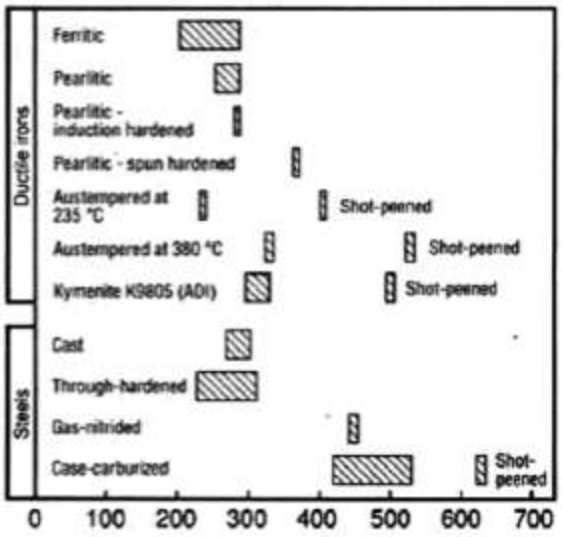


Fig. 17. Comparison of bending-fatigue strength of ADI with those of conventional ductile iron and steels used for gear applications [24].

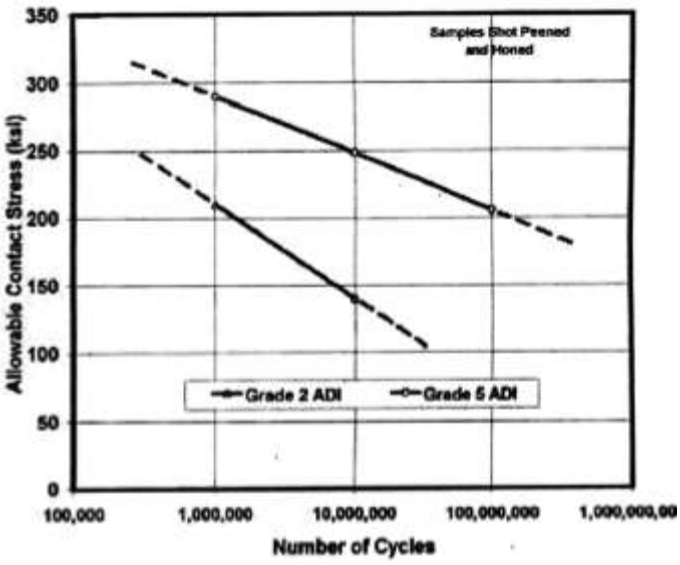


Fig. 18. Contact fatigue (90% confidence limits) from the ASME gear research institute [24].

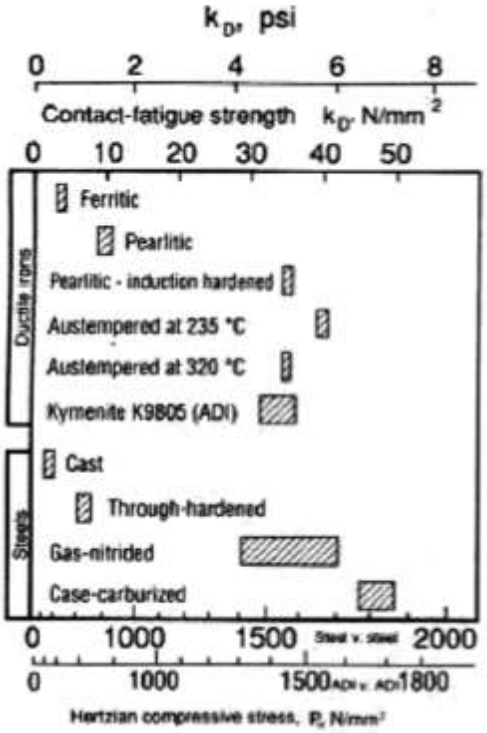


Fig. 19. Comparison of contact fatigue strengths of ADI with those of conventional ductile iron and steels used for gear applications [24].

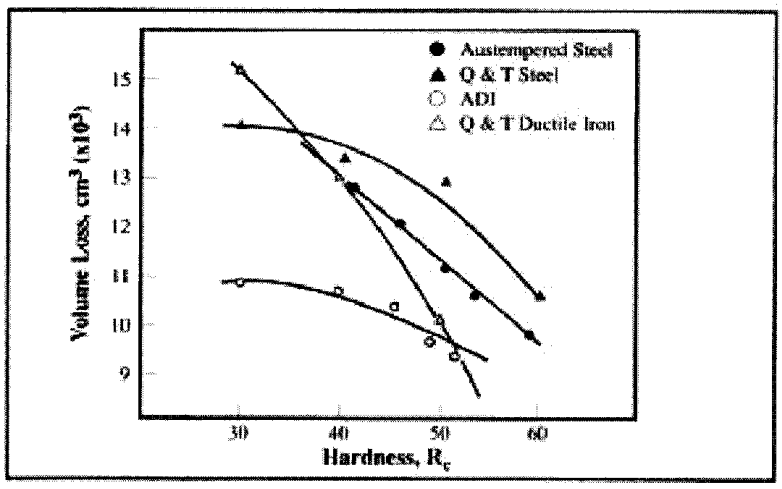


Fig. 20. Pin abrasion wear tests on ADI, ductile iron and two steels [25]

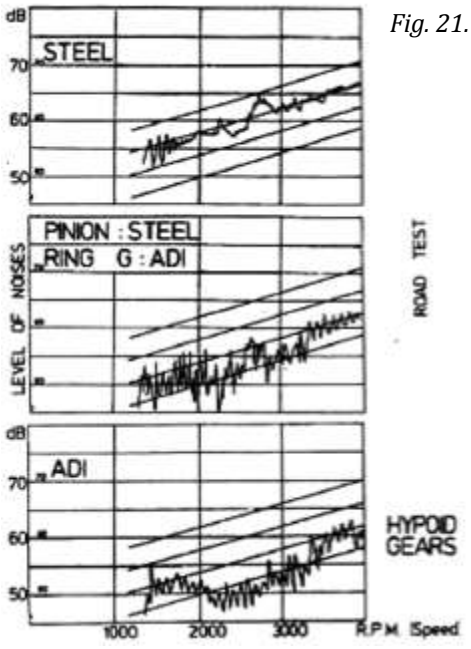


Fig. 21. Comparison of noise in hypoid gears during vehicle road tests, from the ASME gear research institute report A4001 [25].

As a result of the abovementioned advantages, ADI is now a recognized material for gear manufacturing.

ADI - The New Gear Material For WT Gearbox Components

Gear manufacturers may have been, for long time, dreaming about a new gear material, that is stronger per kg than aluminum, as wear resistant as caburized and nitrided steels, easier to machine than free machining steel, capable of producing gears for 20% less expensive than those now cut from forgings with bending and contact fatigue comparable to steels and yet with superior vibration and noise damping capacity, much ligher than steel. Such long awiated material has been conceived as a new "high tech" material and that magic combination of the above-mentioned properties was never expected to be associated with "cast iron". Cast irons and "high tech" scarcely have been uttered in the same breath ... at least until now. The common perception of cast iron is based on a weak and brittle material, with a maximum tensile strength of 250 MPa and virtually no ductility, suitable only for low-performance applications. In 1949, and with the development of ductile (or spheroidal graphite) irons we started to hear about cast irons with tensile strengths up to 600 MPa. This development opened the market for a wide range of commercial applications, but it was not suitable for most gear applications. Finally, the development of the ADI with its unique combination of properties, that gears manufactures have been dreaming of, proved that, that "high-tech" material was a new member of cast iron family.

Different grads of ADI, achieved through a variation in the austempering temperature and time, can create a range of properties in ADI applicable in the specific requirements of the component design as seen in Table (2).

Table 2. Mechanical properties specified in ASTM A897M-03

Grade	Tensile Strength, MPa	Yield Strength, MPa	Elongation, %	Unnotched Charpy Impact Energy, J	Typical Hardness (BHN)
1	900	650	9	100	269-341
2	1050	750	7	80	302-375
3	1200	850	4	60	341-444
4	1400	1100	2	35	388-477
5	1600	1300	1	20	402-512

Gearboxes reaching up to 10 tons are currently made from ductile iron. A wind turbine is one of the - if not the most - demanding applications for a gearbox. It requires a relatively small, compact, high-power density gear drive and electric generator to transmit fluctuating loads in a very demanding environment of deflections, high vibrations and temperature extremes.

Through the 1990s and into this century, wind turbine gearbox failures were beyond the slow development of the wind energy industry. It was obvious that a standard was needed, and the first draft of ANSI/AGMA/AWEA 6006-A03 to supersede AGMA 921-A97 was developed in March 2000. The Standard was approved by the AGMA in October 2003 and then approved as an American National Standard in January 2004.

The operation and loading of a wind turbine speed increasing gearbox is unlike most other gear applications, and the intent of the standard was, therefore, to describe the differences, with much of the information based on field experience. This standard can be viewed as a tool, whereby wind turbine and gearbox manufactures can communicate and understand each other's needs in developing a gearbox specification for wind turbine applications. The annexes present information discussion of various issues specific to wind turbine applications and gear design. A combined committee of AGMA and AWEA members representing wind turbine manufacturers,

operators, researchers and consultants, as well as gear, bearing and lubricant manufacturers, was responsible for the drafting and development of this standard.

The growth of ADI applications has either been accelerated or hindered by the knowledge or lack of:

- the metallurgy of both heavy section ductile iron and ADI,
- the mechanical properties of the material, specifically the dynamic properties, and
- the equipment to properly and cast effective process such components.

The lack of austempering facilities needed for large gearbox components used in wind turbines, was obviously beyond the delay of using ADI as a material for manufacturing those components. Over the last few years, heat treating equipment for the production of ADI has steadily advanced; increasing in both process capability and capacity. Currently, engineers routinely specify ADI components for gearbox components up to several tons. The leading ADI producers and developers Applied Processes of US ADI Treatment Ltd of UK have recently adopted new plans to heat treat large diameter gearbox parts for wind turbine systems [40]. To accommodate the load sizes and quantities expected, special solution was required and the world's biggest commercial, sealed quench austempering unit was designed. The renewable energy market has the potential to fully utilize those new capacities in manufacturing large size gears used in wind turbines. One design of wind turbine gearbox utilizes the 7 metric ton gear carrier is shown in Fig. (22). These new facilities will give the heat treaters a unique opportunity to work with engineers, buyers and the management of manufacturers to develop new, cost-effective conversions of large parts and consolidate weldments and assemblies into efficient, single-piece designs. This new capability means the engineering community is now freed from the overwhelming reliance on large-scale steel components in favor of less costly and lighter ADI components. Such components would most likely allow ductile iron producers to compete more readily with expensive, large steel forgings, weldments and assemblies.

Fig. 22. A photograph of a 7 metric ton ductile iron gear carrier for a wind turbine gerabox being transferred into the vestibule of the furnace as a

6. POTENTIALS FOR LOCAL WT CASTING PRODUCTION: THE ROLE OF CMRDI

For the 1.65 MW wind turbine generators, the largest expected casting to be required is about 15 tons of finished casting, which needs at least 25 tons of liquid metal to be cast into chemically bonded sand moulds. Currently, there is not any Egyptian foundry, that possesses such a melting capacity. It seems, therefore, that a new foundry will have to be established to cover the needs of the wind energy turbines to be set-up in Egypt in the coming years.

The Egyptian Govenmental plans intend to generate from 8-10 thousand MW from the wind energy up to 2020. As each one MW will require about 15-20 tons of large ductile iron castings, a total capacity of the new foundry will have to cover at least around 200,000 tons in the coming 8 years, i.e. ~25,000 tons/year of those castings. A rough preliminary techno-economic study indicates that this foundry project will be economically feasible. The productivity of this foundry will most probably be expanded in the next decade due to:

- it is planned to double the share of the wind power in the total country's power requirement in the next decade

- the wind power industry in the neighboring countries is very promising; the first Egyptian wind energy generation company has already been contracted to establish some projects in other Arab countries.

The new foundry project will cover the following production stages:

- melting
- molding
- machining
- heat-treatment (only for the ADI components)
- coating

The total investment required is estimated to be around 10 million Euros, at least 50% of the investment goes to the machining shop, with its rather large facilities. Currently, a good part of these facilities could be locally made available, which considerably reduces the first investment needed to start the wind mill casting industry in Egypt.

As the rejection of a heavy 15-20 tons castings will involve tremendous losses to the producing foundry, it is of vital importance to concentrate on developing a modified thermal analysis technique to predict the structure and properties of the casting before pouring the molten metal into the moulds, thus avoiding production of castings that will be later rejected. Such technique will be based on the design of special ductile iron specimens for thermal analysis solidified under condition resembling those prevailing in the actual heavy section castings. The resulting thermal analysis (cooling curves will be used to predict the formation of undesired microstructures of the casting before pouring, so that any correction procedure of the molten metal composition could be carried out in CMRDI, with its long history in R&D in the field of ductile iron and technology transfer of ductile iron important and strategic products to the Egyptian industry, can certainly play a major role in introducing the casting technology of WT components to the local market. Two R&D projects have been prepared and submitted to the STDF programs of the Egyptian Academy of Scientific Research:

- **Project 1: Quality Prediction of Molten Iron Used for the Casting of Heavy WT Ductile Iron Castings.**

The objectives of this project is to study the metallurgical parameters controlling the structure and properties of heavy ductile iron castings used in WT and to develop a reliable thermal analysis technique to predict the formation of degenerate graphite formation before casting. The obtained results of the project will be prepared as a "Technological Package" to be available for any local foundry preparing to start production of these castings. This project has been submitted to the STDF program and still waiting for final decision for financing.

- **Project 2:** aims at introduction of advanced austempered ductile iron (ADI) technologies to the Egyptian Industry and create awareness of the capabilities and unique properties of ADI among the engineering community in Egypt. The project has already been contracted for funding in the framework of the German-Egyptian Research Fund (GERF).

The cumulative expertise of CMRDI together with its German counterpart, IWM-Freiburg, will contribute to the development of ADI production and explore new potentials for its application in Egyptian industries, one of them will be certainly gears used in WT generators.

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Energy Efficient and Low Cost Atmospheric Water Generator

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***Abstract* — The world's most essential natural resource is water, but only 3% of all water is fresh water fit for drinking purposes. According to the latest surveys, the global consumption of water increases to the double every 20 years. Furthermore in Egypt many areas with million people have limited or no access to clean fresh drinking water. Many foundations are working hard in order to provide solutions to produce clean water for people have no access to it, to face coming water shortage problems.**
Our objective is to provide a solution for remote places that has no access to clean water, by introducing energy efficient, low cost and environment friendly atmospheric water generator (AWG).

Index Terms* — *Atmospheric water generator (AWG), Humidity, dew point, Water shortage, atmospheric water vapour processor, Environmental friendly AWG.

INTRODUCTION

Atmospheric water generators (AWG), are devices that can extract water from air. Water vapor in the air is condensed by cooling the air below certain point. AWGs are useful where pure drinking water is difficult or impossible to obtain, because there is almost always a small amount of water in the air. AWGs use refrigeration technology to 'turn air into water', producing potable water by condensing water vapour from the surrounding air.

The machines are typically promoted as a replacement for a water cooler, and accompanied by claims that the product is an environmentally responsible choice.

The internal mechanism is similar to a room dehumidifier, but with the addition that the water collected is treated to potable water standards (methods of treatment vary) and chilled for drinking purposes. These machines are similar in size and external design to a water cooler and primarily require humid air and electricity to operate.

The extraction of atmospheric water may not be completely free of cost, because significant input of energy is required to drive some AWG processes. Certain traditional AWG methods are completely passive, relying on natural temperature changes, and requiring no external energy source. Yields of water at a reduced (but non-zero) energy cost.

Atmospheric water generation can be considered as new technology which was first patented in 1992 [1].

Mass production of AWG units appeared for the first time in 2004 [2]. The term "atmospheric water vapour processor" was the most common name; but nowadays the term "atmospheric water generator" is now used by all companies in the market.

Bottled water is the fastest growing market in worldwide. Growth in this market has been accompanied by an increase in concerns about the environmental impact of bottled water. This focus on the environmental impact of bottled water has created a new marketing competition as all companies in the market promote themselves as environmentally friendly.

AWG [3] products are always compared to bottled water coolers which provide mineral drinking water in bulk quantities (typically 19L in Egypt local market) that always sold in polycarbonate returnable bottles. This product was described as "the most environmentally friendly water Source" [4]. Previous studies support this claim showing that bottled water has a lower environmental impact than most

other commercial water products [5] and that bulk bottled water as used in water coolers has a lower environmental impact than other refrigerated bottled water options [6]. However, the environmental impact of water from water coolers is over 100 times that of tap water. This leads us to find another way to have bottled water with lower environmental impact with lower energy cost and pure filtered water, and that was the first step to go forward in atmospheric water generators.

In AASTMT we decided to make a local atmospheric water generator with a very competitive

price that can give a better performance, with low cost, low energy consumption and to be an environmental friendly product.

MECHANICAL DESIGN

In AAST workshops and Laboratories we made two versions of AWG machines and in each time we improve the performance to get the best water quality with low energy consumption.

Three basic requirements are taken into consideration while designing the AWG machine

Potability of water
Water produced by the design must conform to the World Health Organization (WHO) drinking water quality standards. The first requirement is that the water produced is safe to drink. The World Health Organization (WHO) spends significant time working globally to keep people safe from disease.

Simplicity of Use
The second requirement is that the design is simple for people with limited technical experience to use. The interface is designed to have approximately the same complexity level as standard household appliances such as stoves, dishwashers, and washing machines.

Safety
Design must not pose a hazard to users at any point during its normal operation. This third requirement is similar to the first in that it seeks to protect the end users and society in general; however, this requirement focuses on ensuring safety across all aspects of operating the system.

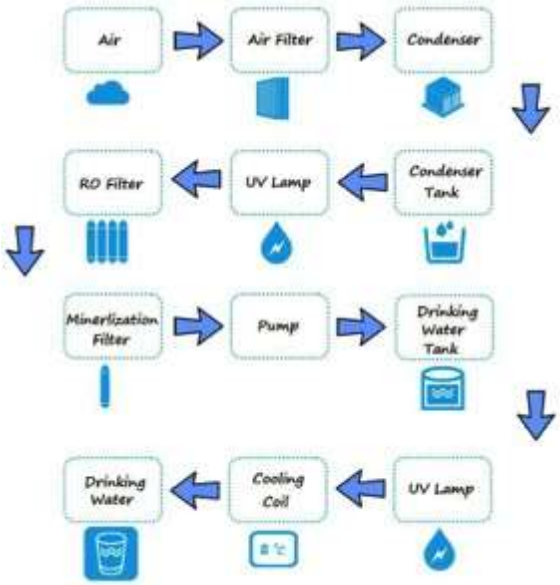

Figure (1): AWG Process

The basic design is based on the following block diagram:

As shown in figure (1), the process starts with a certain amount of humid air filtered using electrostatic filter then condensed using aluminum condenser coated with electrostatic paint to prevent any negative side effects on the resultant water. The condensed water is stored on a tank supplied with UV lamp to kill the bacteria on the internal walls of the tank. RO filter with a pump filter the condensed water then pump it to the drinking tank which is provided with cooling coil to maintain the water at 8 ºC.

When starting the design, we developed several objectives that the design will meet:

Flexibility in Power Source - The design should be able to utilize a variety of power sources, including (but not limited to) solar, and the traditional power grid.
30 Liters of Water Production per Day - The design should produce at least one liter of drinkable water per day.
Maximize Efficiency - The design should maximize the water produced per unit energy.
Minimize Cost - The design should minimize the cost per unit water production for both capital cost and production cost.

To meet the specifications of the WHO for drinking water, we used RO filter that has 7 stages (mentioned the recommended time for use of each filter):

(PP) Pre Filter - Filtration accuracy: 10um (6- 9months).
It can remove rust, hair, sand, clay, colloid, floating substances and part of harmful organic matters, which are bigger than 10um by precipitation filtration efficiently.

(UDF) Granular activated carbon - Filtration accuracy: 5um (6-9months)
It can absorb odor or color, some residual chlorine, red worms, pesticides, methane Organic chemicals, unpleasant taste as well as heavy metal particles.

(CTO) Extruded block activated carbon - Filtration accuracy: 1um (6-9months)
It can remove odor or color, some residual chlorine, pesticides, organic chemicals, unpleasant taste, floating substances as well as heavy metal particles further.

(RO) Reverse osmosis membrane - Filtration accuracy: 0.0001um (24 months)
Absolutely does it can remove bacteria (0.4-1.0um), virus (0.02-0.40um) heavy metal harmful ion, dissolved salts some organic chemicals, and remains water molecule dissolved oxygen.

(PGA) Post granular activated carbon (12 months)
It can adjust water PH value, remove unpleasant tasty, odor or color, residual impurities and make water taste better and healthier.

Mineral Ball Filter
Adds mineral back to water

The External mechanical structure of the AWG is shown in figure (2). The design is simple, lightweight, simple user interface, portable and modern design.

Figure (2): External Mechanical Structure

The final manufactured product is shown in figure (3). The used for manufacturing the machine is Etalbond which is a technologically advanced product whose unique features facilitate creative architectural design. Curved and flat surfaces in many colors can be made.

Figure (3): Final AWG Product

CONTROL AND SOFTWARE DESIGN

The control and software was designed to apply our algorithm which improve the performance with minimum power consumption.

Figure (4) and figure (5) show the main control circuit layout and loads control board respectively.

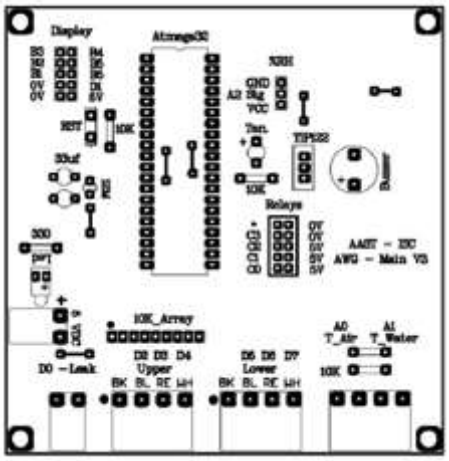

Figure (4): Main Control Board

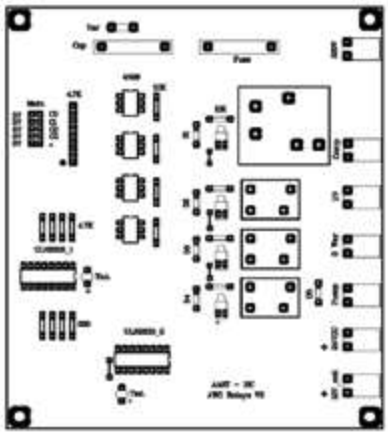

Figure (5): Loads Control Board

The main control features achieved by the AWG control system:

Display of Air Humidity, Air temperature and water temperature.
Display of condensed water level (lower tank) and cold water level (upper tank). Each is 3 levels.
A button for requesting cup of water.
Water leakage Alarm.
Level sensors failure alarms with full emergency stop.
Stopping the operation at humidity less than 20%. And continue back when raised to 30%.
Maintaining the water temperature between 8 – 10 ºC
Once the machines' tanks are totally full (full condition), the machine stops till the water temperature exceeds the limit.
The machine resumes working after the full condition if the lower tank (condensed water) is decreased by one level but this is not immediately but after 3 mins to make sure the compressor will take a suitable time to neutralize the pressure inside it.
The machine starts operation after 3 mins from power up state, this to avoid sudden on and off case of the compressor which reduce the performance and life time of the compressor.

PERFORMANCE MEASUREMENT

The performance of the AWG measured by two main parameters which are the production capacity (L/day) and the energy consumption (KWh/day). Table (1) shows different results depending on the air humidity (RH%).

Humidity (RH%)	Production Capacity (L/Day)	Energy Consumption
30	8	0.6
40	10	0.9
50	15	1.3
60	24	1.5
70	30	1.8
80	45	2
90	60	2.3

Table (1): Humidity vs. production capacity and energy consumption

From table (1) we can notice a great reduction in the energy consumption with the increase of the water production capacity which leads to a significant improvement in the AWG performance compared to other products in the international market.

Comparing our AWG with most of the common products in the market, they can produce 18L/day at 50% humidity and consuming about 5.5KWh/day which is too much higher than our product.

CONCLUSION

Many approaches have been introduced to enhance atmospheric water generator performance and to enhance quality of water.

However, some problems are still considered obstacles towards the perfect solution. Energy consumption is a great point of research. Our contribution is using energy management operations algorithm in order to decrease energy consumption nearly to 1.8 KWh/Day at 70% humidity, which permits it to be energy efficient and also to enable us to build a sustainable system that will operate on solar energy. Furthermore the concept has been modeled into different forms to serve different applications. It can be a standalone system for aims of production of clean water for drinking purposes and also it can be complementary system attached to air conditioners in order to utilize the condensed wasted water for non-drinking purposes.

By applying this method for water generation in Egypt, we can face possible shortage of water due to Grand Ethiopian Renaissance Dam, avoid diseases resulted of low quality water delivered at remote areas and by working on this technology we can overcome the possible global water shortage.

FUTURE WORK

The great reduction in energy consumption of the 30 L/day model makes it promising to add new models with solar panels to remove the running cost of electricity which will make the machine portable and can be operated under any condition especially in these zones with no infrastructure in Egypt and in Arab countries.

Larger capacity machines are our target in the next step to supply about 1000 liters/day which would represent a sustainable supply of water using solar energy.

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Networked, Anti-failure and Cost Efficient Neonatal Incubator Model

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***Abstract* — Medical technology has greatly advanced in the recent years, solving problems that faces patients, facilitates doctors' missions and widely produces highly advanced medical devices. Even though developing countries can't make benefit of upcoming technologies due to low economy conditions compared to developed countries, One of the most important medical devices is a neonatal incubator, which is greatly needed in every hospital to treat premature babies. So to fulfill the needs of low budget hospitals, this may result in greatly poor designed neonatal incubators causing failure in infants' survival. The purpose of this project is to produce a cost efficient, high performance and anti-failure solution. We aim at this solution to reach efficient power consumption model in order to enhance operation using battery backup systems. In addition, our model is easy to operate and the staff finds the incubator simple to use and no need for prior special training.**

Index Terms* — *Anti-failure, Cost efficient, Neonatal Incubator, Neonatal hypothermia, Thermal regulation.

INTRODUCTION

Neonatal Incubator main role is temperature regulation for hypothermia treatment. Hypothermia is defined as a core body temperature of 36.0 ºC – 36.4 ºC, moderate Hypothermia as 35.9 ºC – 32.0 ºC, and Severe Hypothermia as less than 32.0 ºC .Reducing heat losses in the first few days of neonates life has been a great effect to improve survival long time ago . So the main way of care is to maintain the neonates in neutral thermal environment which ensures minimal metabolic activity and also oxygen consumption are required to maintain body temperature. Remedies are used to be skin-to-skin contact with mothers,
radiation heaters, or using incubators [4].
Incubators are designed to decrease heat losses by radiation, convection, conduction and evaporation. Its processes start by forcing air circulation system of the incubator in order to permit stable temperature control, reliable heat regulation, uniform heat distribution, humidification, and oxygen concentration control. One of the major problems that faces neonates and may cause great loss in infants' health and lives is the chronic shortage of neonatal incubators due to high cost of these important devices especially in developing countries. High grade basic functionality incubator can reach 30,000 £, which is dramatically high, this leads the developing countries to deal with lower grades which it can only afford, but, it also introduces a risk for neonates lives .

Low cost neonatal incubator introduces many risks including bad design or failure of thermal regulation system, Further more the failure of the control which may lead to system collapse. We introduce a complete automated self healing system on control unit failure, also continuous automated system modules functionality and performance checking. Manual control through a networked system will also be added. Finally the neonatal incubator can produce an hourly report for baby health conditions.

The production of Egyptian neonatal incubators with high performance, safe operation and equipped with all options with low cost will greatly help the society, in addition production of upgraded capabilities that may enhance already available incubators instead of replacing them. New control architecture and upgraded software are designed to fit available incubators in the Egyptian market and hospitals.
This system model of the incubator aims to introduce a high performance Hypothermia treatment for infants and a complete safe operation to maintain their health and prevents risks that may occur in any incubator in order to save babies lives. Introducing this solution in Egypt can dramatically help the society needs and gives a solution for the low budget hospitals at lower costs than exporting the technology which they can't afford, so we can prevent annual 100,000 infants' deaths.

INCUBATOR MECHANICAL DESIGN

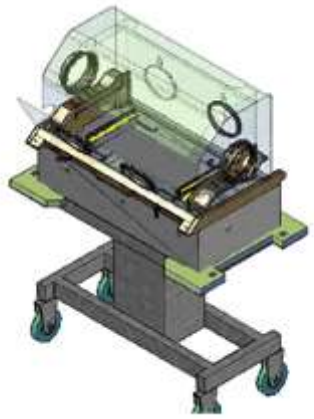

Figure (1): Implemented mechanical design of the incubator

This incubator design has been chosen to apply our work, because it is the most common design available in Egyptian hospitals. Our vision is to improve the design in order to introduce a high performance system, produce upgraded design to enhance its operations, and also launch a new reliable, anti-failure and safe design.

In this design the baby hood is made up of doubled layer acrylic walls, Air inlet and outlet as shown in figure [1]. The results are shown on this setup is as follows:

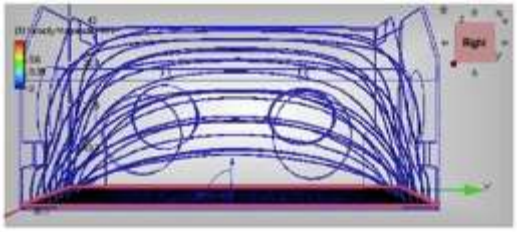

Figure (2): Air flow inside the incubator

The incubator design clearly affects the air flow structure where air flow enters the incubator at velocity of maximum 1m/s, as shown in figure (2) the air flow is uniform and covers the most of the incubator except the low part at the mattress and below. Based on the results from computational fluid dynamics, it was found that fluid particles moved in very regular paths, which is really important in order to prevent the increase in body heat loss that may cause unbalances in body heat storage and threatens the premature neonates' lives [2].

Air flow is one of the parameters that permit a good or bad heat distribution in baby incubators. Results based on CFD simulations have been shown in the following figures (3&4).

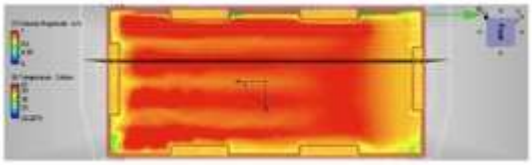

Figure (3): Temperature distribution inside the incubator - Front view

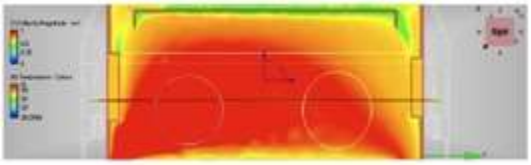

Figure (4): Temperature distribution inside the incubator - Right view

The used simulation setup is:

The room temperature is 27 ºC.
Air temperature at inlet is 41 ºC.
Air temperature at outlet is 38 ºC.
Air velocity maximum is 1 m/s at inlet.
Heat losses due to radiation are considered. 6.
Volume: 121597 cm^3.

In figure (4), results from simulation showed the higher temperature is found at the head and gradually decreases at the neonate's chest, then increases a little more at the end of the mattress. Lower temperature is found to be at the lower part of the hood at the mattress. The low temperature at this area is due to the lack of air circulation in this part as shown in figure (2), and significantly will take a long time to settle the required temperature; consequently this will lead to neonate's heat loss due to conduction and may exaggerate the premature neonate's conditions[9][10][11][12].

In figure (3), longitudinal areas have high temperature and others with low temperature that will eventually make every body part of the baby exposed to different temperatures. It is important to equally distribute the air temperature that will surround the baby. Also unequal distribution of temperature may lead to faulty indication using the feedback sensors which will consequently affect the control decisions.

Some modifications should be added to the design of the air inlet to eliminate the longitudinal temperature variation, and also to enhance air circulation in the

area of the mattress and surrounding the baby.

Control Architecture design

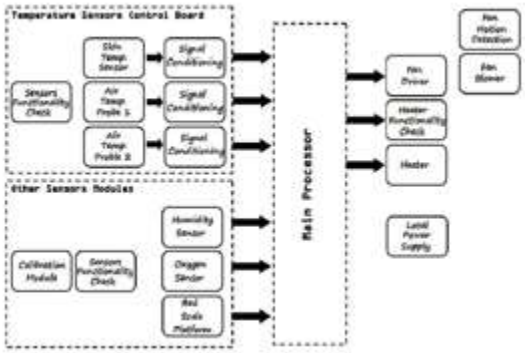

Figure (5): Conventional control architecture

Figure (5) shows a conventional control of a closed loop system is. The process in neonatal incubators goes as follows:

The doctor diagnoses the premature baby and inputs suitable parameters.
The parameters to be adjusted are temperature mode, temperature values and humidity values.
The system has 3 temperature sensors probes, one to monitor baby's skin temperature, and the other two to monitor the incubator temperature.
Feedback from humidity and oxygen sensors are sent to main display to indicate their levels.

Many problems face low cost incubators in developing countries and consequently threaten neonatal lives. Unreliability due to modules failure is considered the main issue in the low cost incubators.

Failures also can be control unit failure, sensor failure or thermal regulation system failure. Solutions that the study introduces to low cost devices and enhance its operations include:

Adding self healing capability
Handling sensor failure issues
Separate analog alarming system
Networked system

Adding self healing capability

The system checks for failures and faults to continually monitor its health. Then, after a system diagnoses its malfunctioning, certain tactic will be applied to maintain the normal functionality of the

system. The new self healing capability is implemented with least duplication that will mainly not affect the cost; it is presented in an additional control unit that only supervises the whole systems' functions and processes and on malfunctioning, the control architecture is designed to let the supervisor access the control on the system and excludes the failed. Tactic starts by computations between the components of the system, coordination between components and configuration — in which the tactic decides how the components will react to the new strategy.

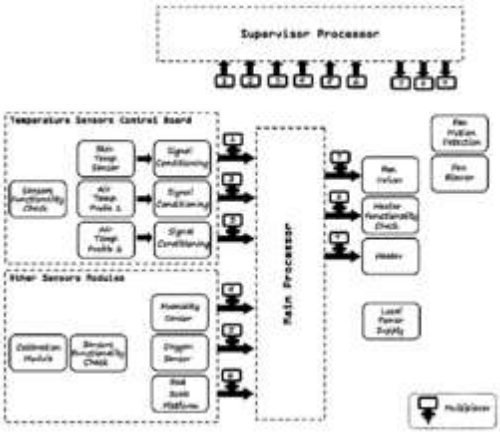

Figure (6): Modified self healing control architecture

The Supervisor processor for the system healthiness or unhealthiness has a complete access to all loads through 8- bit multiplexer unit as shown in figure [5].

Handling sensor failure issues

On sensor failure, a strategy will be launched to enable the system to operate as a healthy one with no duplication.

There are some cases of failure listed below:

Air temperature sensor probe failure
The system contains 3 air temperature sensor probes, for convection, conduction and radiation heat losses, in order to maintain an accurate thermal regulation process, but, in emergency cases of sensor failure, if radiation sensor probe failed, it can be neglected and a system can perform perfectly without any effects on thermal regulation due to the double layered acrylic wall, that makes heat losses due to radiation negligible. So on failure of any sensor, priority should be for convection sensors, and if convection

sensor failed, conduction or radiation sensors can act instead of the failed unit.

Skin temperature sensor probe failure
The system contains 1 skin temperature sensor, this sensor is the most important one, and any failure in this unit can cause risks to neonatal lives. The strategy dictates that on this failure any of conduction or radiation sensors can operate instead.

Humidity Sensor failure
On humidity sensor failure, the system is transformed from a humidity control closed loop system to an open loop system to keep the humidity level in the suitable normal range.

Separate analog alarming system

Analog alarming system is added to the digital control in order to eliminate any chances of failure.

Networked system

The system is equipped to work in a networked system, in order to enable remote supervision and control from a central unit. The incubator can generate a report about the baby conditions and through its connection to the central unit can create profiles for the baby. Software is developed to monitor the incubators on the network, to compare their performance and to state its condition periodically.

Conclusion

Incubators in Egypt face many problems, so a complete system analysis has been done, and showed unsatisfying results which greatly violates the guidelines concerning neonatal health. Our work greatly improved the system reliability, robustness and safety without adding to the cost. Adding humidity and oxygen monitoring will help doctors accurately diagnoses the baby condition. Building upgraded control of the same structure of the baby incubators already available, will make it more practical to have benefit of the incubators in hospitals instead of replacing them. In addition upgrading software will dramatically enhance the performance.

III. Future Work

Neonatal incubator can be greatly enhanced in terms of performance and options that can facilitate the doctors' work and guarantees babies good health and lives. Adding neural networks to the system control will greatly affect its performance, in addition a diagnostics module depending on calibrations and creating a profile for the baby will make the incubator more intelligent in order to eliminate human faults, and also it will have an enhanced behavior if more parameters have been taken in to consideration to deal with different hypothermia conditions. Furthermore transforming the neonatal incubators network to a wireless sensor network will make it easier in establishing this system.

Concerning the mechanical design, some modifications are being tested to enhance air flow and temperature distribution inside the incubator.

	Incubators in Egyptian Market	**Incubators in European Market**	**The developed incubator**
Robustness	unguaranteed	✓	✓
Safety	unguaranteed	✓	✓
Performance	unguaranteed	✓	✓
Options	Only temperature regulation	Temperature Humidity & Oxygen monitoring	Temperature Humidity & Oxygen monitoring
Cost	Low cost 4000 – 7000 LE	High cost Can reach 300,000 LE	Can reach 20,000 LE

Table (1): Baby incubators' comparison

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On the Influence of dust stroms, anthropogenic pollution and biomass burning on air quality over the Nile Delta during 2000-2010

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The Nile Delta is situated on the eastern side of the Sahara desert and receives numerous dust storms along with local emissions and/or transported anthropogenic aerosols from biomass burning or industrial activities during different seasons. A combination of these aerosols results in poor air quality and poses significant health hazards for the population in this region. We used remotely sensed observations of aerosols based on more than a decade long (1997-2010), MODIS and SeaWiFS measurements supplemented by CALIPSO (since 2006) and some ground-based data from Microtops, AERONET, to study the aerosol characteristics and their sources. The CALIPSO measurements were used to characterize the vertical structure of aerosols and their characteristics (spherical and non-spherical) for major dust storms and biomass. To partition the contribution of different sources of aerosols we also used a combination of meteorological data and a dust transport model. We used MODIS derived aerosol parameters (at 10km resolution, level 2, version 5.1) to study seasonal changes in aerosol parameters due to the influence of dust storms, anthropogenic pollution and biomass (crop residue) burning. MODIS derived deep blue (DB) Atmospheric Optical Depth (AOD) provided better representation of aerosol loading over the northern Africa (Sahara region) along with dark-target AOD and related parameters. AERONET data provided aerosol parameters such as optical depth, angstrom, fine mode fraction, size fraction, volume, effective radius, refractive index, single scattering albedo, and radiative forcing during different seasons dominated by dust storms, anthropogenic pollution and biomass burning (black cloud phenomena). We used meteorological data including vertical profiles of wind vector to identify major dust transport pathways, their altitude, source and sink regions. The meteorological data from NCEP reanalysis and the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model were used to identify major aerosol transport pathways (trajectories) over the study area. The pathways are clustered into seasonal low and high (polluted: dust or biomass or anthropogenic) aerosol days. Trajectory statistics coupled with seasonal aerosol statistics provided critical information on the aerosol source and type and allowed identifying high aerosol loading days over Nile Delta during biomass burning events during 2000-2010. We found that the natural dust from Mauritania and Algeria transported at high altitude over a long distance by following the westerly wind patterns and contributed to the dense black cloud events during the Fall season. Our study results show that the air quality over the Nile delta region is subject to a complex mixture of aerosol types, during the Fall season, when biomass burning contributes to a background of urban pollution coupled with long range transport of desert dust from the Sahara regions.

Introduction:

Generally speaking, understanding the origin (natural versus anthropogenic) and movement of aerosols in various parts of the Earth will provide more knowledge on the impacts of aerosols at regional levels and therefore regional climate and its ultimate connections to the Earth's global climate system. For that and because of the complicated scenario over the Delta region I worked with others on investigating

the regional pattern of pollution and dust aerosols exchange from and to Europe with the Delta region using satellite and ground observations namely ground Microtops II sun photometer, over Alexandria, Egypt, which is centrally situated within the region of interest. We have also studied the biomass burning contribution and long range transport of dust and other pollutants using Hybrid Single-Particle Lagrangian Integrated Trajectory **(HYSPLIT)**, Dust REgional Atmospheric Model **(Dream)**, Navy Aerosol Analysis and Prediction System **(NAAPS)** and The Goddard Chemistry Aerosol Radiation and Transport **(GOCART)** models. In this research line we have used satellite data from Moderate Resolution Imaging Spectroradiometer **(MODIS)**, Multiangle Imaging SpectroRadiometer **(MISR),** Total Ozone Mapping Spectroradiometer **(TOMS)**, Atmospheric InfraRed Sounder **(AIRS)** data over the Delta region. Over the greater delta region I have analyzed aerosol and cloud properties, using MODIS data during the spring and fall seasons in a trial to examine dust versus pollution optical properties by studying parameters such as aerosol optical depth (AOD), fine mode fraction (FMF) and cloud properties (cloud top temperature (CTT), cloud top pressure (CTP), AIRS temperature profiles and water vapor column. Microtops ground observation aerosols measurements have been used as well over Alexandria to characterize different atmospheric conditions.

Pollution Episode Discussion

AOD is a measure of the opaqueness of air, and high values of AOD indicate poor visibility. We have used MODIS data for obtaining the AOD used for showing the dust storm and black cloud impacts on the optical properties of the aerosols.

The great presence of the dust and smoke particles during certain time periods all over the year results in the optical depth increase and hence, high absorbance of sun light leading visibility reduction creating a hazardous situations (Figure 1).

Dust and different anthropogenic pollutants forming the black cloud vary widely in the grain size distribution and hence have varying optical characteristics. Using the fine mode aerosol optical depth fraction derived from radiance measurements by MODIS on Terra, aerosols can be partitioned between the fine and coarse mode. This partitioning result in the reduction of the averaged aerosol optical depth to values below those retrieved from MODIS. However, FMF shows only the fine particles contribution in the AOD intensity which is minimum during the dust storms season in the months of April and May all over the whole time domain. On the other hand FMF shows high values during the stable times of the years as well as a matching value with the AOD value during the months of October during the years 2000 – 2003. This is because of the fine emissions during these months of the year as proposed with the matching season of the black cloud events as manifested from the fire pixel counts observed. High anomalous fire counts are detected over the Delta region in the four years studied,

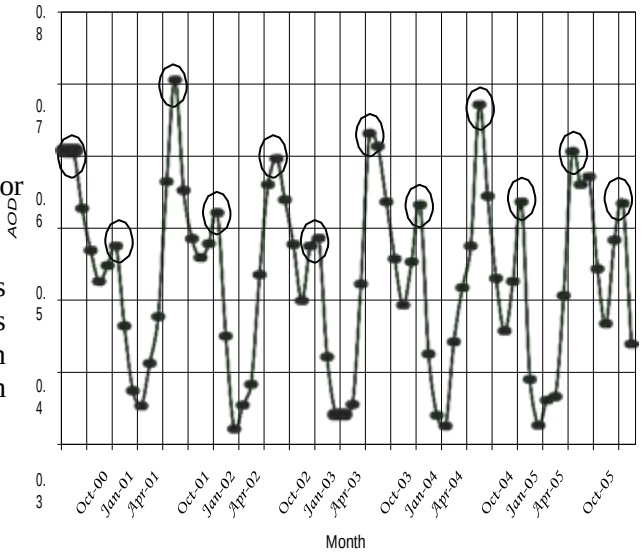


Figure 1. MODIS monthly AOD over Cairo Lat = [29.66 N, 30.43 N] Long = [30.64 E, 31.84 E]

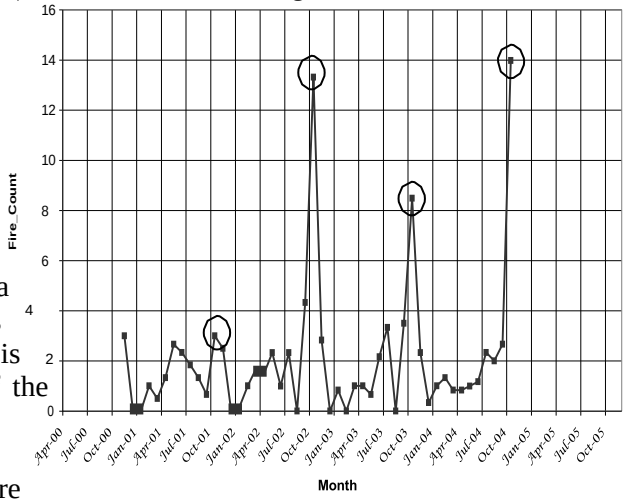


Figure 2. MODIS monthly Fire Count over Cairo Lat = [29.66 N, 30.43 N] Long = [30.64 E, 31.84 E] from November 2000 till October 2004

however with different strengths where the years 2002 and 2004 showed the highest count in the order of 50-100 counts (Figure 2). The dominant presence of the FMF particles during the most stable months of the year is validated by the high negative correlation between AOD and FMF of value -0.75 (Figure 3).

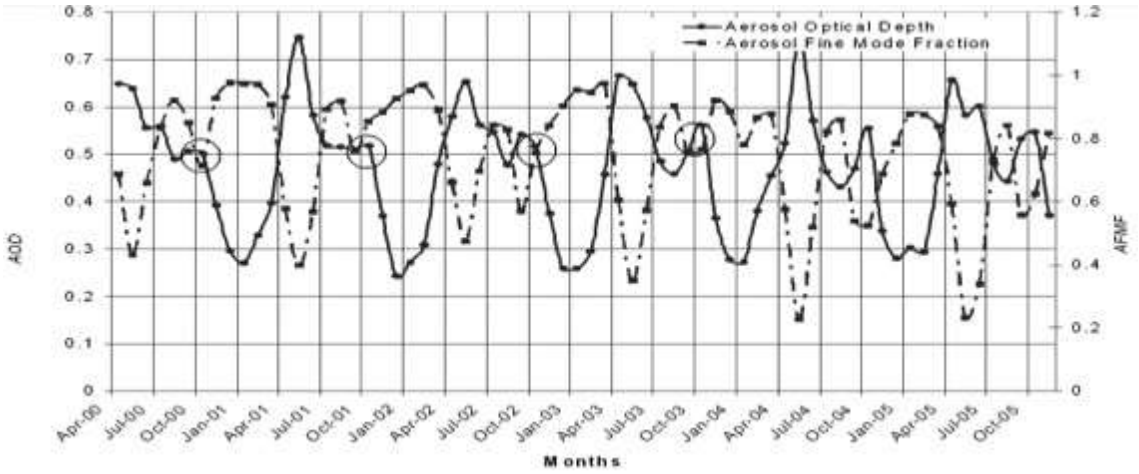
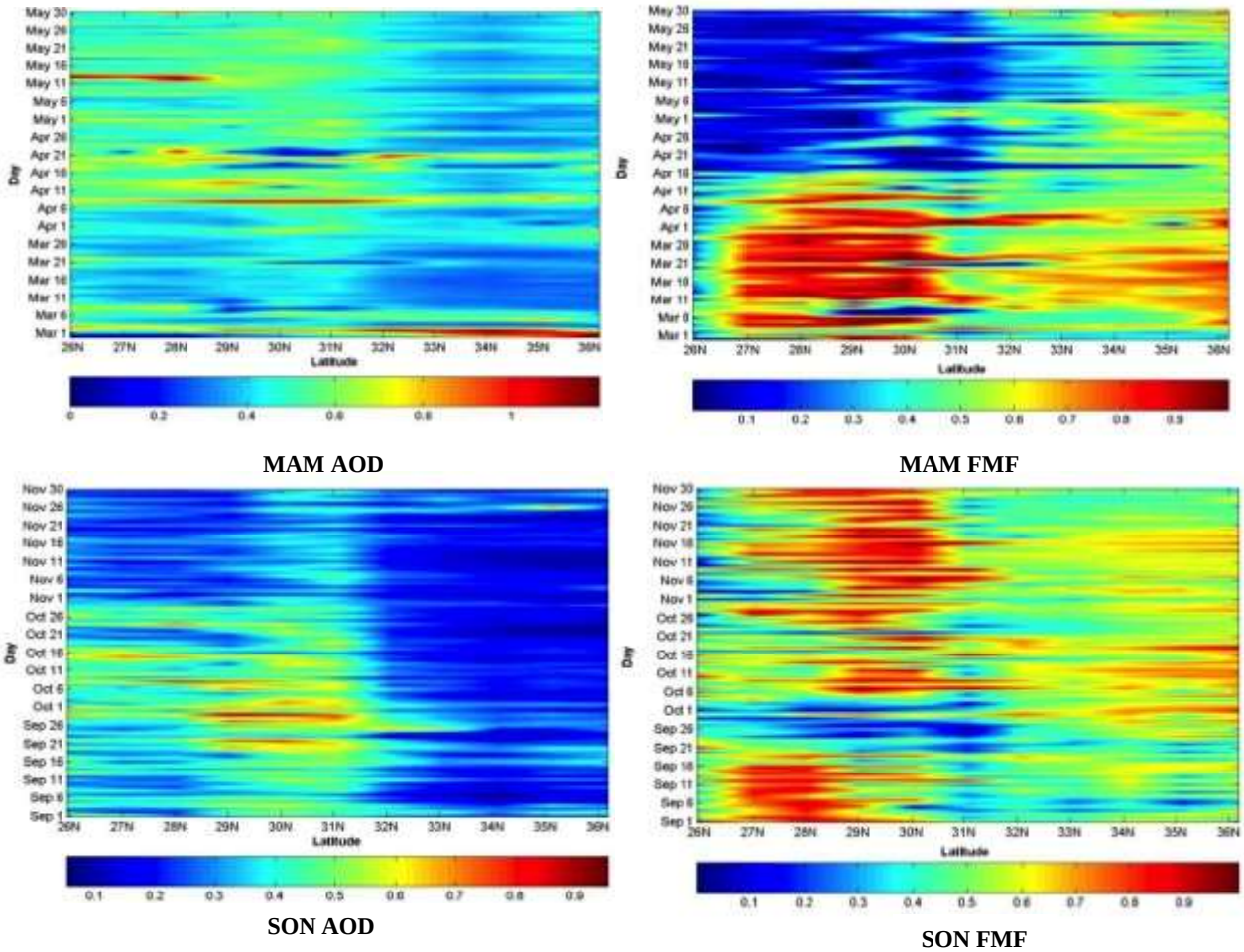


Figure 3. Aerosol Fine Mode Fraction (AFMF) versus Aerosol Optical Depth (AOD) over Cairo Lat = [29.66 N, 30.43 N] Long = [30.64 E, 31.84 E] from April 2000 till November 2005

Higher AOD persists over northern Egypt, Cairo and the Greater Delta region; this is a distinct pattern that is not present over the rest of Egypt, with dust aerosols dominating the spring, while urban/industrial emissions prevail during the autumn months as reflected from the FMF (Figure 4).



MAM AOD **MAM FMF**

SON AOD **SON FMF**

Figure 4. TERRA/MODIS Time-Latitude map averaged over longitude showing the temporal variability of daily AOD and FMF over Cairo and Greater Delta Region during a) spring time (MAM) and b) fall time (SON)

Figure 4 shows the AOD and FMF variations during MAM and SON of 2005 over Cairo and the Greater Delta region. The AOD shows a high dominancy of the pollutants and dust aerosols during the months of September and October and April and May, respectively. Anthropogenic pollutants during SON belong to the fine mode size category, while dust particles belong to the coarse mode category. Hence, higher AOD values during MAM than during SON are attributed to large dust loading in the atmosphere, while higher FMF in SON than MAM are due to the urban/industrial car and fuel emissions. A sharp boundary at 32u N, with little variation north and south of it, is observed due to the fact that, at this cut-off point, we entered the Mediterranean, which is not a part of the Greater Delta region that is characterized by a highly vegetated and not bright surface. Fine mode aerosols constitute the majority of the haze during SON months and are found to be significantly coupled with an increase in the water vapour column and the strongly decreasing CTT (Figure 5). The CTT during MAM of the three years shows a slightly increasing trend when departing from March (low dust) and entering April and May (high dust), reflecting the increase in the aerosol content towards the dust season.

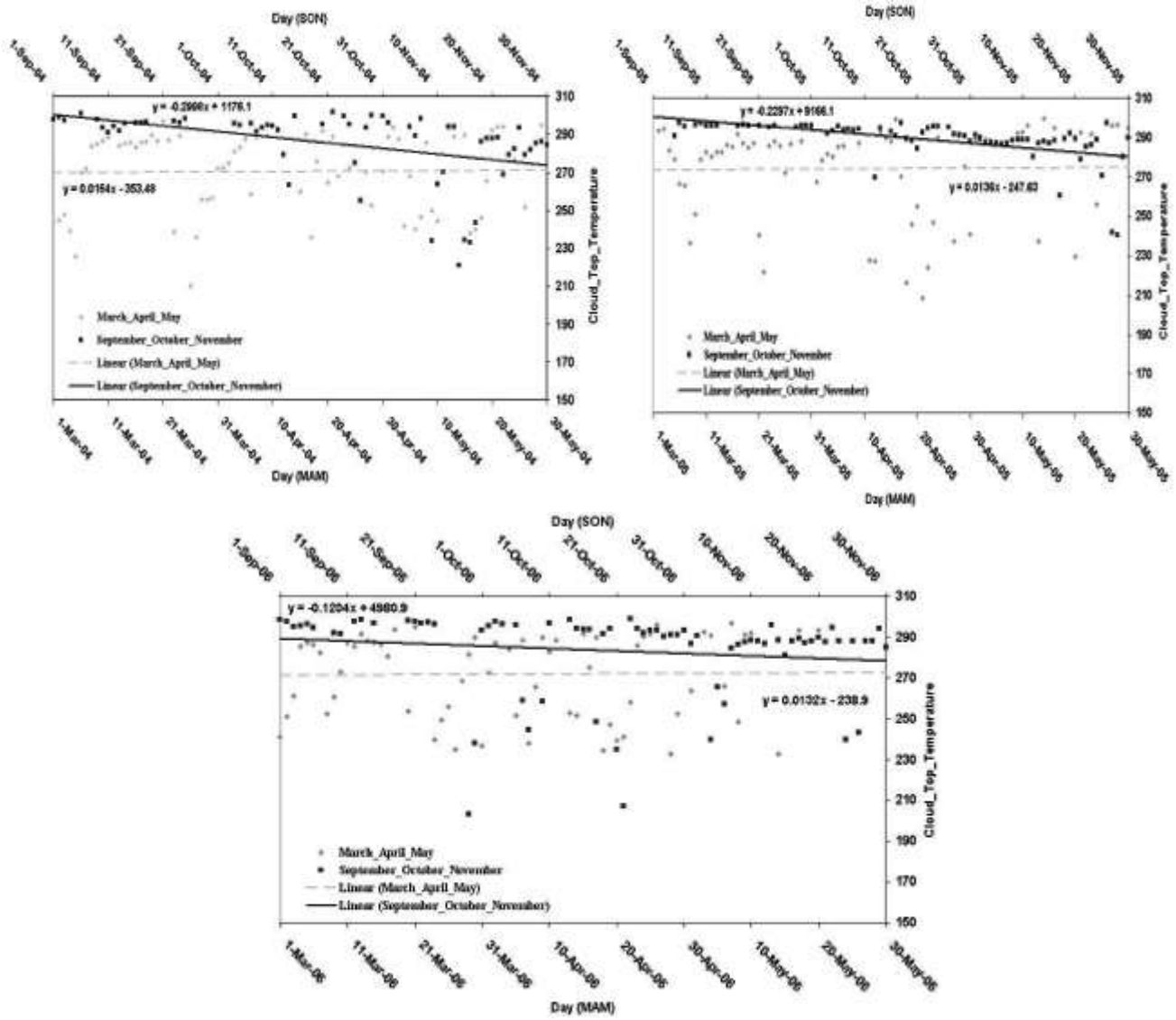
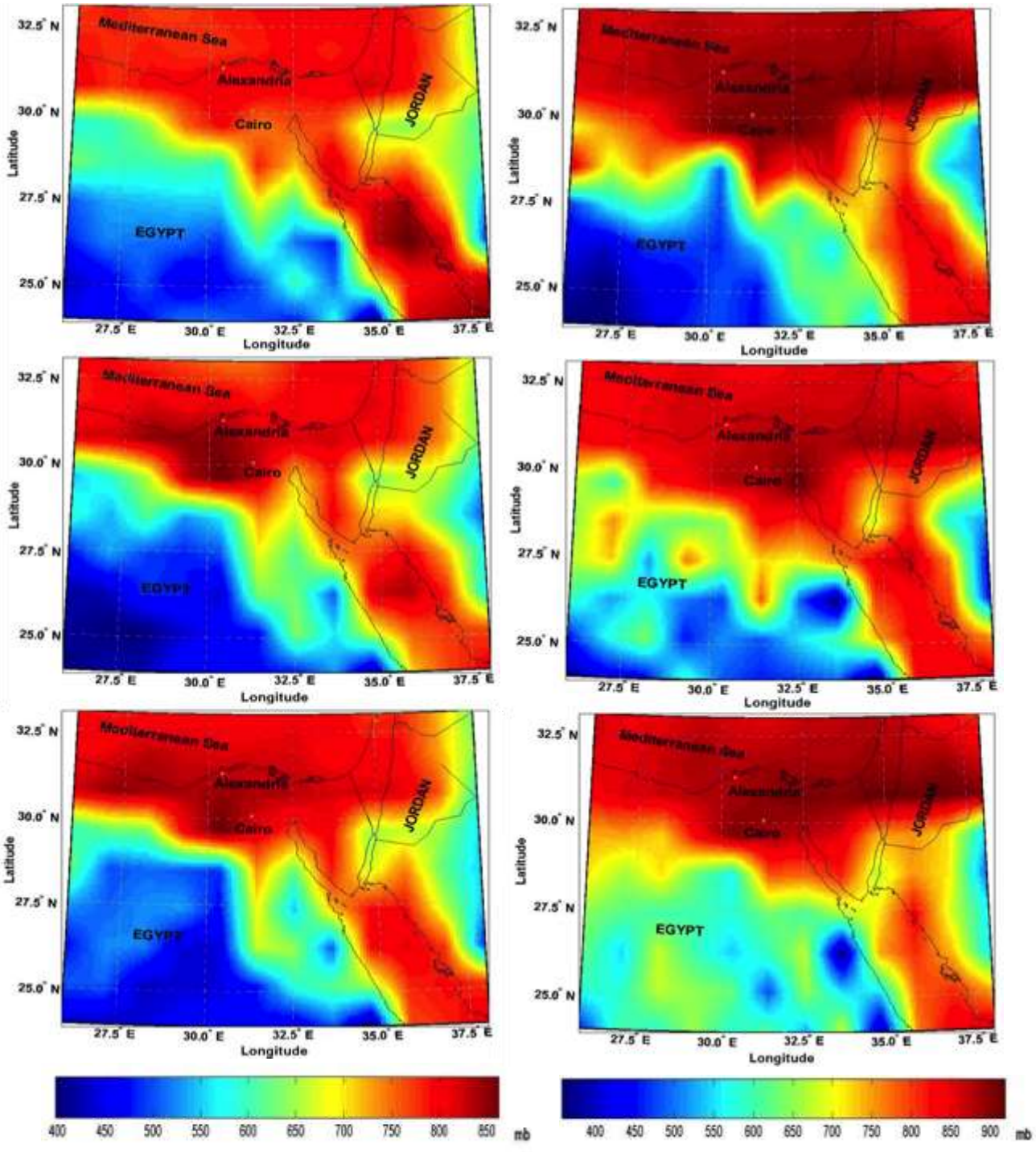


Figure 5. Temporal variability of CTT over Cairo and Greater Delta Region during spring time (MAM) showing dust impact on the increasing trend of CTT (gray line) and during fall time (SON) showing anthropogenic impact on the decreasing trend of CTT (black line) for years a) 2004 b) 2005 and C) 2006

Dust aerosols during MAM are found at higher altitudes, yet are low compared to the anthropogenic aerosols revealed from the CTP values (Figure 6).



a) MAM 2004, 2005, 2006

b) SON 2004, 2005, 2006

Figure 6. CTP over Cairo and Greater Delta Region during a) spring time (MAM) of 2004, 2005, 2006 showing dust occurrence at higher altitudes ~ 750 - 800 mb and b) during fall time (SON) of 2004, 2005, 2006 showing anthropogenic aerosols occurrence at lower altitudes > 900 mb

The reason that they are found at higher altitudes as compared to SON aerosols is due to the normal temperature gradient during this particular time of the year over Cairo. Hence, in the absence of the inversion layer and, in the case of occurrence, would be an elevated type inversion, which is not found to be the case during the black cloud season. This is evident from the vertical temperature profiles obtained from the atmospheric infrared sounder (AIRS) level 3 daily global girded data products during the month of October over Cairo and Alexandria, the second biggest city, for comparison (Figure 7). This profile revealed the occurrence of an inversion layer in the lower troposphere in the vicinity of less than 1km above the ground's surface over Cairo. Meanwhile, over the same day, a regular negative temperature gradient is observed over Alexandria, which is located 250 km away from Cairo. Such a temperature inversion layer, together with the continuous unregulated emissions, harvest by-products burning, traffic and other human activities, contributes, to a great extent, to the higher aerosol emission, as observed from the AOD and FMF products. However, the CTT during SON of the three years shows a decreasing trend from September to November, reflecting the higher levels of aerosols at the beginning and decreasing in concentration towards November (Figure 5). It is evident that, during the pollution episodes, lower CTTs were achieved due to the decreasing trend, as compared to the dust episodes that show an increasing trend in the CTT values. This implies that anthropogenic aerosols have an indirect impact in the thermal infrared, compared to the dust aerosols. Anthropogenic pollutants during SON are found at a very low altitude, less than 1km closer to the earth's surface, as revealed from the CTP values (>920 mb). Such low elevation is occupied because the pollutants are being prevented rising by an inversion layer, which keeps the air from naturally being ventilated. This, in turns, keeps any aerosol and pollution below the temperature inversion layer, resulting in an increase of the concentration of pollutants. This creates a permanent haze that develops a hazardous situation, causing severe respiratory problems. It has been found that thermal inversion persists during the fall season of each year during the locally know black cloud episodes. Thermal inversion occurs when a layer of warm air settles over the cooler air that is closer to the ground, trapping it there. There is little to no wind in an inversion layer, so pollutants stay in one place instead of being blown away. In other words we can say that the air is already polluted, therefore, the particles remain in the layer close to the ground. The occurrence of an inversion layer during the season of Black cloud is examined using vertical temperature profiles obtained from AIRS (Figure 8). Although it is commonly known that local biomass burning causes most of the experienced pollution episodes during the fall season over major cities and rural regions of the Nile Delta. Previous studies have attributed the increased pollution levels during the black cloud season to the bio-

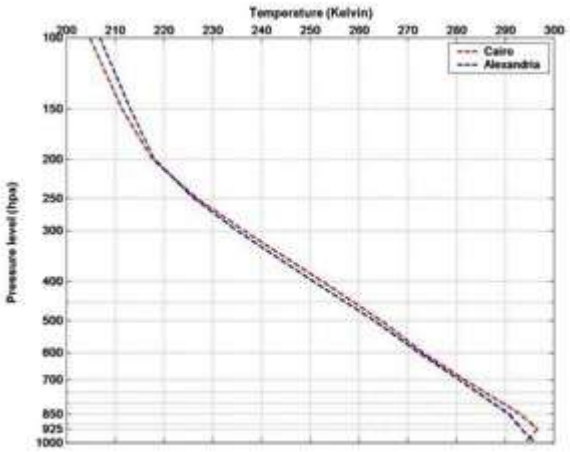


Figure 7. AIRS temperature vertical profile over Cairo and Alexandria, October 2nd, 2005.

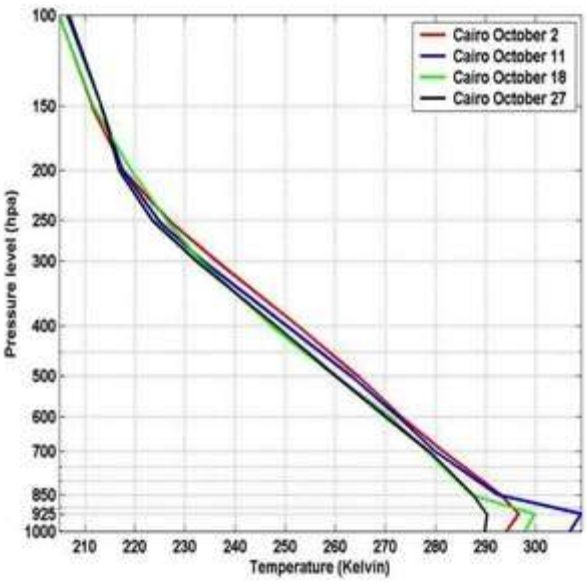


Figure 8. Vertical temperature profiles over Cairo for selected days during October, 2005

mass or open burning of agricultural waste, vehicular, industrial emissions, and secondary aerosols. However, new multi-sensor observations (column and vertical profiles) from satellites, dust transport models and associated meteorology present a different picture of the autumn pollution. In one of my research papers we showed, for the first time, the evidence of long range transport of dust at high altitude (2.5-6 km) from Western Sahara and its deposition over the Nile Delta region unlike current Models. The desert dust is found to be a major contributor to the local air quality which was previously considered to be due to pollution from bio-mass burning enhanced by the dominant northerly winds coming from Europe. Three consecutive day aerosol composite loadings from MODIS Terra show very high concentration over the Mediterranean Sea especially over the Nile Delta region on October 2 and 3, 2008. The high AOD zone was observed over the Libya coast on October 1, west of the Nile Delta on October 2, and over the Nile Delta and river valley on October 3, 2008, indicating an eastward movement of the aerosols (Figure 9). The observed aerosol layer extends from 2.5 to 6 km high above the surface as shown in the Lidar profile from CALIPSO (Figure 9).

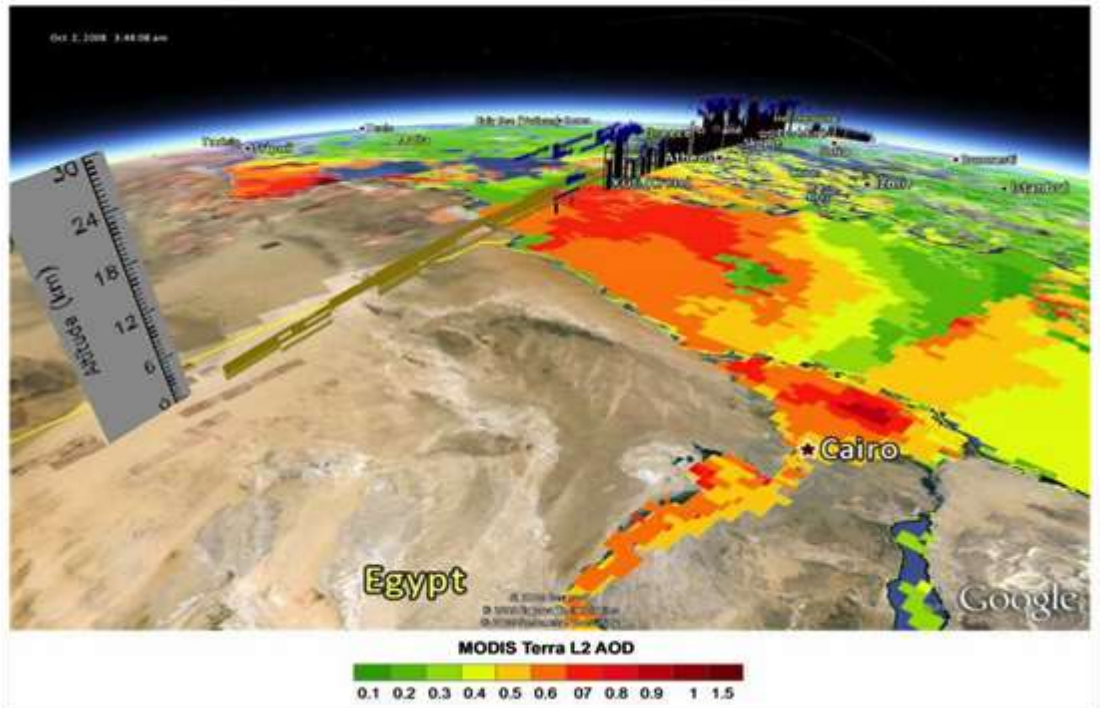


Figure 9. The high aerosol loading over Nile Delta and surrounding region as seen in the three day composite of MODIS Terra level-2 AOD (at 10 km spatial resolution) during October 1-3, 2008. The vertical profile of feature mask obtained from CALIPSO on October 2, 2008 show aerosols at 2.5-6 km height.

The large increase in AOD (>0.9), with a corresponding drop in the Angstrom Exponent (0.8-1 to 0.4-0.6) suggest that the particles were relatively coarser on October 2-3, compared to September 28. It is noteworthy that nearby areas such as Cyprus and Turkey also exhibit similar patterns of change in the AOD and Angstrom Exponent (September 28 and October 3). The results imply dust-like characteristics of these aerosols compared to aerosols produced by biomass burning. Owed to the Terra MODIS algorithm limitations over land due to high surface reflectance, we combined aerosol loading information available from other sensors and algorithms such as Deep Blue AOD from MODIS Aqua (over land) and AOD from MODIS Aqua (over ocean) that clearly shows continuity of high AOD from the arid regions of Mauritania, Algeria, extending into Libya, Egypt and the Mediterranean Sea (Figures 10a). The three day composite of UV – AI from OMI AURA corroborate the findings (Figure 10b). Similar high aerosol events over the Nile Delta have been found for other years (2002-2007) during September-October.

Overlay of wind field at 600mb (~4.4 km from the surface) shows the presence of favorable wind pattern for transportation of soil dust from the presumed source (Western Sahara) to the sink (Egypt, north- eastern Sahara). Satellite derived AOD from other sources (Parasol AOD, daily MISR AOD) also shows similar aerosol distribution. However, such transport pathways deduced from aerosol or dust distribution during this season are not visible in dust transport models (DREAM) over northern Africa and surrounding region (Figures 10c, d). DREAM only shows high AOD over the Niger-Chad area while it misses the other major source (Mauritiana-Algeria-Mali) (Figure 10c). A comparison of MODIS and DREAM AOD (at 550nm) over Nile Delta and Nile Fan region show AOD to be >0.8 and <0.15, respectively (Figures 10a, b). Further, the satellite and DREAM model estimates of AOD show strong disagreement over Western Sahara (marked as broken ellipse, Figures 10a, b). The NAAPS show high dust AOD (> 0.8) during September 29-30 over Algeria (Tamanrasset station) and October 1-2 over the Mediterranean Sea (Forth station, Crete) (Figures 10e, f). Such pathways which are apparent in high frequency (daily) data are also not visible in monthly mean from MODIS Terra and Aqua AOD, and MISR AOD due to various limitations of temporal-spatial coverage and limitations of the algorithm itself. Thus, the detection of dust transport during the biomass burning season presently remains undetected in model runs and monthly composites from satellite observations. Our present analysis from multi-satellite data coupled to meteorological data, reveals the origin of high aerosol loading during biomass burning season over the Nile Delta region.

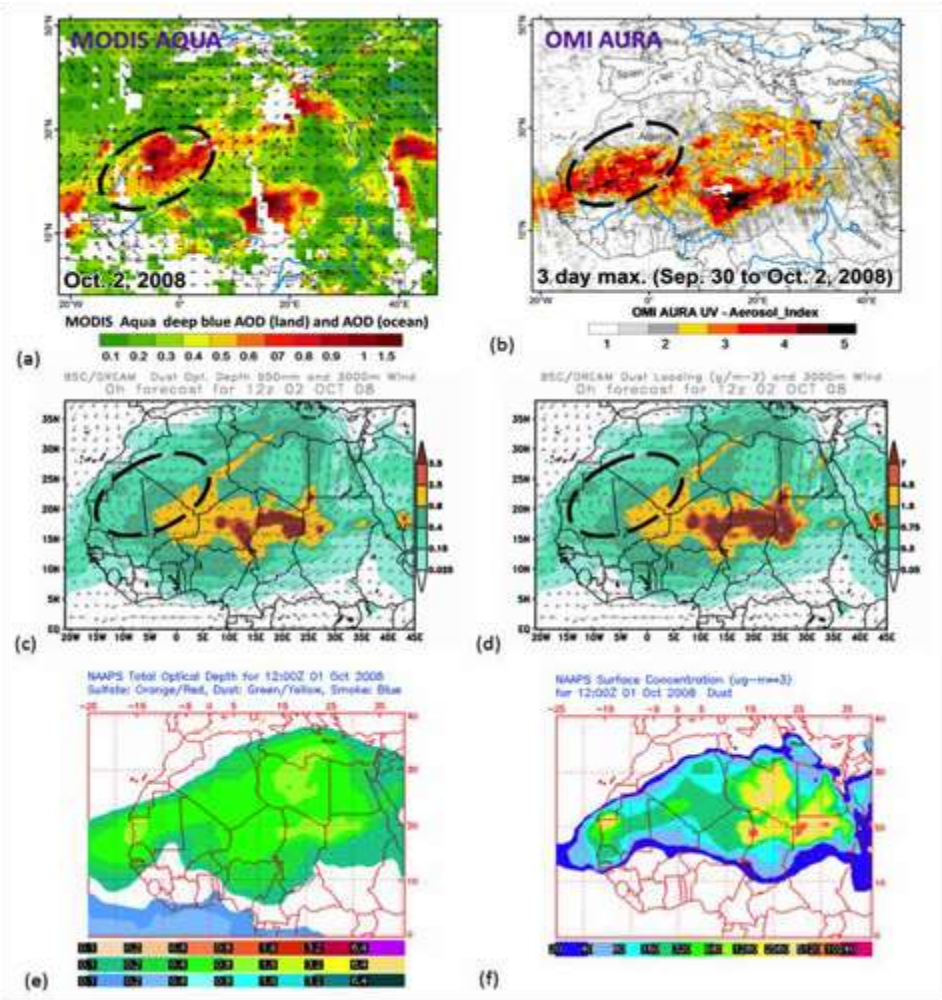


Figure 10: (a) The distribution of aerosols on October 2, 2008 over the study region using a combination of MODIS Aqua Deep Blue AOD and AOD over land and ocean, respectively. The vectors represent wind field at 600 mb. (b) The 3 day maximum composite of OMI AURA derived Aerosol Index showing the source of aerosols around Mauritania-Algeria-Mali region. DREAM model derived (c) dust AOD (550 nm) and wind field at 3000 m, and (d) dust loading (g/m2) on October 2, 2008 at 12z. NAAPS model derived (e) total optical depth, and (f) surface concentration of dust (µg/m3) on October 2, 2008 at 12z. (Source: DREAM - http://www.bsc.es/projects/earthscience/DREAM/, and NAAPS - http://www.nrlmry.navy.mil/aerosol/).

The transport pathways and altitude from source to the sink region is discussed using the HYSPLIT transport model, whose back-trajectory for 3 days, shows that the air mass originated from NNE direction at 100 and 500 m from the surface. The autumn season (October–November) is generally known to be largely dominated by the northern winds (<65%). However, at high altitudes (especially 2.5-6 km or 700-500 mb pressure level) the air mass is originating from Western Sahara (Figure 11a). A 3-day forward trajectory from the source (Western Sahara) shows that the air mass at high altitude (2.5-6 km) was moving towards the Nile Delta region from September 30 to October 2, 2008 (Figure 11b). The transport model shows that a west-to-east pathway from the source to the sink was evident at 2.5-6 km height from the surface (Figures 11a, b). This matches aerosol distribution observed by the Deep Blue AOD from MODIS Aqua (Figure 10). It is notable that another 3 day forward trajectory at a region 10 °S (or 1100 km) from the source shows completely different trajectories for air mass at 1-6 km (Figure 11c). This can explain the presence of other aerosol plumes over Western Sahara coast reaching into the Atlantic Ocean. In other words, the HYSPLIT model shows that there are two different pathways for transport of dust aerosols from Western Sahara: one extending westwards into the Atlantic Ocean and the other eastwards towards NE Africa (Egypt). The eastward arm of the air mass trajectory can potentially affect the Nile Delta, provided the dust can be lifted high-up in the air. The Lidar profile obtained from CALIPSO on October 2 corroborates the height of aerosol layer (2.5-6 km), in agreement with HYSPLIT model. The model and observations confirm the vertical structure and high altitude transport height of the aerosols. Furthermore, the wind vectors at the 600 mb height are shown to be westerly, matching with other observations (HYSPLIT, CALIPSO, and MODIS Aqua) (Figure 10).

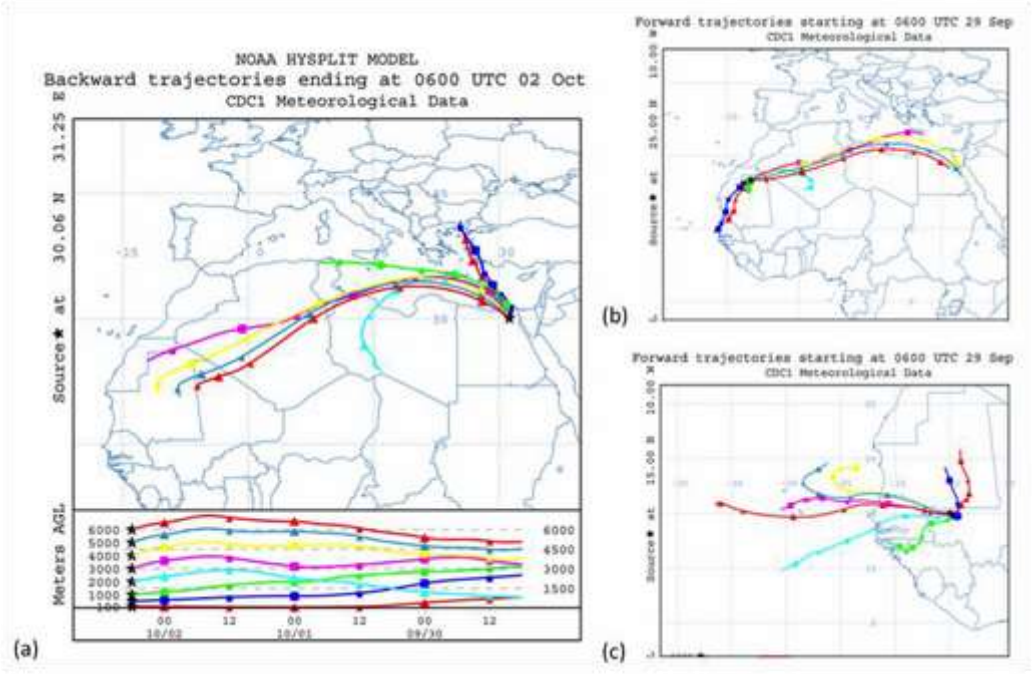


Figure 11. (a) The HYSPLIT model derived (a) 3 day back-trajectory from Sink region (Cairo, Nile Delta), (b) 3 day forward trajectory from Source (Mauritania-Algeria-Mali) region, and (c) 3 day forward trajectory from southern Mali showing transport of dust towards the Altantic ocean. The HYSPLIT trajectories are shown at 100, 500 m (near surface) to up to mid troposphere (1, 2, 3, 4, 5, 6 km above surface).

The meteorological profiles of vertical component of the wind (W wind or omega or vertical velocity) show strong downward movement of air mass at pressure level 500-700 mb (2.5-6 km height) on October 2 and 3 (Figure 12a). This suggests that the dust transported from Western Sahara at 2.5-6 km height was deposited over the Delta region as conditions were favorable. The horizontal components of wind (U and V wind) also show contrasting features for this period (Figures 12b, c). The temperature profile shows

strong change (up to 8.4 °K) in air temperature near surface (up to 925 mbar or 775 m height) on October 3-4, 2008. The warming of the air (over 300 °K) is unique compared to the entire month (Figure 12d) and shows contrasting changes over the Nile Delta region during the dust deposition period.

The regional map of omega at 600 mb on October 2 shows positive values (subsidence conditions) over the Nile Delta (Figure 13a). A west to east (source to sink, Figures 13b, c) vertical profile of omega shows evolution of the favorable meteorological conditions for this dust transport. On October 29-30 (at 0, 12z), strong uplift conditions are observed over the source (Mauritania, Mali, and Algeria) from ground up to mid troposphere (Figure 13c). The sink region shows the presence of strong downward movement of air-mass, especially over Egypt, leading to deposition of transported dust. The favorable wind vectors (westerly winds) at mid-troposphere facilitates transport of the dust uplifted from source to the sink region (Figure 10a). The Deep Blue AOD from MODIS Aqua corroborates that the aerosol loading is very high over the source during this period, which in turn can be transported to the sink region far away, if the meteorological and topographic factors are favorable. The presence of high mountains NW and SE of the source (Figure 13b) forms a topographic channel for the transport of dust along this west-to-east axis (Mauritania-to-Egypt). In part of my work, we have discovered for the first time a dust transport pathway along the Mauritania-Mali-Algeria-Libya-Egypt axis that significantly affects NE Africa, especially the Nile Delta region, during the biomass burning season. The increase in aerosol loading (A0D >0.9) along with corresponding decrease in the Angstrom Exponent, a typical feature of desert dust, point towards the presence of desert dust over the Nile Delta region. The high aerosol concentration episodes cannot be solely attributed to biomass burning or

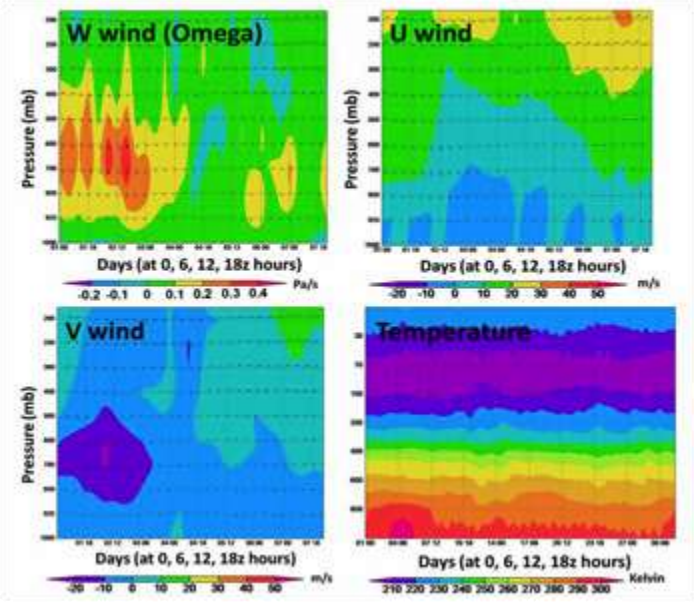


Figure 12. The vertical profile of meteorological parameters (w-wind or omega, u-wind, v-wind and temperature) over Nile Delta using 6-hourly National Centers for Environmental Prediction (NCEP) reanalysis data. The meteorological parameters show conspicuous changes during the dust transport event.

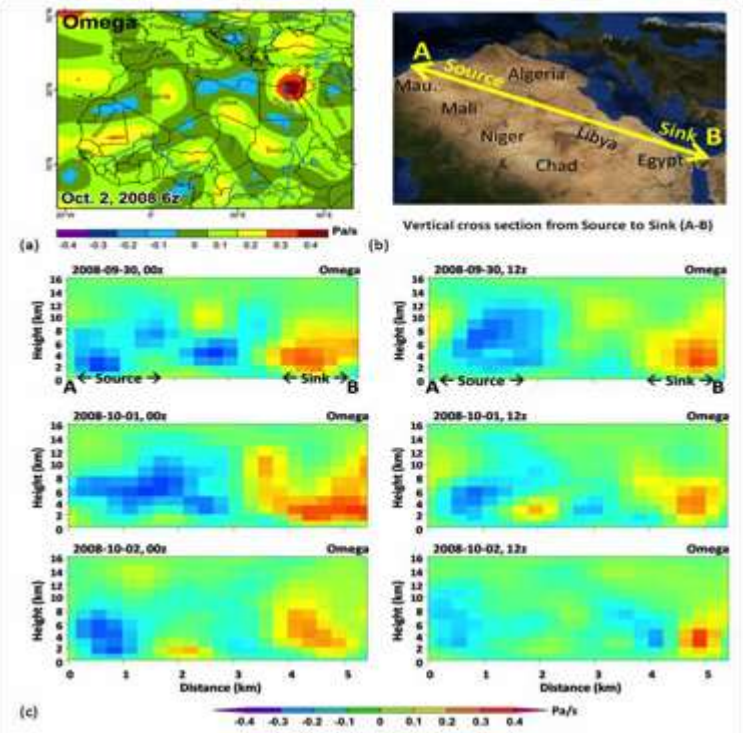


Figure 13 : (a) The regional map of omega or vertical velocity (Pa/s) show presence of strong subsidence conditions (marked as red zone) over Nile Delta on October 2, 2008 at 6z. (b) The map showing west-to-east (source to sink, A to B) transect along which cross section of omega have been extracted. (c) The source-to-sink cross section of omega from September 30 to October 2 (at 0 and 12z) show uplift conditions near source (Mauritania-Algeria) and subsidence conditions over sink (Egypt) region.

local pollution. Our results show that the long range transport of dust at high altitudes is a major contributing factor to the black cloud pollution during the biomass burning season. To further investigate the regional pattern of exchange of pollution and dust aerosols between Europe and North Africa, we have used multi-year remotely sensed aerosol data acquired both from satellites and from the ground, over Alexandria, Egypt, which is centrally situated within the region of interest during the periods of October 1999-August 2001 and July 2002-September 2003 due to ground observations limitations. The spectral aerosol optical thickness at a given wavelength λ (τλ) represents the extinction of radiation at wavelength λ as a result of the presence of atmospheric aerosols. AOT measurements in two wavelengths can be used to calculate the corresponding Ångström exponent (α) given in Eq. (1), which represents the slope of the wavelength dependence of the AOT in logarithmic coordinates.

$$\alpha(\lambda,\lambda_1,\lambda_2) = -\ln\left(\frac{\tau_{\lambda_2}}{\tau_{\lambda_1}}\right) \Big/ \ln\left(\frac{\lambda_2}{\lambda_1}\right) \quad (1)$$

In the solar spectrum, α is a good indicator of the size range of the atmospheric particles responsible for the AOT: α >1 when fine mode (submicron) aerosols are dominant, while α <1 for aerosols dominated by coarse or super micron particles. The spectral variation of the Angstrom exponent can provide further information about the aerosol size distribution. Many satellite-based and ground-based measurements provide retrievals of spectral AOT, but no direct size distribution retrievals. Therefore, analysis of α is important in the interpretation of these data and in providing further information on particle size. High α value indicate a higher abundance of smaller aerosol particles, while low α values reflect coarser particle sizes. The coarse mode aerosols are mainly from sea salt and mineral dust, whereas the mainly anthropogenic submicron aerosols are mostly carbonaceous and sulfate aerosols generated from biomass burning and urban/industrial activities in addition to those from gas-to-particle conversion mechanisms. Therefore, either an increase in the number of smaller particles or a decrease in the number of larger particles can cause an increase in the value of α. In that context, we classified the months into different categories (clean / dust / pollution / mixed) according to the number of days that fall into each (Table 1). This categorization is based on the aerosol optical thickness τa675 values and the Ångström exponent α675/440. Cases with τa675 ≤ 0.06 were classified as "clean" conditions. For those with τa675 > 0.06, further classification was based on the values of the Ångström exponent, being categorized as "dust" for α675/440 < 0.25, "pollution" for α675/440 > 1.0, and "mixed" otherwise (Table 2). Figure 14 shows sample 3-day air mass back trajectories at three vertical levels ending over Alexandria for the four aerosol categories: dust, pollution, clean, and mixed for highlighted days during 2003 taken from Table 2. The wind directions observed during dusty days were found to be variable. However, the major dust wind directions were W, S, and SW when the air mass comes from the Sahara or from North Africa during spring. We observe that when the wind directions are from N and NW, although the source of the wind may be from Europe, it passes (typically) over North Africa where it becomes loaded with dust before reaching Alexandria. Therefore, the air mass back-trajectory allows for the visualization of a sizeable segment of the air-mass path, giving an indication of where the dust may have been collected. Dust situations with elevated water vapor content are often cases where an air mass collects dust from the Sahara before or after it collects some moisture over the Mediterranean, after which part of it is blown back by headwinds toward Alexandria. During the pollution days, (summer and fall seasons), the air masses come predominantly from different regions of Eastern, Central or Western Europe mainly due to the well-known convection patterns and the associated prevailing meteorology. While passing over the Mediterranean toward North Africa, there is a high chance for cloud nucleation and indirect radiative forcing due to the associated sea breeze. During the days with mixed aerosols, the air masses come from two sources, one that brings pollution from Europe and the other that brings dust from the Sahara and North Africa. The wind directions during the mixed days are from all directions. These different directions reflect the convergence of air masses from diverse source areas. During the clean days, the air masses mainly come from the Atlantic Ocean via the Mediterranean. Therefore, the wind directions during the clean days typically fall between N and W. We carried out further

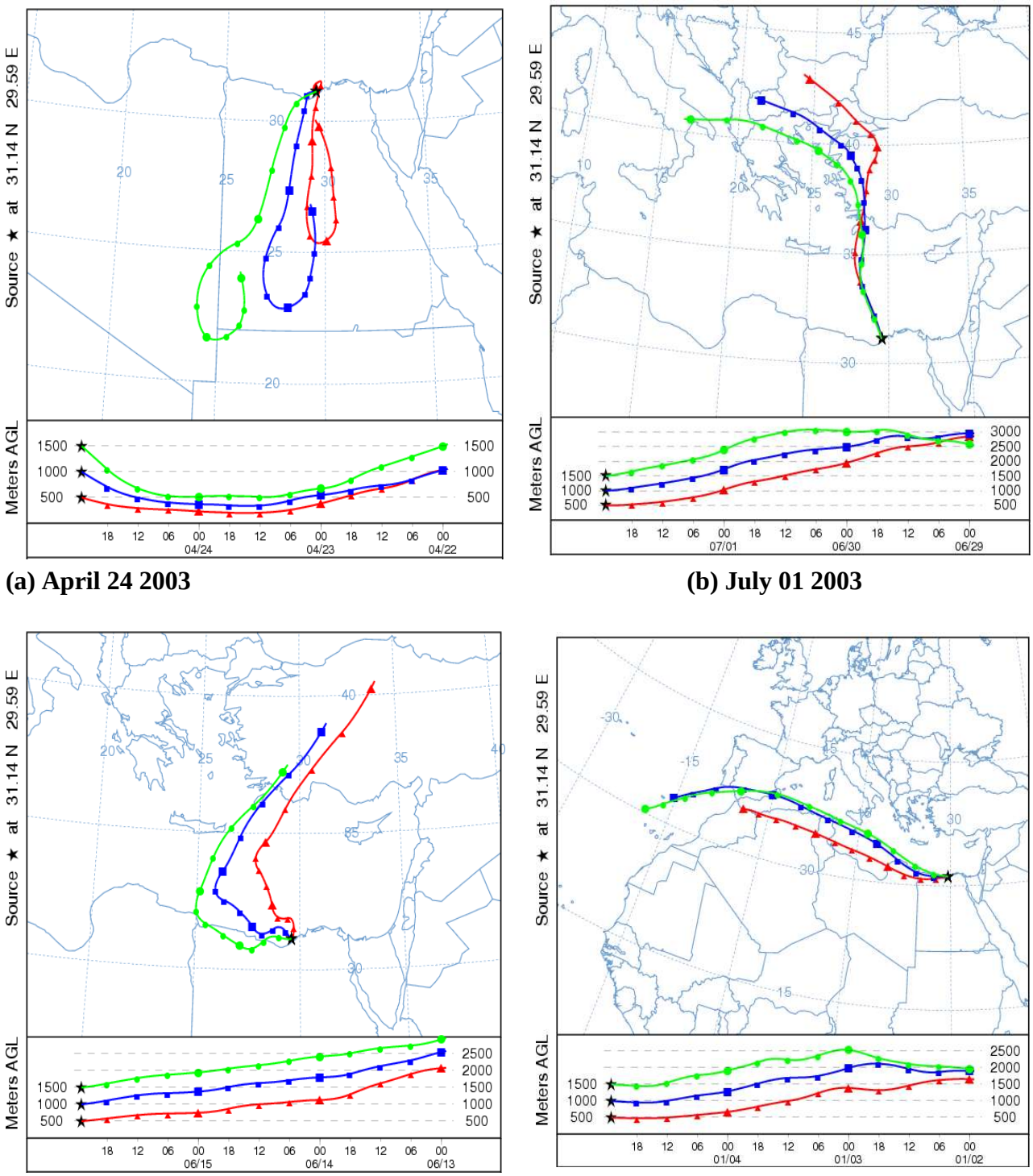
investigations by exploring what appears to be significantly high sea salt, dust, sulfates and black carbon concentrations over the Delta region as indicated by GOCART model outputs (Figure 14).

Table 1. Percentages of occurrence for different aerosol categories and their corresponding Ångström exponent.

Date	Dust%	Pollution%	Clean%	Mixed%	$\alpha_{675/440}$
Oct-99	23.1	15.4	7.7	53.8	0.61
Nov-99	19.2	30.8	11.5	38.5	0.88
Dec-99	24.0	12.0	0.0	64.0	0.90
Jan-00	26.3	10.5	5.3	57.9	0.68
Feb-00	26.1	17.4	0.0	56.5	0.87
Mar-00	25.0	3.6	0.0	71.4	0.70
Apr-00	34.5	10.3	0.0	55.2	0.62
May-00	3.6	10.7	21.4	64.3	1.03
Jun-00	0.0	26.7	13.3	60.0	1.29
Jul-00	25.8	25.8	3.2	45.2	0.59
Aug-00	0.0	66.7	6.7	26.7	1.41
Sep-00	0.0	36.7	0.0	63.3	1.12
Oct-00	0.0	50.0	7.1	42.9	1.19
Nov-00	0.0	58.3	0.0	41.7	1.24
Dec-00	11.1	33.3	11.1	44.4	0.96
Jan-01	25.0	35.7	10.7	28.6	1.04
Feb-01	17.4	21.7	4.3	56.5	0.88
Mar-01	32.0	0.0	4.0	64.0	0.63
Apr-01	52.2	8.7	8.7	30.4	0.37
May-01	50.0	9.1	0.0	40.9	0.46
Jun-01	10.0	3.3	6.7	80.0	0.97
Jul-01	10.0	15.0	0.0	75.0	0.96
Aug-01	0.0	33.3	0.0	66.7	1.16
Aug-02	6.9	51.7	0.0	41.4	0.89
Sep-02	17.2	31.0	0.0	51.7	0.69
Oct-02	6.7	36.7	0.0	56.7	0.85
Nov-02	11.5	46.2	7.7	34.6	0.87
Dec-02	13.0	34.8	0.0	52.2	0.76
Jan-03	24.1	27.6	13.8	34.5	0.48
Feb-03	19.0	9.5	0.0	71.4	0.47
Mar-03	8.7	47.8	0.0	43.5	0.83
Apr-03	29.2	29.2	0.0	41.7	0.42
May-03	4.0	20.0	0.0	76.0	0.67
Jun-03	0.0	74.1	0.0	25.9	1.11
Jul-03	0.0	65.5	0.0	34.5	1.09
Aug-03	0.0	75.9	3.4	20.7	1.18

Table 2. Characterization of aerosol types over Alexandria, Egypt, for selected dates. Back ward trajectories' are shown for dates in bold (Figure 14). Shaded cells represent great variations associated with the specified atmospheric scenario in the highlighted parameters.

Date	τ_{a675}	$\alpha_{675/440}$	W
		Dust	
March 29 2000	0.61	0.24	1.96
April 06 2000	0.55	0.12	2.51
April 01 2001	0.36	0.02	1.94
May 5 2001	0.71	0.17	2.25
September 29 2002	0.31	0.22	2.86
November 10 2002	0.32	0.05	1.52
March 2 2003	0.6	0.19	1.32
April 24 2003	**0.82**	**0.08**	**1.77**
		Pollution	
August 24 2000	0.18	1.29	2.66
October 20 2000	0.31	1.13	3.16
August 20 2001	0.23	1.34	2.77
September 20 2002	0.15	1.29	2.32
July 1 2003	**0.27**	**1.09**	**3.41**
August 8 2003	0.21	1.22	2.82
		Mixed	
October 23 1999	0.23	0.28	2.45
February 22 2000	0.14	0.36	1.79
April 29 2000	0.57	0.54	2.18
March 1 2001	0.29	0.25	1.37
April 4 2001	0.09	0.85	1.70
July 30 2002	0.43	0.46	2.61
September 26 2002	0.37	0.44	2.92
March 10 2003	0.28	0.88	1.77
June 15 2003	**0.16**	**0.63**	**2.14**
		Clean	
November 30 1999	0.05	0.49	1.76
January 3 2000	0.05-0.22		2.21
June 23 2000	0.05	0.79	1.09
Januray 5 2001	0.05	0.81	1.64
February 09 2001	0.05	0.81	1.12
November 14 2002	0.06	1.40	1.95
January 04 2003	**0.04**	**0.63**	**1.04**
August 17 2003	0.06	1.47	1.30



(a) April 24 2003

(b) July 01 2003

(c) June 15 2003

(d) January 4 2003

Figure 14. Hysplit back trajectory analysis at different vertical levels over Alexandria showing a) dusty b) pollution c) mixed d) clean weather conditions

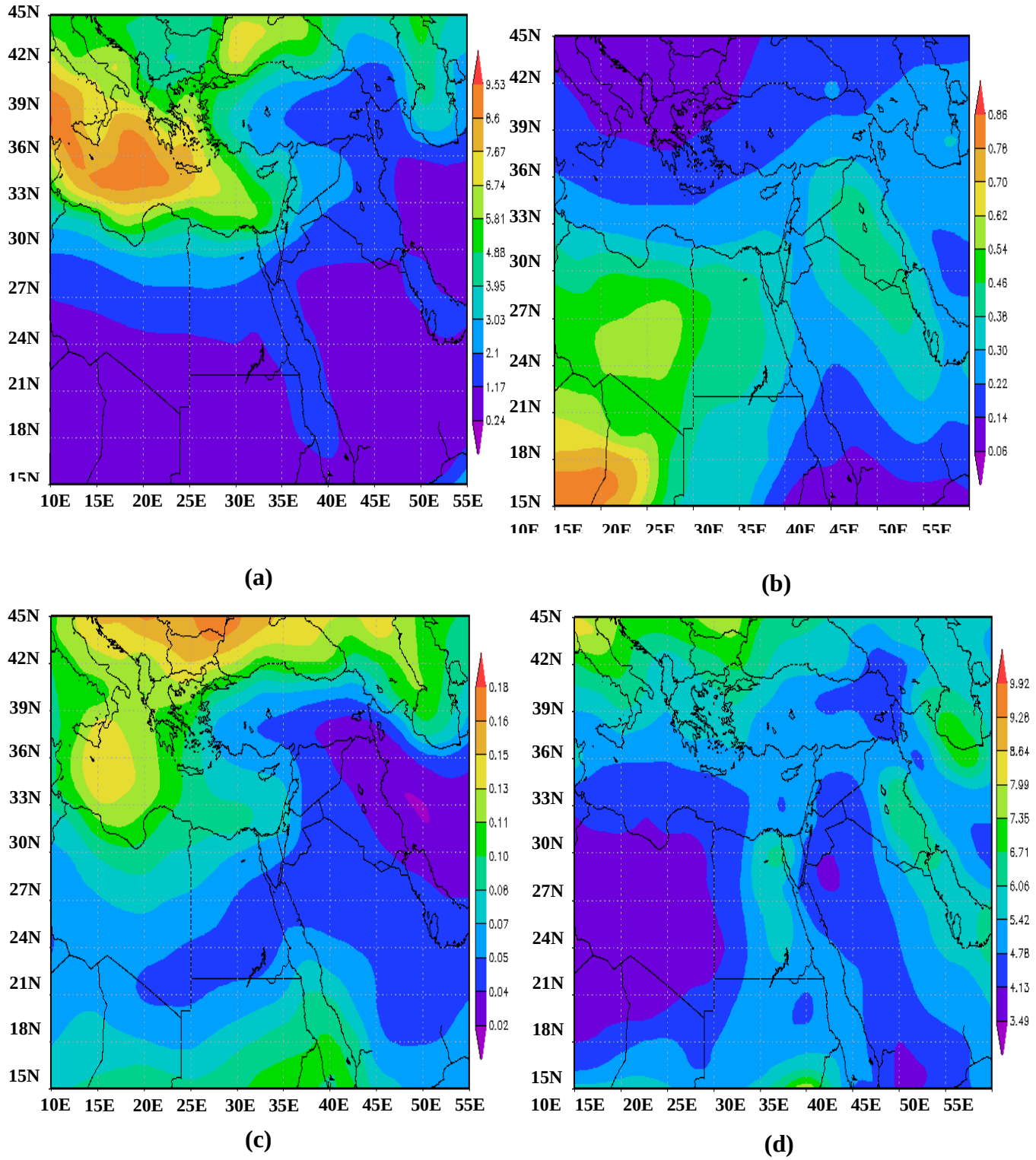


Figure 15. GOCART model outputs of (a) Sea salt, (b) Dust, (c) Sulfates, and (d) Black Carbon AOD respectively showing potential sources and relative concentrations of these aerosol types during (a) winter (b) spring (c) summer and (d) fall, 2003, over and around Alexandria and the Delta Region.

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"A Study on Using Pulsed Corona Discharges to Degrade Humic Acid from Drinking Water With and Without Titanium Dioxide"

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ABSTRACT
Degradation of humic acid was experimentally investigated in pulsed corona discharge reactor. Several important parameters including electrode-to-electrode gap space or distance, dissolved organic carbon, effect of pH, and effect of frequency were investigated for humic acid removal. The addition of titanium dioxide particles were also investigated when used in the degradation at the frequency of 60Hz and 120Hz. From this study, ANOVA analysis was conducted and the frequency and electrode gap space were found to be the most significant factors at $\alpha = 0.05$ affecting the degradation of humic acid by using pulsed corona discharge under the conditions studied. The frequency also had an impact on increasing reduction of humic acid at early stages but less at long time behavior; however, the lowest frequency (60Hz) seems to favor degradation at early stages

Nuclear Energy as an Essential Element of a Sustainable and Environmentally Clean Energy Mix in Egypt

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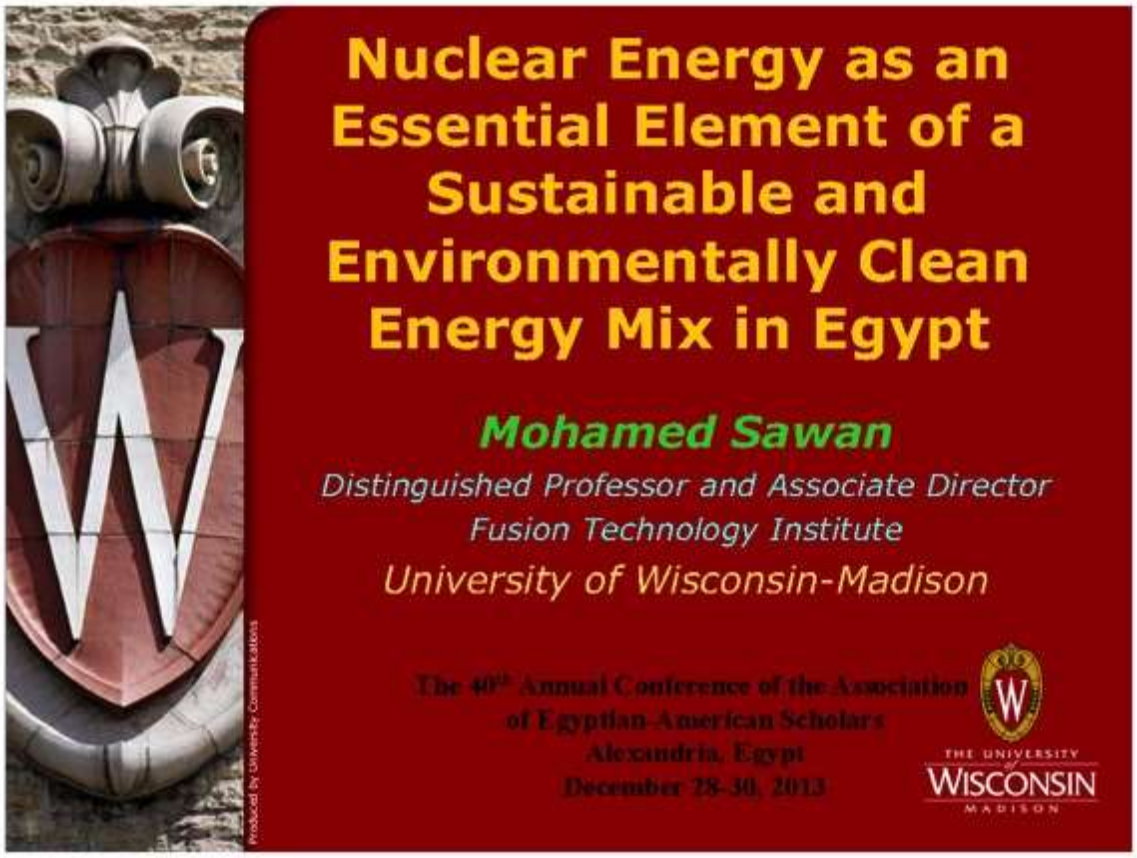
Energy is critical to human development and central to the challenge of sustainability in the social, economic, and environmental needs. With the growth of world population and rapid increase in energy demand to meet human development needs, it is essential to ensure energy sources that are environmentally clean and economically attractive. Nuclear energy is by far the largest source of carbon-emission-free electricity production. It can provide a reliable, environmentally friendly, large-scale source of base load electric-generating capacity. Public perceptions about nuclear power have been mostly negative because of concerns about safety, waste disposal, nuclear weapons proliferation, high upfront capital cost, and long construction time. Such concerns must be resolved if nuclear technology is to play a prominent role in the transition to a sustainable global energy mix. To alleviate these concerns, significant effort is underway to develop new generations of advanced nuclear reactors as well as innovative approaches to utilizing nuclear energy. With dwindling fossil fuel resources in Egypt and enhanced demand for energy, nuclear energy should play a major role, along with renewable sources, in the future energy mix. Egypt had an ambitious nuclear power program for the past 50 years but no serious implementation took place yet. Hundreds of nuclear engineers have been graduated in Egypt and many of them are leaders in the field abroad with significant experience. Egypt needs to utilize that this human resource for the advancement of the Egyptian nuclear energy program.


Nuclear Energy as an Essential Element of a Sustainable and Environmentally Clean Energy Mix in Egypt
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Alexandria, Egypt
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Outline

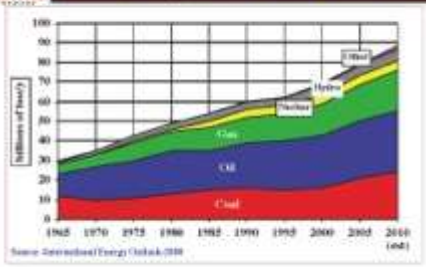
- Growing Energy Demand
- Need for Environmentally Clean Source of Energy
- Nuclear Power Growth and Advances
- Planning for Nuclear Power in Egypt

Energy is Fuel of Prosperity

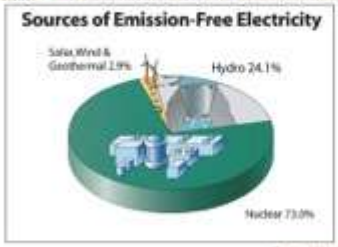
Population and Energy Usage

- **Population continues to increase worldwide**
  (US/Europe: <1%/yr; Asia: > 2%/yr; Egypt ~2%)
- **Energy usage is growing more rapidly**
  (US/Europe: >1%/yr; Asia: >8%/yr; Egypt ~5%)
- **Electrical energy use is also increasing**
  (US/Europe: >2%/yr; Asia: >5%/yr; Egypt ~6%)

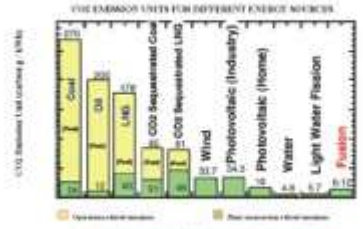
Fossil Fuels Still Account for Over 85% of the Primary Energy Consumed in the World



Nuclear Generates Most of US Emission Free Electricity

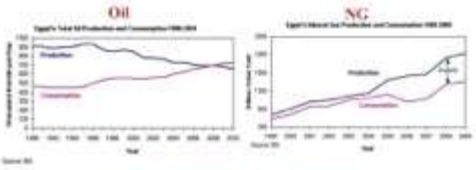


CO_2 Emission from Energy Sources



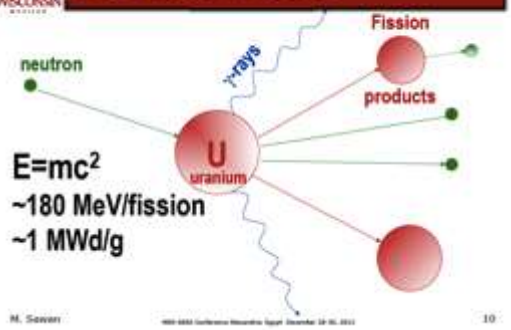
CO2 Emission in Egypt

Oil and NG Production and Consumption in Egypt

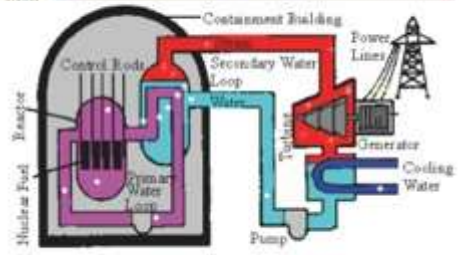


Hydro produces ~10% of electricity
NG produces ~85%
Oil produces ~5%
Wind/solar ~1%

The Fission Process

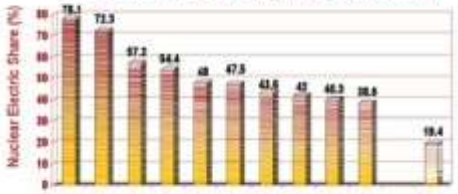


Pressurized Water Reactor

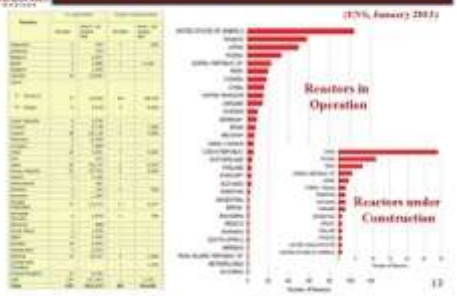


Who uses nuclear energy?

- 16% of world's electricity production



Nuclear Power Plants in the World



Public Perception of Nuclear Power

The Public Developed a Resistance to Nuclear Fission Power in the Late 20th Century

The resistance seems to be largely based on:

1) Fear of radioactivity releases
2) Uneasiness with long-term nuclear waste storage
3) Fear of proliferation of nuclear weapons grade material

All of the above problems stem from the nuclear reaction:

1) Radioactive fuel
2) Radioactive reaction products
3) Neutrons

Radioactive Emissions

"All radiological emissions from normal operations are monitored and contribute to a very small dose to the external environment equivalent to about 1% of the Natural Background Radiation and is continually decreasing"

Radiation Effects Facts

- *Background radiation exits (sun, cosmic rays, materials in soil and buildings) 300 mrem/y*
- *Acute doses in short time result in sickness and death*
- *No member of public received more than 1/3 year background equivalent after TMI accident. A person living there received less dose than a person in Denver for whole year*
- *Most casualties from atomic bombs resulted from heat and blast rather than radiation*
- *People living near coal plant receive 100 times more radiation than those living near nuclear plant*

Addressing Concerns with Nuclear Power

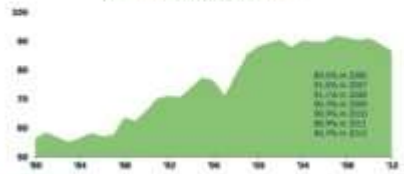
- Significant effort took place to alleviate the concerns with nuclear power by developing new generations of advanced nuclear reactors with innovative approaches
- Passive safety systems should be employed
- Fuel reprocessing and recycling could significantly reduce amount of high-level waste that needs deep geological burial
- Increased international collaboration is needed to explore options for addressing enrichment and reprocessing needs in ways that minimize public safety and proliferation risks
- It is essential to have independent autonomous regulatory agencies to ensure that required regulations are strictly implemented during construction and operation
- Development of simplified, standardized reactor designs that would expedite licensing and construction will greatly improve the economical attractiveness of nuclear power

Generations of Nuclear Power

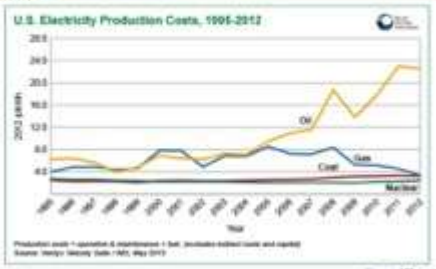
Capacity Factors Improved

Sustained Reliability and Productivity

U.S. Nuclear Capacity Factor, Percent



Cost of Electricity



Safety History

- 1979: Three Mile Island
  - Reactor valve malfunctions
  - Small radioactivity release
  - No radiation-related health impacts
  - Economic disaster for owner
- 1986: Chernobyl
  - Flawed reactor design & operations
  - Large radioactivity release
  - 50-1000 radiation-related deaths/illnesses
  - Regional socio-economic catastrophe

Fukushima (11 March 2011)

- The Fukushima nuclear facilities were damaged in a magnitude 9 earthquake centered offshore of the Sendai region
  - Plant designed for magnitude 8.2 earthquake
- Serious secondary effects followed including a significantly large tsunami (>factor of 3 of design limit of 20 ft), significant aftershocks and fires at many industrial facilities
- Chernobyl released over 10 times more radioactive material over a few days due to the explosion
- Earthquake and Tsunami damage was extensive (25,000 dead/missing; disaster costs range from $500b - $1000b)
- Fukushima accident has not caused any loss of life but is estimated to cost 5-10% of this total damage (estimate of latent cancers ~100 out of 10's millions)
- Several lessons learned from the disaster

GEN IV International Forum (GIF)

- The GEN IV International Forum (GIF) was initiated in 2000 to investigate innovative nuclear energy system concepts for meeting future energy challenges
- GIF members include Argentina, Brazil, Canada, France, Japan, South Africa, South Korea, Switzerland, United Kingdom, and United States

GEN IV Nuclear Systems

- Member countries of GIF commit to joint development of the next generation of nuclear technology for deployment between 2020 and 2030
- GEN IV is widely recognized as an R&D program for reactors with advanced features well beyond the GEN III+
- Primary goals for GEN IV development are:
  - *Improve nuclear safety*
  - *Improve proliferation resistance*
  - *Minimize waste and natural resource utilization*
  - *Decrease the cost to build and run such plants*

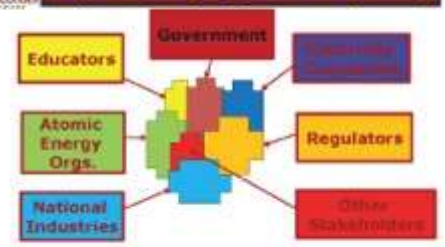
Six Generation IV Nuclear Energy Systems

1. Gas-Cooled Fast Reactor System	GFR
2. Lead-Cooled Fast Reactor System	LFR
3. Molten Salt Reactor System	MSR
4. Sodium-Cooled Fast Reactor System	SFR
5. Supercritical-Water-Cooled Reactor System	SCWR
6. Very-High-Temperature Reactor System	VHTR

Planning for First Nuclear Power Plant

- "A nuclear power program is a major undertaking requiring careful planning, preparation and investment in **time** and **human resources**. While nuclear power is not alone in this respect, it is considered different because of the **issues associated with the possession and handling of nuclear material.**"

Nuclear Energy Program Implementing Organization (NEPIO)



Government

- **Ministry of Electricity and Energy**
- **Ministry of Higher Education and Scientific Research**
- **Ministry of Finance**
- **Ministry of Foreign Affairs**
- **Ministry of State for Environmental Affairs**
- **Ministry of Defense and Military Production**
- **Ministry of Trade and Industry**
- **Ministry of Military Production**

Nuclear Organizations

- **Egyptian Atomic Energy Authority:**
  - -The Nuclear Research Centre (NRC)
  - -The Hot Laboratories and Waste Management centre (HLWMC)
  - -The National Centre for Radiation Research and Technology (NCRRT)
  - -The National Centre for Nuclear Safety and Radiation Control (NCNSRC)
- **Nuclear Material Authority.**
- **Other Research Centers**

Regulators

- **Nuclear and Radiation Control Authority (NRCA) replaced National Center for Nuclear Safety and Radiation Control (NCNSRCA):**
  - **Law passed by The People's Assembly in March 2010.**
  - **Bylaw of NRCA signed by PM in October 2011.**
  - **Structure of NRCA is not known yet!!**

Universities

There is no shortage of Engineers at the moment.

- **Nuclear Degree offered:**
  - Nuclear Engineering (only Alexandria University) 916 graduated 1967-2007
- **Relevant Degrees offered:**
  - Physics
  - Material science and engineering
  - Mechanical, Electrical, Computer, Civil, Chemical

Egypt Nuclear Timeline

- Establishment of Atomic Energy Committee 1955
- Establishment of Atomic Energy Authority 1957
- Operation of first research reactor (2 MW) 1961
- International bidding for NPP, PWR 150 MWe (1) 1964
- Limited international bidding for NPP 600 MWe (2) 1974
- Establishment of Nuclear Power Plants Authority (NPPA) 1976
- Selection of EL-Dabaa site for NPPs 1980
- International bidding for two PWR 900 MWe (3) 1983
- Chernobyl disaster, Ukraine April 1986
- Operation of second research reactor (22MW) 1998
- Revival of NPP Program 2006
- Contract for 10 years consulting services – Worley Parsons 2008
- Nuclear and Radiation Safety Law 2010
- The 25 January 2011 Revolution
- Fukushima disaster, Japan March 2011

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Egypt Needs to Utilize Human Resources in Nuclear Field

- Egypt had an ambitious nuclear power program for the past 50 years but no serious implementation took place yet
- Hundreds of nuclear engineers have been graduated in Egypt and many of them are leaders in the field abroad with significant experience
- Egypt needs to utilize this human resource for the advancement of the Egyptian nuclear energy program

Summary and Conclusions

- With growth of world population and rapid increase in energy demand to meet human development needs, it is essential to ensure energy sources for the 21st century and beyond that are environmentally clean and economically attractive
- Nuclear energy is by far the largest source of carbon-emission-free electricity production
- To alleviate concerns about safety, waste disposal, nuclear weapon proliferation, high capital cost, and long construction time, significant effort is underway to develop new generations of advanced nuclear reactors
- With dwindling fossil fuel resources in Egypt and enhanced demand for energy, nuclear energy should play a major role, along with renewable sources, in the future energy mix
- Egypt needs to utilize the vast human resource of Egyptian nuclear experts for the advancement of the Egyptian nuclear energy program

Novel approaches for biofuel production from Lignocellulosic biomass

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Oklahoma State University, Stillwater, OK USA

Lignocellulosic biomass is the raw, non-edible plant biomass that is mainly composed of sugar (cellulose and hemicellulose) and aromatic (lignin) polymers. Generally, lignocellulosic biomass could be virgin biomass (the naturally occurring vegetation within an environment), Crop-waste biomass (the inedible fraction of various crops such as Corn stover, wheat straw, and rice straw), and dedicated energy crops (plants that are planted usually once for the sole purpose of harvesting for energy production such as switch grass). Collectively, lignocellulosic biomass is a vast and underutilized resource for the production of biofuels. In spite of its promise, multiple hurdles need to be overcome to render the process economically feasible. We are utilizing an anaerobic fungal isolate (*Orpinomyces* sp. strain C1A) as a novel platform for biofuel (ethanol) production from lignocellulosic biomass. The scheme involves utilizing a defined co-culture of strain C1A with a dedicated sugar fermenter e.g. *Saccharomyces cerevisiae* for direct, high-titer single step production of biofuel from lignocellulosic biomass. We demonstrated the feasibility of this process on switchgrass and corn stover. In addition to the economic relevance of this approach, it has an important environmental relevance since it could be used for the conversion of available crop waste in Egypt such as rice straw into biofuels.

Coal Production Challenges in Egypt

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Abstract
Coal is the main source for power generation around the world. Coal is present in Egypt in El-Maghara mine in Sinai. However, coal production is stopped due to the difficulty in removing associated pyritic gangue which makes it not suitable for coke industry in addition to its low rank. The fine dissemination of pyrite in coal represents the main difficulty for coal beneficiation using conventional gravity techniques and raises the need for an alternative process. Advanced centrifugal gravity technique, bio-processing, and column flotation may be considered potential techniques to overcome this problem but all these techniques need ultrafine grinding of El-Maghara coal to less than 20 micron.

Coal liquefaction or gasification could represent strong options for the Egyptian coal. Coal can be converted into liquid fuels like gasoline or diesel by several different processes. By coal gasification, the produced syngas can be cleaned-up relatively easily leading to cleaner burning than burning coal directly (the conventional way).

On the other hand, the presence of appreciable amounts of resinous materials reached about 15% by wt. in El-Maghara coal represents an added value components that never been utilized so far. Until now, there is no method proved technically and economically feasible to recover these valuable materials. The resin value is larger than that of coal and it is very crucial to develop a technique to solve this issue which will have a good impact on the national economy and the coal industry in Egypt as well.

1. Introduction

Coal is a fossil fuel formed in ecosystems where plant remains were saved by water and mud from oxidization and biodegradation. Coal is a readily combustible black or brownish-black rock. It is a sedimentary rock and it has different ranks. The kinds of coal, in increasing order of alteration, are lignite (brown coal--immature), sub-bituminous, bituminous, and anthracite (mature). Coal starts off as peat. Under the effect of time, heat, and burial pressure, it was metamorphosed from peat to lignite. Lignite is considered to be "immature" coal at this stage of development because it is still somewhat light in color and it remains soft. As time passes, lignite increases in maturity by becoming darker and harder and is then classified as sub-bituminous coal. As this process of burial and alteration continues, more chemical and physical changes occur and the coal is classified as bituminous. At this point the coal is dark and hard. Anthracite is the last of the classifications, and this terminology is used when the coal has reached ultimate maturation. Anthracite coal is very hard and shiny.

The degree of alteration (or metamorphism) that occurs as coal matures from peat to anthracite is referred to as the coal “rank”. Low-rank coals include lignite and sub-bituminous coals. These coals have lower energy content because they have low carbon content. They are lighter (earthier) and have higher moisture levels. As time, heat, and burial pressure all increase, the rank does as well. High-rank coals, including bituminous and anthracite coals, contain more carbon than lower-rank coals which results in a much higher energy content. They have a more vitreous (shiny) appearance and lower moisture content then lower-rank coals.

However, coal is composed primarily of carbon along with assorted other elements, including sulfur and silica. Carbon forms more than 50 percent by weight and more than 70 percent by volume of coal (this includes inherent moisture). This is dependent on coal rank, with higher rank coals containing less hydrogen, oxygen and nitrogen, until 95% purity of carbon is achieved at anthracite rank and above. Graphite formed from coal is the end-product of the thermal and diagenetic conversion of plant matter (50% by volume of water) into pure carbon. Other constituents of coals include mineral matter, usually as silicate minerals such as clays, illite, kaolinite and so forth, as well as carbonate minerals like siderite, calcite and aragonite. Iron sulfide minerals such as pyrite are common constituents of coals. Sulfate minerals are also found, as in some form of salt, trace amounts of metals, notably iron, uranium, cadmium, and (rarely) gold. Methane gas is another component of coal, produced from methanogenesis. Methane is a valuable by-product of some coal mining operations, serving as a significant source of natural gas.
Some of the macerals of coal are:
vitrinite: fossil woody tissue, likely often charcoal from forest fires in the coal forests
fusinite: made from peat made from cortical tissue
exinite: fossil spore casings and plant cuticles
resinite: fossil resin and wax
alginite: fossil algal material

The classification of coal is generally based on the content of volatiles. However, the exact classification varies between countries. Coal is the largest single source of fuel for the generation of electricity world-wide, as well as the largest world-wide source of carbon dioxide emissions, slightly ahead of petroleum and about double that of natural gas.

1. Coal Occurrences in Egypt

As per world coal association data published in 2011, coal provides 30.3% of global primary energy needs and generates 42% of the world's electricity. The total global production was 7678 Mt. China is the main producer with approximately half of the world production followed by United States then India.

Figure 1. World Coal Deposits

In Egypt, coal is located in western desert, eastern desert, and Sinai Peninsula at three main localities, Beda and Thora, Ayun Musa and El- Maghara, Figure 2. The coal outcropping along the northerly flank of El-Maghara anticline is the main source of coal in Egypt. Its mineable reserves as proved by exploratory drilling amount to 50 million tons, where inferred reserves may eventually estimated at 130 million tons. The coal of the Maghara mine in the Sinai Peninsula represents a rare occurrence of a Jurassic coal deposit. The access to the coal deposit is available from Ismailia on the Suez Canal and from El-Arish on the Mediterranean (Nakhla, 1988). Coal deposits exists in smaller quantities in western desert (in Abu-senan, Abu Rawash, and Borg El-Arab, El-Khatatba, Geeb Afia) and eastern desert (in Edfu, and Abu-Regal).

Figure 1. Occurrence of Coal in Egypt

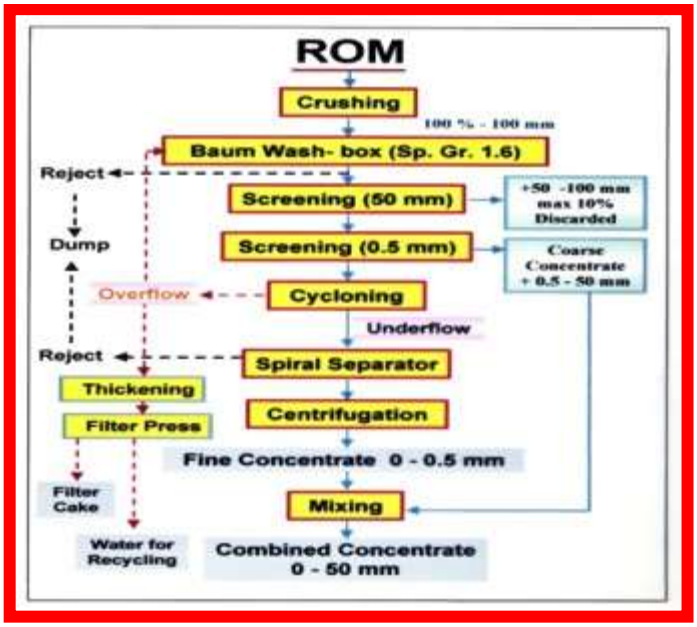

Figure 3. El-Maghara Coal Preparation Plant Flowsheet

El-Maghara coal contains a substantial amount of resin whose value is much more worthy than the coal as a fuel. The fossil resins, are the most valuable material associated with coal. They

represent a large group of valuable natural resins. The absence of economic technology to recover these resins led to losing them during coal burning. Recently, the attention is paid to find an economically feasible technique to separate the fossil resin from coal.

2. Coal & Resin Beneficiation

2.1. Coal Processing

Coal preparation plants generally use gravity processing techniques to beneficiate coal from the undesirable minerals due to the difference in specific gravity between the coal (1.35-1.5g/cm^3) and its gangue minerals (2.1-2.3g/cm^3), in addition to their potential benefits in terms of energy savings and environmental impact. Heavy Media is the most popular method to clean coarse sizes followed by jig plants as the second most common method used for this purpose. On the other hand, heavy media cyclones are being used more often for finer size fractions, where as spirals are generally used for middle sizes (10 - 60 meshes), (Leonard and Mitchell, 1968).

Coal preparation improves raw coal by reducing its content of inorganic impurities (the mineral matter). The most common criterion of processing quality is that of ash, which is not removed as such from coal during beneficiation processes; instead particles with a lower inorganic matter content are separated from those with a higher inorganic matter content. The constituents of ash do not occur as such in coal but are formed as a result of chemical changes that take place in mineral matter during the combustion process. The ash is sometimes defined as all elements in coal except carbon, hydrogen, nitrogen, oxygen, and sulfur.

Sulfur, the other main gangue material associated with coal, is probably the one constituent in coal that most affects coal marketing. Sulfur may be of organic or inorganic nature. Inorganic sulfur is mainly occurring in the form of pyrite mineral (FeS_2) and Pyrrohtite (FeS). El-Maghara coal is a complex and heterogeneous material incorporating a variety of minerals in different forms, where silicates and carbonates constitute the major ash-forming minerals. The principal sulfur-bearing minerals in coal are pyrite and marcasite (FeS_2). Other sulfide minerals, elemental sulfur and calcium as well as iron sulfates are found as minor constituents, while a considerable portion of the sulfur content may be organic in the form of alkyl and aryl thiols.

Desulfurization of coal is carried out through chemical processing using different leachants (iron and copper sulfate) and oxidizing agents such as H_2O_2 and O_2 (Mixon and Vermeulen 1981; Prasassarakich and Pecharanond, 1992; Yaman etal., 1995; Prayuenyong, 2002). Chemical desulfurization is a technique to remove both inorganic and organic sulfur.

Flotation and microbial beneficiation have been considered the most potential techniques for desulfurizing coal (Nikitin et al., 1981; Mistrik et al., 1982; Petukhov etal., 1988; Ichinose etal., 1988; Sen et al., 1991; Setfanova et al., 1991; Choudhry and Aplan, 1992; Dogan and Celedk; 1992).

Both flotation and microbial beneficiation partially separate pyritic sulfur from coal, while organic sulfur, which is chemically bound to the organic structure, can be removed only through chemical reaction. Additional problems of separation by flotation result from similarity in the surface properties of un-weathered coal and fresh coal pyrite. An efficient sulfur removal is difficult to be reached since both materials are hydrophobic.

Distinction between inorganic and organic sulfur is of great importance. The inorganic sulfur content in coals can be reduced by physical separation methods, and since the content of sulfates is negligible, the pyritic sulfur content can also be determined from a linear function between total sulfur and ash contents.

Pyrite density is 5.2 and with coal density being in the range from 1.3 to 1.5, gravity separation methods are quite efficient in separating coal particles from pyrite particles. Due to the relatively high density of pyrite, even small amounts of pyrite are sufficient to increase the density to a point so that coal particle can be rejected. Therefore, particles containing small amounts of pyrite are more easily rejected by density processes than surface-based processes such as flotation.

However, the efficiency of separation by gravity methods falls rapidly for particles finer than 100 micrometers. While separation of pyrite from other sulfides is commonly carried out by flotation and several selective pyrite depressing agents have been developed to aid selectivity in such differential flotation processes, these agents were found inefficient when used in coal flotation. As a result, coal desulfurization depends critically on liberated pyrite particle size, and hence on dissemination of pyrite in coal. It is worth noting that the degree of required liberation will vary depending on (i) the type of utilized separation process and (ii) the type of mineral to be rejected.

2.2. Resin Separation

Most coal deposits around the world contain variable amounts of fossil resins which are considered value-added materials varied in their chemical structures and properties and accordingly to their numerous industrial applications (Benemelis, 1990; Irwin, 1990; and Poinar, 1991).
Macroscopic fossil resins are friable solids with colors changing from yellow to dark brown and a melting point in the range of 140-178^{o} C. Their density is about 1.0369 g/ cm^{3}. Due to unique physicochemical properties, fossil resin can compete in the market with synthetic resin. The main market is the printing industry, where fossil resin is a valued additive especially in offset ink compositions, and has particular advantage in high speed printing technologies. Other possibilities of resin utilization are adhesives, rubber, paint, coatings and thermoplastic industries. Consequently, the value of coal containing these fossil resins is much higher than its value as a fuel, (Crelling et al., 1982; Crelling et al., 1991; Crelling et al., 1990; Miller et al., 1991; Yu et al., 1992; Irwin, 1997; Miller, 1997; Mwuzelaar; Yu Q., 1991). It appears that those fossil resins are derived from terpenoid plant resins and are associated with other coal macerals in the coal seams are of predominantly aliphatic character when compared to normal bituminous coal (Miller et al., 1993; Meuzelaar et al., 1991). Four macroscopic fossil resin types were distinguished by their color i.e. light-yellow, orange, light-brown and dark-brown, and were physically isolated by hand-sorting. The differences among the four hand-sorted fossil resin types have already been recognized and quantitatively categorized on the basis of their major bulk and surface characteristics (Yu Q., 1991; Miller et al., 1991; Miller et al., 1993).

Fossil resinous materials are partially lost during coal preparation and the rest are destroyed during the combustion of the coal in power stations. Macroscopic identification as well as physical diagnosis of solvent refined resinite material proved its particular significance and of

sufficient value to justify a fossil resin industry in Egypt, (Ibrahim, and Mostafa, 2003). The presence of fossil resin in the Egyptian coal makes it much more valuable. These fossil resins have thermosetting properties superior to most synthetic resins available from the petrochemical industry. This feature has become of particular significance today due to the development of high-speed printing. As another example, fossil resins in coal have a higher B.T.U value than other coal macerals and are easiest to be liquefied, (Murchisom, 1976; Miller, 1994).

Table 1 Types of resinous material in coal

Resin Type	Density, g/cm3	Molecular Weight
yellow	1.037	1140
Amber	1.042	1170
Light Brown	1.049	1350
Dark Brown	1.054	1500
Coal	1.293	---

Several techniques had been applied in resin separation from El-Maghara coal although none of these techniques proved to be technically feasible. Some of the results obtained will be discussed as follows:

2.2.1. Heavy Media

Sink-float, by heavy media separation method of fossil resin from coal was carried out. Different coal sizes (-0.85+0.25, -0.25+0.08 and -0.08 mm) representing 66.63%, 26.79% and 6.58% by weight, were separated in heavy media solutions of $ZnCl_2$ of increasing density from 1.1 up to 1.5 gm/cm^3. Process optimization of the sink-float test were carried by varying the levels of its main parameters such as particle size of coal feed, pulp density of media, method of separation and rate of feed.

2.2.2 Jigging

The gravity separation of fossil resin from El-Maghara coal was attempted by jigging separation method using "Denver" mineral jig size 1-M. Process optimization of this separation method was conducted by varying the main parameters of the jigging process such as stroke, thickness and size of artificial bed, rate of flow of pulp, pulp density, rate of coal feed and particle size of coal feed as well as technique of separation and method of cleaning.

2.2.3. Shaking Table

Gravity separation of fossil resin from El-Maghara coal tests were carried out using "Wilfley" shaking table. Process optimization of this separation was conducted for different size fraction (-0.85+0.08 mm) and (-0.25+0.08 mm) and feeding rate of (10 Kg/h), (17%) solids, motor speed (280 rpm), stroke (12 mm) and inclination (10^o). This technique of separation and cleaning process were conducted.

2.2.4. Froth Flotation

The main bulk of the crushed coal sample was subjected to further size reduction by crushing in jaw crusher followed by roll crusher. The sample was further crushed in a "Denver" roll crusher followed by dry screening in closed circuit. The crushed product was ground to (100% -0.15 mm). The ground samples were directed to flotation. The pre-concentrate of the gravity

concentration method at optimum conditions was ground further to (100% -0.15, 0.75, 0.45 mm) (-100, 200, 350 mesh). These finely ground products were subdivided into representative samples and directed to flotation. Process optimization of the main parameters of flotation of fossil resin from coal was assessed in terms of variations in the metallurgical performance of the flotation cell with respect to recovery and grade of fossil resin in the concentrate and the tailing. Parameters affecting the flotation process were investigated. Process optimization of the main working parameters of the flotation process of El-Maghara coal was conducted. These parameters are usually particle size of feed, pulp density, type and dosage of modifiers and frothers, air flow rate, impeller speed, methods of reagents additions, methods of cleaning and pulp temperature.

3. International Prices of Fossil Resins

Generally, fossil resin products have market value depending on its color and softening point. For example the Indian natural resin FOB price is about $1400-2100/ton (Reference). Due to the lake of separation technologies for the efficient recovery of fossil resins from coal and competition from synthetic resins, on the other hand, this valuable resource has been wasted by being burned with coal for electric power generation (Benemelis, 1990; Irwin, 1990; Miller, 1995; Rosin, Hydrocarbon Resins Seen Growth Area for "90's", 1989).

An example of Valuable Aliphatic Resins

Amber (fossil resin):

- Chemical formula: $C_{10}H_{16}O$ (succinite), bears succinic acid (3-8%), common fossil remnants of flora and fauna (mostly insects).
- Colour: from almost colourless through yellow, red, brown, bluish to black (rare). Most common are yellow and orange ("amber") colours of various saturation, what depends on th admixture of the organic pigments.
- Hardness: 2 - 3 according to the Mohs's scale, sometimes as low as 1,5. Brittleness varies significantly. The values of the absolute hardness varies for succinite from 17.66 to 38.40 kg per sq mm, for the "bone" amber 20 kg per sq mm, for "bastard" amber 25 kg per sq mm, for Carpathian amber 26 kg per sq mm.
- Melting temperature of succinite is 340 to 360°C.
- Density: 1.07 +/- 0.2; plastic.
- Cleavage: absent.
- Transparency: from transparent to opaque.
- Shine: glassy, resinous, fatty.
- Refractive index: n = 1.540

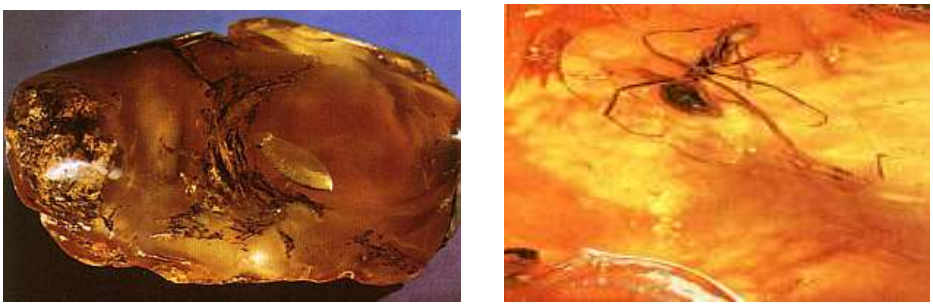

Figure 3. [A] Amber, lump 7.5 cm long, Kaliningrad region, [B] Amber with an embedded insect 30 mm long, Kaliningrad region.

4. Processing difficulties due to mineralogical nature of El-Maghara coal

Although macerals are the main components of coal but also coal may contain ash such as, clays, quartz, pyrite, etc. In this study, the samples were examined under polarized microscope as thin and polished sections in transmitted light for thin sections and reflected light for polished sections. In thin sections; vitrinite or wood tissue is the most common component, it appear in red, reddish black color enclosing all other components. Liptinites are represented by (pollens & spores) which appear in ordinary light, in elongate or blobs shape with golden yellow to orange yellow color and (cuticles) which appear in long elongated form with zigzag and peaked internal wall and roughly smooth on other samples and (resinous) materials witch appear in golden yellow color and in many cases related to definite canal may be resin canal and appear as successive layer or two stages old phase penetrate by younger phase through the resin canal. Resinous material show variety of degree of yellow color from golden yellow to brownish yellow and also some appear clear yellow and others appear cloudy by more brownish yellow matter which suggests two types of resinous materials aromatic and aliphatic. Inertinite appear as fusinite with cellular texture with yellow to golden yellow color and cell's cavities filled with opaque minerals, and in many cases the cells replaced by silica during silicification of wood.

Ash represented in the petrography sections as quartz which appears to fill fractures passing through wood tissue, or around opaque minerals; mainly pyrite; or replacing cellular structure of fusinite. Quartz show different degree of crystallinity between cryptocrystalline to nearly macro crystalline quartz which suggests many stages of replacement and alteration. In the polished sections wood tissues appear in gray color and pyrite showed as framboidal type with spherical shape or framboid habit, with golden yellow color or yellowish white according to the microscopic lighting, many of framboids packed and concentrated to form polyframboid structures.

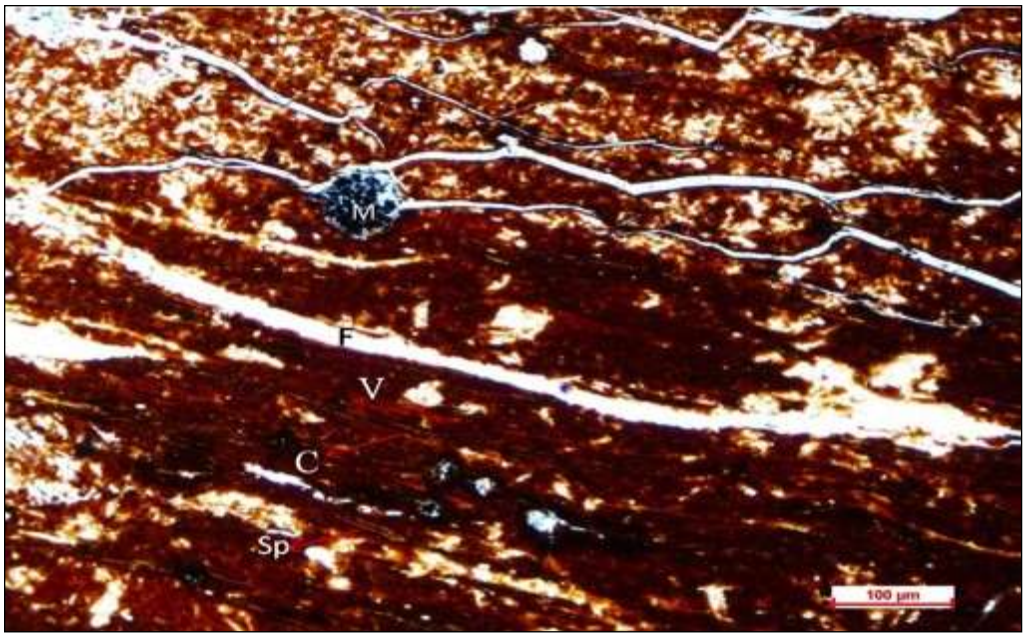

Figure 4.

In the photo, vitrinite appear in red color (V), Liptinie in forms of cuticle which appear in orange yellow color and large elongate shape and pollens and spores (Sp) which appear in elongate or blobs shape, fractures filled with quartz mainly in cryptocrystalline form (F), and opaque minerals (M) which may be framboidal pyrite,PPL.

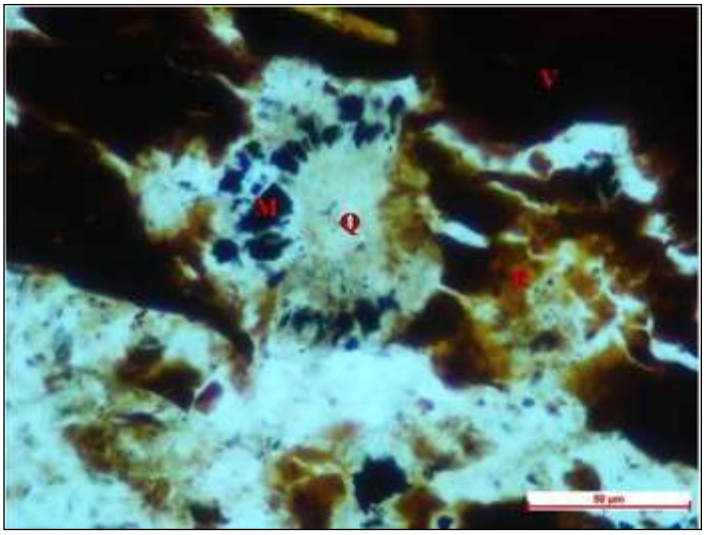

Figure 5.

Photos show , (R) resin in yellow color or brownish yellow, (Q) quartz minerals, (M) opaque minerals mainly pyrite, found as aggregates, condense or ordered representing initial stage in the formation of framboid shape, and (V) vitrinite (wood tissue) in reddish black color, PPL.

5. Other Technologies that does not need beneficiation to be investigated

5.1. Underground Coal Gasification

Coal gasification breaks down the coal into its components, usually by subjecting it to high temperature and pressure, using steam and measured amounts of oxygen. This leads to the production of syngas, a mixture mainly consisting of carbon monoxide (CO) and hydrogen (H_2). In the past, coal was converted to make coal gas, which was piped to customers to burn for illumination, heating, and cooking. At present, the safer natural gas is used instead. South Africa still uses gasification of coal for much of its petrochemical needs.

Gasification is also a possibility for future energy use, as the produced syngas can be cleaned-up relatively easily leading to cleaner burning than burning coal directly (the conventional way). The cleanliness of the cleaned-up syngas is comparable to natural gas enabling to burn it in a more efficient gas turbine rather than in a boiler used to drive a steam turbine. Syngas produced by gasification can be CO-shifted meaning that the combustible CO in the syngas is transferred into carbon dioxide (CO_2) using water as a reactant. The CO-shift reaction also produces an amount of combustible hydrogen (H_2) equal to the amount of CO converted into CO_2. The CO_2 concentrations (or rather CO_2 partial pressures) obtained by using coal gasification followed by a CO-shift reaction are much higher than in case of direct combustion of coal in air (which is mostly nitrogen). These higher concentrations of carbon dioxide make carbon capture and storage much more economical than it otherwise would be.

5.2. Liquefaction

Coals can also be converted into liquid fuels like gasoline or diesel by several different processes. The Fischer-Tropsch process of indirect synthesis of liquid hydrocarbons was used in Nazi Germany for many years and is today used by Sasol in South Africa. Coal would be gasified to make syngas (a balanced purified mixture of CO and H_2 gas) and the syngas condensed using Fischer-Tropsch catalysts to make light hydrocarbons which are further processed into gasoline and diesel. Syngas can also be converted to methanol, which can be used as a fuel, fuel additive, or further processed into gasoline via the Mobil M-gas process.

A direct liquefaction process Bergius process (liquefaction by hydrogenation) is also available but has not been used outside Germany during World War I and World War II. Several other direct liquefaction processes have been developed, among these being the SRC-I and SRC-II (Solvent Refined Coal) processes developed by Gulf Oil and implemented as pilot plants in the United States in the 1960s and 1970s.

Another direct hydrogenation process was explored by the NUS Corporation in 1976 and patented by Wilburn C. Schroeder. The process ultimately yielded a synthetic crude product, Naphtha, a limited amount of C_3/C_4 gas, light-medium weight liquids (C_5-C_{10}) suitable for use as fuels, small amounts of NH_3 and significant amounts of CO_2.

Yet another process to manufacture liquid hydrocarbons from coal is low temperature carbonization (LTC). Coal is coked at temperatures between 450 and 700°C compared to 800 to 1000°C for metallurgical coke. These temperatures optimize the production of coal tars richer in lighter hydrocarbons than normal coal tar. The coal tar is then further processed into fuels.

All of these liquid fuel production methods release carbon dioxide (CO_2) in the conversion process, far more than is released in the extraction and refinement of liquid fuel production from petroleum.

Coal liquefaction is one of the backstop technologies that could potentially limit escalation of oil prices and mitigate the effects of transportation energy shortage. This is contingent on liquefaction production capacity becoming large enough to satiate the very large and growing demand for petroleum. Estimates of the cost of producing liquid fuels from coal suggest that domestic U.S. production of fuel from coal becomes cost-competitive with oil priced at around 35 USD per barrel, (break-even cost). This makes coal a viable financial alternative to oil for the time being, although current production is small.

6. Concluding Remarks

Coal remains the largest source for power generation around the globe. Egyptian production from El-Magahara coal has stopped working due to economic and technical problems. Mineralogical studies showed that the fine liberation size makes coal cleaning from associated gangue minerals, especially sulphur bearing minerals, mainly pyrite a very difficult task. Liquefaction or gasification of El-Maghara coal may represent feasible solutions. Another parallel approach to exploit El-Maghara deposit is to separate its resin content which represents a higher economic value than the coal itself. The current technologies are not capable of separating resin from coal due to its fine dissemination in the coal matrix. New techniques are needed to work efficiently at the ultra-fine size range separation for both sulfur and resin removal.

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Know – how and technology transfer of nano- inoculants addition to steel alloys for spare parts and castings manufacturing

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Low alloy and alloyed steel plays an important role in the modern industries. In order to overcome the high cost of repair and maintenance in different technological applications, plain carbon and high strength low alloy steel were replaced by high alloyed steel. This replacement solved many technological and economical problems and difficulties by increasing the corrosion resistance and improving the strength of structures by increasing the durability of the buildings. The tremendous increase in the cost of steel structure based industries laid to the necessity of improving the used chromium steel grades in order to improve their properties and consequently increase their durability and economic impact. In this study, the structure of high chromium steel is modified by fine SiC additions to improve the corrosion and mechanical properties of this grade. The microstructure, corrosion behavior in marine conditions and mechanical properties were investigated to evaluate the applied technique.

I. Theoretical consideration and technique interpretation

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I.1 Theoretical consideration

Metal materials are developing too fast. For improvement of their mechanical and service properties expensive alloying elements, with exhausted to a great extent possibilities, are used. Some problems, relevant to the microstructure defects in cast welded products as well as to their mechanical characteristics, that do not satisfy the practice needs are not resolved yet. One of the novel methods for metals and alloys properties improvement is the nanopowders or nanomodifiers (NMs) introduction in the liquid metal, followed by crystallization, known as modifying with NMs. NMs of high-melting-point components (nitrides, carbides, carbonitrides, borides etc.) are produced by plasmachemical synthesis and are covered with metal protector. They are featured by both high melting temperature (2273-3273 K depending on the composition) and nano-dimensions (<150 nm). They possess unique physical and chemical properties which could be used for advanced materials development as well as for improvement of the conventional ones. For a successful usage of the NMs it is necessary all the range of metallurgical, physical, chemical and other processes, occurring during casting and welding, to be well understood.

The main object of the work is to obtain knowledge on the behaviour and properties of the interface at the boundary of two different materials (nanomodifier - liquid/solidifying metal) and to use this knowledge for development of new technologies for the SME usage. A new knowledge concerning the cast and welded microstructure formation processes that occur on nano-scale at the interface will be generated. It is expected a model, describing the interface nanomodifier – alloy, to be created and solved by means of numerical methods. The solution and the model could be used for studying and design of high performance materials produced by casting and welding. Experimental investigations on the interface are expected to be performed both for gathering new data of the phenomena and mathematical model verification. The data

and knowledge obtained will be implemented for development of new technologies for producing of castings and welded joints.

Detailed S&T objectives are:

1. Study of the behaviour of interface at the boundary NM-liquid/solidifying metal.
2. Research and data acquisition for the structure modified with NMs.
3. Analysis and obtaining of new relations: mechanical characteristics-structure- NM for castings and welded joints of SME partners alloys.
4. Development of novel technologies for casting and welding with NMs for the SME purposes.

These objectives include theoretical analysis by means of theoretical modelling, both laboratory and industrial experiments. Validation of the models will be accomplished.

The main and the most important requirement is the deep understanding of the interface behaviour at the boundary of two different materials or materials phases. This requirement is specified in S&T objectives as follows: to investigate the interface nanomodifier - molten/solidifying metal. Another requirement of the theme is to propose advanced approaches for interface phenomena modelling, appropriate for high performance materials studying and design. Our project is addressed to creation of theoretical and experimental models for investigation of the interaction at the boundary nanomodifier – molten/solidifying metal. It is of great interest to model the system "nanomodifier - multicomponent liquid/solidifying alloy" using more simple models describing the system "nanomodifier – two component liquid/solidifying alloy". These models, in our opinion, would be appropriate for studying and design of high performance materials. In this instance, the high performance materials are those which have reached the limits of their operational characteristics but we expect surpassing these limits by nanomodifying. The focus of the project is on the modelling of the realistic systems in which nanomodifiers are added in the multicomponent alloys offered by the SME partners. The verification of the models by means of special experiments is envisaged in our project. The new knowledge obtained will be implemented in design and development of advanced technologies for the needs of SME partners. This guarantees the realizing industrial relevance and the impact effort of the work.

I.2 Progress beyond the state-of-the-art

Nano-powders of high-melting-point (nitrides, carbides, carbonitrides etc.) are obtained by plasmachemical synthesis [1-3]. It is reported that the application of such nano-powders has been realized to the modification of malleable and cast alloys, in the composition of ligatures for comminution of the modifying phases, in the composition of welding electrodes, and in composite materials [1].

In another investigation of Cr12 steel modifying by nano-dispersed powder of Si_3N_4 is carried out [2]. Reducing of the eutectic colonies in size is established. The eutectic cell becomes more equi-axial. The hardness of cast metal is higher in comparison with non-modified steels.

The basic problems of the initiation of solid phase in an alloy, modified with nano- powders are specified and considered [3-5]. It is shown that the mechanism of the effect of nano-particle on liquid and, later on solidifying metal is connected with the nano-particle size. The initiation of the solid phase starts on the nucleus of nano- particles. For describing the behaviour of the interaction "particle - crystal phase - liquid phase" it has to be considered the following basic parameters: parameter of wetting ability, relative energy of the nucleus free surface and its radius. The authors propose physical model for suspension building from nano-particles on ceramic powders, covered with cladding layer. Criterions for thermo-dynamical stability of such suspension are obtained on this basis and they are used for choosing a chemical composition of the

compounds with the most effective modifying ability. Approximate calculations for the diffusion solubility of modifying particles in an overheated melt are given. For the first time, in a theory of heterogeneous nucleus initiation, the influence of the force of linear tense, acting along the line of triple phase contact "nucleus - melt - substrate" on the process of nucleolus initiation is investigated.

The basic mechanism has been found in which the activated nano-particles influence upon the process of nucleus initiation. This process is provoked by the electrical field, consequence of ion-radical existing on the particle surface and of electrocontact interaction. On a base of the offered theory for volumetric-sequent heterogeneous crystallization of a binary alloy, the dependencies between the area of kinetic metastability and nano-particle size are investigated.

Investigations on the modifying effect of NM SiC in case of alloy CuAl9Fe3 when casting by centrifugal cast method are carried out [6]. In comparison with non- modified alloy a significant structure refinement is obtained. Structure refinement of casting alloys AlSi12, AlSi10Mg, AlSi7Mg, AlZn9Si7 etc. after modification by NM B_4C, SiC, TiCN and TaN is reported. The application of NM AlN for modification of AlSi7Mg alloy increases the tensile strength up to 26.2%. Also, NMs are used for the joints structure refinement at laser bonding as well [7]. The obtained results show the perspective ability of this method for improving the welded joint.

The method for out-furnace modification of cast irons and steels by ultra fine particles (non bigger than 100 nm) clad with metal-protector is patented [8]. It contributes to improve the mechanical and service properties of cast irons and steels.

AES analysis is ideal for studying solid-solid interfaces chemistry of the materials. Used in combination with another analytical techniques (HRSEM, HRTEM etc.) it gives valuable information about the interface regions. This approach is applied to Al- Si rapidly solidified alloys modified by Fe and nano-sized iron containing phase, altering significantly the initial structure, is registered [9].
The obtained experience in the area of production, properties and application of nano- scale materials are presented in the work of Dragieva et al [10, 11]. This experience gives a base for analysis and determination of the NM characteristics.

The experience in the modelling [12-14] will be very helpful for investigation of the behaviour of interface NM – liquid/solidifying metal at convection conditions.

Recently developed EBSD – method [15] allows description of the real 3-dimensional shape and crystal orientation. This method could be utilized for investigation of NM and its surrounding in the metal matrix.

The microstructure characterization of steels and aluminum alloys are important for every investigation in the field of metal sciences. Such methods and investigations are presented in the work of Lazarova et al [16-18].
The microstructure of Mg-Si-Al alloys modified with NM of TiCN as well as the unmodified microstructure is investigated by means of SEM/EDS, TEM/EDS, RDX and LM. It is found out that Mg_2Si phase size diminishes from 25-80 microns to 0.1-1.8 microns. The microhardness of the modified alloys is 314-428 HV, while the microhardness of unmodified alloys is 129-142 HV [19].

AltimEco corporation [20] reports the development of a novel Ti(C,N) NM for grey cast iron. The mechanical properties and the wear resistance of the modified cast iron increase to a degree when it can successfully and beneficially substitute high- chromium white iron. Both H13 steel structure refinement and hardness increase have been achieved by NM of Ni modification [21]. On this purpose a special NM of Ni - addition process is developed.
At this moment the powders of metal nano-particles are used for production of composite materials with improved strength, corrosion resistance and abrasive properties where the volume part of the powders can

be from 1 to 100% [22- 24]. Literature data for adding the metal nano-particles to the liquid metal where they combine with some of the elements in the melt and this leads to strengthening of the metal matrix are presented [25].

The following conclusions could be drawn from the presented above investigations:

1. Methods for using of different types of NMs exist and are developed. The improvement of the structure and properties of castings and welded joints is proved.
2. The theoretical investigations by means of modelling and experiments are insufficient. Satisfactory results about the solid phase nucleation on the nanoparticle are obtained. The investigation base of the interaction nanoparticle -crystal phase – liquid phase theory is laid. A physical model of suspension composed of nanoparticles is proposed.
3. Scientific work and patents concerning the modifiers of nano-sized ceramic particles clad with metal-protector have not been found. The partner's works are relevant to microstructure investigation, new alloys and casting and welding technologies design and modelling. The development of this knowledge as well as its application for the new objects of investigation will undeniably contribute for the successful project task solution.

We consider that as a result of developed by us project the following progress can be expected:

1. The stability of NM and the efficiency of the clad metal at durable stay of NM in overheated melt or welding bath will be determined.
2. A possibility for prognostication of the structure of alloys with NM and determination of the influence of the NM type and its concentration will be created.
3. SMEs will be founded, where the advanced casting and welding technologies with usage of NM, developed in this project, will be applied.
4. New knowledge concerning the interface NM – melt for different molten metals will be acquired.
5. New knowledge about the crystallization process of metal alloys in the presence of NM will be gained.
6. New knowledge about the structure and mechanical properties of modified with NM castings and welded joints, produced by the SME partners, will be obtained.
7. Advanced technologies for castings and welded joints using NM will be developed.

Moreover the application of different methods for modifying does not lead to good results in all cases. The strength increase leads to plasticity decrease. Using NM modification the increase of both strength and plasticity characteristics is expected. This is an important innovation.

The above innovations will be realized by development of models for physicochemical processes at the boundary NM-multicomponent melt and for the heterogeneous nucleation and growing of the solid phase on NM as well as the models mechanical characteristics-structure-NM. All the models together with the laboratory and industrial experiments contribute for the pointed progress.

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II. Technique application on chromium steel

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Fine SiC particles were added to the molten Cr steel with assuring of stirring and the system was hold for 4 minutes. SiC powders with the percentages 0.015, 0.025, 0.05, 0.1, 0,15 were added. The steel was tapped in cylindrical iron ingots. The produced steel ingots were hot forged into plate and squared rods with 85% reduction in area. The as cast structure, microstructure of forged steel, SiC distribution, hardness of forged steel, wear behaviour and SEM and EDS investigations were carried out to study the effect of SiC additives on the produced steel.

The obtained results showed that a good distribution of the additives was obtained. Although the results cleared also the positive effect of the amount of added SiC on the wear resistance and hardness of hot formed samples, the obtained improvement did not show a regular increase with increasing the amount of additives but it showed irregular behaviour.

Concerning the microstructure, the application of the technique of inoculants addition show a strong improvement in the grain size refinement process by adding SiC both in as cast as well as hot formed steels. The SEM study for hot formed steels showed that the SiC inoculant addition plays a strong role in the decreasing the grain size of the produced steel to the nano size level. On the other hand the EDS analysis confirmed the regular distribution of the SiC in the steel matrix.

Applied Research in The Area of Advanced Industrial Coatings Applications

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Corrosion control and surface protection department, Central metallurgical R & D I (CMRDI)

ABSTRACT

The coating technology provides advanced surface treatments to produce high performance materials for applications requiring significant wear and corrosion resistance. Corrosion control and surface protection department at CMRDI has experience in this field using different techniques such as Plasma spray, Hot- dip, Pack cementation, conversion coatings, electroplating, electroless.....etc. Recently, the centre for advanced coating technologies (CACT) will be dedicated to both fundamental and applied research in the area of advanced coating technology. The center activities will begin with the set up of plasma enhanced chemical vapor deposition system (PECVD) which is expected to last within six months. PECVD reactors have the advantage to operate under low temperature. The typical deposition temperature in PECVD can be reduced down to 200°C. The relatively low deposition temperature makes PECVD suitable for a wide range of substrates including tool steel and so that the deposition temperature is below the tempering temperature of tool steels therefore maintaining the required microstructure and properties of the substrate and minimizing distortion of the substrate. PECVD can also be used in a multitude of semiconductor wafer fabrication processes, including the production of amorphous and polycrystalline thin films, e.g. amorphous silicon for solar cell, polycrystalline silicon for gate contact, Si wafers used in electronics, deposition of SiO_2 and silicon nitride, etc. This technology is economically feasible for coating of different materials. The center scientific goals include:

- Initiation and enhancement of advanced coating and thin film technology in Egypt.
- Fabricating high performance thin films and coatings for metallurgical engineering, biosensors, microelectronics, solar cells and medical applications.
- Understanding fundamental aspects of the thin film hardness, toughness, adhesion and functionality.
- Transfer of advanced coating and thin film technology to Egyptian industries.
- Aspiring to be the leading center in thin films research.
- Additionally, it will conduct research in the area of Physical Vapor Deposition (PVD), and Laser Chemical Vapor Deposition (LCVD).

Energy Conservation Incentive Programs and Renewable Energy for the Egyptian Economy, the Canadian Experience

Dr. Mohamed Attalla, P.Eng., FCSCE
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The cost of producing, importing and distributing energy is one of the major challenges for the Egyptian economy. It is also one of the major drivers for the Egyptian economy reform. Energy conservation incentive programs play an important role in advancing energy conservation globally. It is very crucial for the Egyptian economy and particularly the energy sector to develop energy conservation incentive programs that encourage and motivate Egyptian institutions, industrial establishments and individual residents to take an active role and participate in energy conservation.

This paper will present the Canadian experience with its energy incentive programs for energy conservation as well as for the implementation of Renewable Energy measures as well as its applicability for implementation in Egypt.

The benefits of energy conservation in the Canadian program and the implementation of Renewable resources are self-evident from the documented results. Every dollar invested in energy conservation is estimated to result in two to three dollars in net savings over the life of the investment.

Financial energy incentives help move the economy towards energy conservation and has been shown in the Canadian Province of Ontario to yield significant results by allowing for realizing smart energy savings which would otherwise be cost-prohibitive for institutions in the competitive marketplace as well as residential energy consumers who have limited capacity for capital investments in energy conservation.

The Canadian Experience is very much applicable to the Egyptian market. Its application will save the Egyptian economy a large volume of investments and will help produce a sizable portion of its energy requirement from renewable

Development of Professional Science Master's Degree Program in Manufacturing Sustainability

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ABSTRACT

The main purpose of the Professional Science Master's in Manufacturing Sustainability (PSM-MS) is to provide an interdisciplinary educational teaching and learning platform for greening our future by educating tomorrow's workforce. It is intended for educating current students and professionals from manufacturing industry to promote knowledge and competencies related to manufacturing sustainability. The PSM-MS interdisciplinary approach will include a business background and concepts that are applicable across fields and as diverse as, environmental social policy, environmental economics, lean manufacturing and strategy for sustainability, energy management and alternative energy production.

NEED

Manufacturing Sustainability (MS) strategy could be considered developing technologies to transform resources into goods and services that respond to basic needs and improve the humans' quality of life. While being economically viable, manufacturing sustainability should also minimize the use of natural resources and toxic materials, the emission of waste and pollutants, and negative impacts to humans and the environment considered over the product life cycle. The success of Tennessee's manufacturers in global market remains challenged with reducing its carbon footprint, measuring and trading emissions and developing innovative, sustainable technologies.

Manufacturing has been and will remain as one of the principal means of creating wealth. According to the US Bureau of Economic Analysis report dated June 7, 2011: "Durable goods manufacturing led the recovery in U.S. real GDP by state in 2010; it was the leading contributor to real GDP growth in 29 states. Among those, durable goods manufacturing contributed more than o*ne percentage point to growth in Michigan, Wisconsin, and* ***Tennessee***." Several national and international automotive industries are contributing to Tennessee and southeast US economies. According to an NIST Blog posted September 29, 2011, by Tom Murray and called "Auto Suppliers Embrace E3 in Tennessee," E3 (Economy, Energy and the Environment) is an initiative jointly created by five Federal Agencies, including the Department of Energy**,** Environmental Protection Agency**,** Department of Labor**,** Small Business Administration and the Manufacturing Extension Partnership (MEP) of The National Institute of Standards and Technology, to help manufacturers implement Manufacturing Sustainability practices.

As Manufacturing Sustainability takes hold across the country, the demand for workforces who are trained to identify opportunities for improving process efficiencies and prevent environmental wastes will considerably increase. While some job candidates have a basic

knowledge of ***lean manufacturing techniques***, few realize how environmental wastes and pollution prevention relate to lean initiatives. TTU is taking a lead in filling this knowledge gap and meeting these demands by incorporating manufacturing sustainability concepts into the classroom. Meeting manufacturing sustainability goals requires a commitment to incorporate green manufacturing knowledge in the day-to-day activities of all manufacturing professionals, not just executives, managers, or process engineers. Integrating these course materials into the proposed PSM-Manufacturing Sustainability curriculum will help build our state and country's green workforce capacity, which will help revitalize our manufacturing sector and promote job growth.

IMPACT

As environmental issues become more complex due to population growth, pollution, and limited natural resources, the Professional Science Master's in Manufacturing Sustainability program will effectively prepare future professionals and current manufacturing practitioners in three focus areas: Business Management, Lean Manufacturing and Pollution Prevention, and Energy and Carbon. Through this effort, TTU will become recognized as a leader in Manufacturing Sustainability studies in Tennessee and the southeastern United States.

"**Sustainability will help us be a trusted partner in expanding in markets around the world. Our emphasis on resource efficiency positions us well to weather rapidly rising costs for energy and materials."**

— Alan Mullaly, *CEO of Ford Motor Company*

DIVERSITY STATEMENT

The University provides educational opportunities to all eligible persons without regard to age, gender, ethnicity, race, religion, national origin, disability, or sexual orientation. The institution is committed to an inclusive and diverse campus that enriches the educational experience, promotes personal growth and a healthy society, prepares students for success in a global economy, and enhances America's economic competitiveness. Professional Science Master's degree programs can increase diversity promotes student success in global economy and enhances America's economic competitiveness.

PLANS FOR ACCREDITATION:

(Identify the source and **projected date** of Professional accreditation if applicable; SACS notification, if required, and if a substantive change, the scope of the substantive change. If there are no plans to seek specialized accreditation, please provide reasons.)

The College of Engineering plans to seek recognition of the Professional Science Master's in Manufacturing Sustainability degree through the Council of Graduate Schools (CGS) as a concentration in a Professional Science Master's program at TTU. The Professional Science Master's is a unique professional degree grounded in natural science, technology, engineering, mathematics and/or computational sciences and is designed to prepare students for direct entry into a variety of career options in industry, business, government, or non-profit organizations. It is a distinctive advanced degree for those intending to pursue a career in the practice of science. Professional Science Master's programs prepare graduates for high-level careers in science that have a strong emphasis on such skill areas as management, policy, and entrepreneurship. A Professional Science Master's recognition provides assurance that the program conforms to nationally accepted criteria. Recognized Professional Science Master's programs agree to use the name "Professional Science Master's" and the Professional Science Master's logo on websites and other promotional materials. The following criteria must be met by Professional Science Master's programs:

1. The institution must be accredited by a regional accrediting association, or in the case of international applicants, a recognized organization or appropriate governing body that accredits or recognizes institutions of higher learning.
2. A program must have stated goals and learning outcomes appropriate to the particular degree.
3. The total number of credits must be at least equivalent to the minimal number required for a master's degree at the institution.
4. Programs must include the following three components:
    1. A majority of the course content in the natural sciences, technology, engineering, mathematics, and/or computational sciences.
    2. A professional skills component must be developed in consultation with leaders from the targeted

industry, business, government, or non-profit organizations.

3. An experiential component that must include at least one capstone project, supervised collaboratively by faculty and employers, evaluated or graded by faculty, and typically developed with an employer(s), which integrates the practical application of scientific and professional knowledge, behavior, and skills. The experiential component typically includes a structured internship and provides an opportunity for students to demonstrate proficiency in written and oral communication skills.

5. Program quality assurance must be provided using the faculty-based mechanisms normally used by the institution for graduate programs in order to ensure that the program is fully integrated into the academic offerings of the institution and that it is sustainable over time.
6. An active and engaged advisory board of leaders from industry, business, government, or non-profit organizations is required.
7. The program must collect annual data relative to enrollment, degrees, completion, and demographics; and the employment history of graduates should be tracked to help assess program outcomes.

Regular SACS accreditation standards will apply to the Professional Science Master's with a concentration in Manufacturing Sustainability program.

Curriculum

The program is designed for graduates of approved and hold a baccalaureate degree in sciences, technology, engineering or mathematics (STEM). Candidates not holding an appropriate baccalaureate degree may be required to complete necessary prerequisite courses prior to admission to the program. Thus, a baccalaureate degree is required for full standing. Applicants that have baccalaureate degrees in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses. Academic exceptions may be granted in exceptional circumstances for individuals with extensive professional experience or other background that, in the opinion of the admission committee, qualifies the candidate for admission.

Graduation requirements are successful completion of all course work and the capstone internship, with an overall GPA 3.0. Other graduation requirements can be found on TTU's graduate catalogue. TOTAL credits required for program are 33 credit hours and represent the three pillars of sustainability E3: Environment, Economy, and Energy as well as the social impact:

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1. **Business Courses (12 credit hours):**

The business courses are taught online and on campus via TTU's MBA program). These courses would be available to any PSM. The prerequisites, which are available on CD, will be met through the College of Business's modules that can be taken at the student's own pace and can be completed within a month, a week, or a weekend.)

Rubric/Number	Course Title	Credit Hours
BMGT6200	Organizational Leadership	3
MKT6100	Strategic Marketing	3
MATH6070	Applied Linear Statistical Methods I	3
ACCT6010	Accounting Information for Management Decisions	3

2. **Concentrations (18 credit hours):** (Identify and list courses in each concentration separately.)

Rubric/Number	Course Title	Credit Hours
EVSS6010	Environmental Social Policy	3
ECON5200	Environmental Economics	3
MET 5650	Lean Six Sigma Manufacturing	3
MET 6100	Manufacturing Strategy for Sustainability	3
MET 6200	Energy Management Principals	3
MET 6990	Internship	3

3. **Electives (3 credit hours):** Students will take one elective course in the student's area of Professional interest (subject to Graduate Advisory Committee approval). **Note:** The one-course elective allows students to choose a course to broaden or enhance their educational program.

Rubric/Number	Course Title	Credit Hours
CEE 6610	Applied Environmental Chemistry	3
EVSC 6010	Environmental Chemistry	3
ESS5300	Environmental Management Systems	3
MATH6170	Experimental Design I	3
MATH6180	Experimental Design II	3
MET 5060	CNC Concepts, Advanced Techniques & Applications	3
MET 5200	Industrial Electronics	3
MET 5210	Programmable Logic Controllers and Process Control	3
MET 5220	Industrial Automation and Robotics	3
MET 5300	Advanced CAD Techniques	3
MET 5310	Plant Layout and Materials Handling	3
MET 5400	Geometric Dimensioning and Tolerancing	3
MET 5430	Industrial Supervision	3
MET 5450	Rapid Prototyping	3
MET 5500	Tool Design	3
MET 5550	Maintenance, Replacement and Reliability Engineering	3
MET 5600	Product Design & Development	3

Appendix I

Course Listing and Prerequisites & New courses Syllabi

Course Listing and Prerequisites			
Course #	Title	Prerequisites/Description	Credit Hours
Business Core Courses			**12 CR**
ACCT 6010	Accounting Information for Management Decisions	Prerequisite: Analysis, interpretation, and use of accounting information by managers in directing the operations of organizations	3
BMGT 6200	Organizational Leadership	Prerequisite: An examination of behavioral concepts required for effective leadership within business organizations	3
MATH 6070	Applied Linear Statistical Methods I	Prerequisite: Consent of instructor. Regression analysis in the context of classical linear, nonlinear, generalized linear, and time series models.	3
MKT 6100	Strategic Marketing	Prerequisite: Strategic marketing issues and opportunities that impact both the marketing process and marking program. Decisions will also consider environmental variables as well as the internal elements of an organization.	3
Concentration			**15**
EVSS6010	Environmental Social Policy	Prerequisite: Consent of instructor. Social, political, legal and scientific issues that influence environmental policy decisions.	3
ECON 5200	Environmental Economics	N/A	3
MET 5650	Lean Six Sigma Manufacturing	Prerequisite: Senior or graduate standing in engineering, engineering technology or business. Review of current engineering and technology techniques relevant to manufacturing, service, quality and productivity. Design project required.	3
MET 6100	Manufacturing Strategy for Sustainability	Prerequisite: Consent of instructor. This course examines the concept of "Manufacturing Strategy for Sustainability" using green materials, methods and technologies that are energy efficient, sustainable and friendly to the environment. It will cover topics on carbon footprint management, sustainable manufacturing process design, and life-cycle assessment for industrial processes.	3
MET 6200	Alternative Energy Production	Prerequisite: Thermodynamics and heat transfer or consent of instructor. Principles and technical details of various renewable energy technologies (solar, biomass, wind, hydroelectric, geothermal, tidal and wave energy) for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy systems	3

Internship			3
MET 6990	Internship	The PSM designation requires the completion of an internship in a discipline-	3
		related to manufacturing sustainability, non-profit organization or government agency three credit hours in the internship is required for completion of the PSM designation. Hours beyond these may not be applied toward the degree. The internship component includes an extensive project that is approved and supervised by the student's on-site internship mentor and the student's advisory committee. This internship can be completed at the student's place of employment, and a student may participate in a paid internship.	
Elective(s)			**3**
CEE 6610	Applied Environmental Chemistry	Prerequisite: Consent of instructor. Theoretical concepts from inorganic, organic, physical, and biological chemistry as applied to the analysis of environmental engineering problems.	3
EVSC 6010	Environmental Chemistry	Prerequisite: Graduate standing in environmental sciences; one (1) year of chemistry. This is a broad based course applying the fundamentals of chemistry to the environment. This course cannot be taken for credit toward graduation by students with a concentration in chemistry.	3
ESS5300	Environmental Management System	The course is a case study that presents the student with the techniques, technologies, regulations, and strategies that define industrial pollution prevention. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MATH 6170	Experimental Design I	Prerequisite: Consent of instructor. Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs.	3

MATH 6180	Experimental Design II	Prerequisite: C or better in MATH 6170. Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model	3
		approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs.	
MET 5060	CNC Concepts, Advanced Techniques & Applications	Prerequisite: MET 3060. An in-depth study of programming systems, techniques and applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5200	Industrial Electronics	Prerequisite: MET 3200 . The fundamentals of process control, transducers, signal processing, feedback loops, activators, and analog and digital controllers. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5210	Programmable Logic Controllers & Process Control	Prerequisite: MET 5200 . Programmable logic controllers (PLC's) and automated process control; design and implementation of an automatic controlled industrial process. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5220	Industrial Automation & Robotics	Prerequisite: MET 3060 . Studies in the theory and application of industrial automation relating to manufacturing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5300	Advanced CAD Techniques	Prerequisite: MET 3301. An in-depth course using CAD as a design tool that examines multiview drawings, layers, dimensioning, blocks, and sectional views.	3
MET 5310	Plant Layout & Materials Handling	Prerequisite: MET 3301, MET 3710. An analysis of materials movement within industrial organizations. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3

MET 5400	Geometric Dimensioning & Tolerancing	Prerequisite: ENGR 1110 , MET 3301 . This course will cover the geometric conformance and tolerancing theory and application pertaining to ANSI/ASME Y14.5M-1994 via computer graphics and other electronic data systems for design, manufacture, verification, and similar processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5430	Industrial Supervision	Prerequisite: Senior. Supervisory	3
		responsibilities in an organization and procedures for meeting these responsibilities. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	
MET 5450	Rapid Prototyping	Prerequisite: MET 3301. This course prepares students to create a rapid prototyping file from a computer aided design file, determine the prototype for the model or part, and create a production plan for the part. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5500	Tool Design	Prerequisite: MET 2063, MET 3301 . This course covers an integrated treatment of tool design, specification and application by the use of standard tooling data. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3
MET 5550	Maintenance, Replacement & Reliability	Prerequisites: Senior or graduate standing in engineering, engineering technology or business. Reliability networks, failure mode and effect analysis, apportionment, availability, maintainability, fault trees and human reliability. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3

MET 5600	Product Design & Development	Prerequisites: Senior or graduate standing in engineering, engineering technology or business. This is a project-based course that covers modern tools and methods for product design and development. Topics include identifying customer needs, concept generation, product architecture, industrial design, and design-for-manufacturing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.	3

New Courses Syllabi

MET 6100-Manufacturing Strategy for Sustainability – Lec. 2. Lab 2. Credit 3.
Prerequisite: Consent of instructor. This course examines the concept of "Manufacturing Strategy for Sustainability" using green materials, methods and technologies that are energy efficient, sustainable and friendly to the environment. It will cover topics on carbon footprint management, sustainable manufacturing process design, and life-cycle assessment for industrial processes.

Textbook:

"Industrial Ecology and Sustainable Engineering" by T. E. Graedel and Braden R. Allenby, 1st edition, 2010 (ISBN 9780136008064, publisher: Prentice Hall).

Other Resources:

"Design for Environment: A Guide to Sustainable Product Development." 2nd edition, 2009 (ISBN 9780071605564, publisher: McGraw-Hill).

"Design for Environment, Second Edition: A Guide to Sustainable Product Development: Eco-Efficient Product Development" by Joseph Fiksel, 2nd edition, 2009 (ISBN 10:0071605568

Course objectives /expected learning outcomes

Upon completion of this course, the student should be able to:

1. Understand the concept of "sustainability" in manufacturing.
2. Understand how "sustainable manufacturing" relates to current technologies and manufacturing decisions.
3. Perform carbon footprint analysis specific to manufacturing systems and processes using QuickPEP, ChemPEP, and NEAT.
4. Perform life-cycle assessment of manufacturing processes.
5. Understand global perspectives on sustainable manufacturing practices.
6. Evaluate the economics and environmental impact of sustainable manufacturing alternatives.

Course Content or Outline:

a. Technology and sustainability
b. Sustainable engineering concepts
c. Technological change and evolving risk
d. Industrial product development
e. Design for environment and for sustainability
f. An introduction to life-cycle assessment (LCA)
g. Manufacturing Systems analysis
h. Sustainable manufacturing resources management
i. Carbon footprint analysis and management of manufacturing processes
j. Sustainable engineering in developing countries
k. Sustainability management in manufacturing corporation

Basis for Student Evaluation:

A.	In-Class Assignments and Quizzes	25%
B.	Written Assignments	25%
C.	Mid Term Exam	25%
D.	Final Exam	25%

Grading Scale:

A =100 – 90%
B = 89 – 80%
C = 79 – 70%
D = 69 – 60%
F = Below 60%

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

Student with Disabilities Statement:

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.

MET 6200-Energy Management Principals – Lec. 3 Credit 3.

Prerequisite: Consent of instructor. Principles and technical details of the efficient and effective use of energy to maximize profits minimize cost and enhance competitive positions.

Textbooks:

1. Guide to Energy Management, by B.L. Capelart, W.C. Turner and W. J. Kennedy, 7th Edition, ISBN o-88173-605-8, publisher CRC Press/Taylor & Francis.
2. Solution Manual for Guide to Energy Management, by Klaus-Dieter E. Pawlik, 7th Edition, ISBN 978-1-4398-9392-0, publisher Francis & Taylor.

Course objectives /expected learning outcomes

Upon completion of this course, the students should be able to:

1. Improve energy efficiency and reducing energy use, thereby reducing cost.
2. Reduce greenhouse gas emissions and improve air quality
3. Cultivating good communications on energy matters..
4. Developing and maintaining effective monitoring, reporting, and management strategies for wise energy usage..
5. Finding new and better ways to increase returns from energy investments through research & development.
6. Developing interest in and dedication to energy management program from all employees.
7. Reducing the impacts of curtailments, brownouts, or any interruption in energy supplies.

Topical outline

1. Introduction to Energy Management
2. Overview of the Energy Audit Process
3. Understanding of the Energy Bill
4. Economic Analysis and Life Cycle Costing
5. Lighting
6. Heating, Ventilating, and Air-conditioning
7. Understanding and Managing Boilers
8. Steam Distribution Systems
9. Control Systems and Computers.
10. Energy Systems Maintenance.
11. Insulation.
12. Process Energy Management.
13. Renewable Energy Sources and Water Management.
14. Distributed Generation.
15. Web-based Building Automation Controls and Energy Information Systems.

Grading system

Mid-term exam	25%
Assignments	30%
Class Participation	5%

Sustainable Energy Project 40% [Details will be provided]

Grading Scale:

A =100 – 90%
B = 89 – 80%
C = 79 – 70%
D = 69 – 60%
F = Below 60%

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

Student with Disabilities Statement:

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.

MET6300- Renewable Energy Engineering – Lec. 3 Credit 3. Prerequisite: Consent of instructor. Basic principles and technical details of various renewable energy technologies (solar, biomass, wind, hydroelectric, geothermal, tidal and wave energy) for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy

Course objectives or expected learning outcomes Undergraduates:

This course provides the principles of renewable technologies for sustainable future. It also provides the details of renewable resources, energy conversion techniques and applications of solar, wind, biomass, geothermal, hydro-electric, wave and tidal energy technologies. More emphasis is given to bioenergy technologies to convert biomass into fuels, energy, chemicals and bioproducts.

Upon completion of this course, the students should be able to

1) Recognize the need of renewable energy technologies and their role in the US and world energy demand.
2) Distinguish between the sustainable energy sources and fossil energy sources
3) Describe the principles of renewable energy production from various renewable sources
4) Apply the knowledge of thermodynamic and heat transfer principles to evaluate the performance of energy conversion systems for maximum efficiency
5) Compare the pros and cons of various renewable energy technologies and propose the best possible energy conversion system for a particular location

ABET Program Outcomes:

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c. an ability to function on multidisciplinary teams
d. ability to identify, formulate, and solve engineering problems
e. an understanding of professional and ethical responsibility
f. an ability to communicate effectively
g. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context a knowledge of contemporary issues
h. use an engineering economic tool (Retscreen International Software) to perform energy balance and economic evaluation of renewable energy systems
i. apply engineering principles to assess and evaluate renewable energy systems for maximum performance
j. conduct a comprehensive economic assessment of energy conversion systems for both large and small scale applications
k. modify or propose a new process design to increase energy efficiency and reduce environmental impacts
l. demonstrate energy technology systems and communicate effectively by both oral and written presentations.

Topical outline

1. Introduction
   - 1.1. US & World energy consumption & Demand
   - 1.2. Renewable vs fossil energy sources
   - 1.3. Future outlook
2. Overview of renewable energy technologies
   - 2.1. Renewable energy sources
   - 2.2. Advantages and benefits
   - 2.3. Available technologies and challenges
3. Solar energy
   - 3.1. Solar thermal energy
   - 3.2. Solar photovolatics
4. Biomass and Bioenergy
   - 4.1. Biomass resources
     - 4.1.1. Feedstock collection, transport methods
     - 4.1.2. Feedstock preprocessing and treatment methods
   - 4.2. Biomass conversion technologies
     - 4.2.1. Thermo-chemical platform
       - 4.2.1.1.Combustion technology
       - 4.2.1.2.Gasification technology
       - 4.2.1.3.Pyrolysis technology
       - 4.2.1.4.Trans-esterification or biodiesel technology
     - 4.2.2. Biological platform
       - 4.2.2.1. Hydrolysis and fermentation of biomass into ethanol
       - 4.2.2.2. Anaerobic fermentation of wastes into methane
   - 4.3. Recent advances and applications of bioenergy technology
5. Wind energy
   - 5.1. Wind resources
   - 5.2. Wind turbines and power generating systems
   - 5.3. Current status and R& D needs
6. Geothermal energy
   - 6.1. geothermal resources
   - 6.2. Principles, operation and recovery of energy
   - 6.3. Current status and R & D needs
7. Hydro power energy
   - 7.1. Stored hydro energy
   - 7.2. Principles of hydro power technology
8. Wave & tidal energy
   - 8.1. Energy from tides and waves
   - 8.2. Technological and economic prospects
9. Energy, economics and environmental assessments
   - 9.1. Technical and economical assessment of renewable technology
   - 9.2. Environmental impact assessments and sustainability issues
   - 9.3. Renewable energy technologies software use – RETScreen International

Recommended textbooks

1. Duffie, J. A. & W. A. Beckman. 2006. **Solar Engineering of Thermal Processes**, 3rd ed. John Wiley & Sons, Inc.
2. Boyle, G. 2004. **Renewable energy: Power for a sustainable future**. Oxford

University press, Oxford, UK.

3. Demirbas, A. 2010. **Biorefineries** – for biomass upgrading facilities. Springer publishers.

Additional references:

4. RETScreen International. 2006. Users' guide. Natural Resources Canada, Ottawa, Canada.
5. Sims, R. 2002. The Brilliance of Bioenergy. James and James Publications, London, UK.
6. Frank Rosillo-Calle, Sarah Hemstock, Peter de Groot and Jeremy Woods. 2006. The Biomass Assessment Handbook, James and James Publications, London, UK.

7. Journals related to Renewable energy engineering
    a. Biomass and Bioenergy
    b. International Journal of Renewable Energy Engineering
    c. Bioresource Technology]
    d. Bioresouces
    e. BioProducts, BioFuels & BioRefinery (BioPFR)
    f. Renewable and Sustainable Energy Reviews
    g. Energy Conversion Management
    h. Solar Energy
    i. Applied Energy
8. CIGR Handbook of Agricultural Engineering Volume V: Biomass Engineering. ASABE Publications, MN, USA.

Assignments

Assignment due date will be specified, when the questions are assigned. You are encouraged to discuss problems with other students, however, duplicating another student's work and copying in group will be considered **plagiarism**, and this practice is unacceptable (see Academic Honesty below). If you receive considerable aid on a particular problem you are to indicate so on your homework. **Neatness and clarity** will be important factors in assigning homework grades. Excused late homework will only be accepted under extreme circumstances (e.g., personal crises). Unexcused homework, one class period late will receive 25% of maximum possible credit; beyond one week unexcused late homework will not be given a credit.

Tests and Exam

You may bring pencils, paper, erasers, and calculators to tests and final exam. If necessary, you may be allowed to bring one page formula sheet. There will be absolutely no sharing of calculators and no talking during test periods. Testing dates will not be altered, and "make-up" tests will only be given under extreme circumstances.

Other Responsibilities

A student may be withdrawn from this course by the instructor without notification to the student for excessive absences or for failure to complete necessary prerequisites. For this course, "**excessive absences**" is defined as absences from all of the first three class meetings or five (5) or more absences from any contiguous ten (10) scheduled class meetings. A student may also be withdrawn from this course by the instructor after one warning for disruption of class. **Ringing of a cell phone** during the lecture constitutes a "disruption of class."

The instructor will provide students with an opportunity to complete academic responsibilities resulting from absences due to (for example) 1) observation of religious holidays, 2) significant illness, 3) death in family and 4) emergencies. The instructor requires reasonable written notice of absences (one week, when possible). Please communicate promptly in writing (email) with instructor such absences, including date and

reason for absence, and proposed alternative for academic responsibilities. Failure to communicate with the instructor in a timely fashion may cause the loss of opportunity to complete academic responsibilities.

Grading system for Graduate Students

Mid-term exam (Oct. 3rd) – 25%
Class Participation – 5%
Sustainable Energy Project – 40%
Assignments – 30%
= 75%

RETSCREEN Term report = 25%

MET 6990 – Internship Syllabus

Professional Science Masters Internship Requirement:

An experiential component that must include at least one capstone project, supervised collaboratively by faculty and employers, evaluated or graded by faculty, and typically developed with an employer(s), which integrates the practical application of scientific and professional knowledge, behavior, and skills. The experiential component typically includes a structured internship and provides an opportunity for students to demonstrate proficiency in written and oral communication skills.

The capstone experience is the experiential component for the Professional Science Master's designation. It will include a capstone project supervised by faculty and employers, evaluated or graded by faculty, and typically developed with an employer, which integrates the practical application of scientific and professional knowledge, behavior and skills. The internship provides an opportunity for students to demonstrate proficiency in written and oral communication.

Credit Hours: 3 Credit

Course Description: Full-time or part-time, on-the-job work performed at a sponsoring entity while under the supervision of an approved advisor/in an area related to manufacturing sustainability. Written objectives, a written internship analysis, and a public presentation.

Instructor: Major Professor/Advisor
Prerequisite: At least 24 completed credit hours of PSM-MS courses approved by major professor and graduate advisory committee

Student Requirements:

1. Secure their own internship; meet with instructor to discuss placements and other course requirements.
2. Develop a work plan for the capstone project in consultation with major professor and employer. The work plan will address specific program outcomes that are delineated in business, manufacturing sustainability, lean six sigma manufacturing and alternative energy courses.
3. Contact agencies and arrange work schedule.
4. Work 120 to 180 hours per semester upon approval by Graduate Advisory Committee.
5. Sign and return "Hold Harmless" forms to instructor prior to beginning work in the agency. Include this form in the "Work Plan."
6. Complete the online sexual harassment training (http://www.tntech.edu/aa/training.html).
7. Complete the Internship Work Agreement form and Agency Acceptance form.

8. Keep a journal of the work experience. Journal entries should include the date and time each work session began and ended, what work was done, what was learned, and highlights of particularly interesting experiences.
9. Submit four typewritten interim reports to the instructor: the first after 25-30 hours of job work; the second after 50-60 hours; the third after 75-90 hours; and the fourth at the completion of the internship (see item 12 below). The first three reports should be 2-4 pages in length, and the fourth report will be longer (see item 12).
10. Contact the instructor about a new placement within the first few weeks. Issues regarding placement cannot be resolved within one week.
11. Be aware that the agency or company will keep track of student work hours and submit an evaluation form to the instructor prior to the last day of classes for the semester.
12. Write a final report addressing the objectives established in the work plan. The report will include an introduction of work need, project scope with specific objectives to be accomplished, methods used, presentation of results, discussion of results and conclusions.
13. Schedule an oral presentation based on the internship final report. The presentation will be open to all stakeholders (i.e. faculty, students, Industrial Advisory Board members, and SOES Director, College Dean, and university administration).
14. Be aware that the oral presentation and written report will be evaluated by the graduate student's advisory committee to assess whether the student has mastered PSM-MS program learning outcomes.

Internship Learning Outcomes:

Program Learning Outcomes – things students should know and be able to do upon graduation:

Outcome 1: Students will have the ability to combine the manufacturing and sustainability knowledge required to lead projects that will promote renewable material use, lower energy use, minimize waste and carbon footprint.

Outcome 2: Students will demonstrate the skills and ability to blend manufacturing engineering and operations concepts, tools and techniques with the values, thinking and techniques required to lead projects that will reduce material use, energy use, waste and carbon footprint.

Outcome 3: Students will demonstrate the ability to integrate business management concepts with environmental information to manage manufacturing sustainability.

Outcome 4: Students will communicate effectively in writing, orally, and visually.

Evaluation:

The oral examination and written report will be evaluated by the graduate student's advisory committee, which will consist of graduate faculty and Industrial Advisory Board members, to assess whether the student has mastered program and concentration learning outcomes. During the oral examination, each Professional Science Master's with a concentration in Manufacturing Sustainability candidate will be asked a set of questions that have been prepared by the Faculty Associates. Internship reports will be required by students and used to assess Society, Culture, and Communication learning outcomes.

Course Grading:	
Work Plan Document	20%
Interim Progress reports	20% (first three reports)
Final Written Report	20%

Work Performance Based on journals, interim reports and employer evaluations	20%
Final Oral Defense*	20%

* The oral defense will include a presentation of the capstone experience, defense of report, and a series of questions prepared by PSM-MS Associate Faculty and Industrial Advisory Board to test knowledge obtained from the program curriculum.

Student with Disabilities Statement:

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.

Appendix II

Charter for PSM-Manufacturing Sustainability Degree Program Industrial Advisory Board

Charter for PSM-Manufacturing Sustainability Degree Program Industrial Advisory Board

I. The Board will be called the PSM-MS Industrial Advisory Board. It is authorized by the Department of Manufacturing and Engineering Technology and will serve at the pleasure of the governing body.

II. Purposes

The Board is created for the purpose of working with the PSM-MS program and shall limit its activities to advising on matters that directly concern the instructional program. The specific purposes of the Board may include the following responsibilities:

--assist in placing students at employment sites
--determine necessary entry-level skills, attitude and knowledge competencies as well as performance levels for target occupations
--facilitate cooperation and communication between the program and industry
--assist in program evaluation and improvement
--study number of workers needed by target occupation in industry
--determine the necessary curriculum to achieve programmatic goals

II. Relationship of Board to Department of Manufacturing and Engineering Technology

It is the role and sole prerogative of the Board to enact policy. The Advisory Board is expected to offer recommendations for instructional programs and to provide information relevant to policy about the instructional program to the administration and instructors.

IV. Membership

Composition: The Advisory Board shall consist of up to 20 members. Members will be recommended for appointment to the College of Interdisciplinary Studies. Board members will constitute a cross-section of the Manufacturing Sustainability employment community.

Term: The agencies and private industries that form the Advisory Board are essential to the success of the program, but the individual representatives from those agencies and industries will serve

a minimum term of three years.

V. Organizational Structure

Officers: The Board will have a chair and vice chair who are elected for one-year terms by the membership. The Department of Manufacturing and Engineering Technology's Administrative Associate III at Tennessee Tech University will be the recording secretary. Elections will be held at the first meeting of the new membership year.

VI. Procedural Rules

By-Laws: The Board will draft and adopt a set of written by-laws at the organizational meeting of the committee. The by-laws govern Board operation. By-laws require a two-thirds vote for adoption or change.

Meetings: The Board will meet at least twice per year. Written notices of upcoming meetings will be mailed or emailed to members at least ten days before a meeting.

Minutes: Minutes of each meeting will be kept. Copies will be mailed to the board, local administrator(s), instructors, and Board membership within two weeks after a meeting.

Recommendations and Reports: Board recommendations and reports will be submitted in writing to the director of the Department of Manufacturing and Engineering Technology. Documents will include both suggested action and justification for suggestions. The board will respond/react to such recommendations/reports in writing.

Dismissal: Agency and industry Board members or their representatives who are absent without reasonable cause from three successive meetings will be considered to have resigned their seat. The Board will move to fill the position.

Public Announcements: While members are expected and encouraged to discuss the instructional program within the community, members shall not report opinions expressed in meetings, nor shall they report independently on Board action.

_____ _____

Signature Date

_____

Printed Name

Design, synthesis and bioevaluation of Thiazolo[3,2-a]pyrimidine Derivatives Containing Benzimidazole Moieties as dual KSP and Aurora-A kinase inhibitors for anti-cancer agents

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Abstract

A series of N-(4-(1H-benzo[d]imidazol-2-yl)phenyl)-7-amino-8,8a-dihydro-(5-substiuted benzylidine) -5H-thiazolo[3,2-a]pyrimidine-6-carboxamide were designed and synthesized as dual KSP and Aurora-A kinase inhibitors for anti-cancer agents by introducing some fragments of Aurora-A kinase inhibitors and KSP inhibitors , A total of 17 target compounds were evaluated by two related enzyme inhibition assays and a cytotoxicity assay *in vitro*. The results showed that all target compounds could inhibit both enzymes, and several of them showed significant inhibition activity against HCT116 cell line and HepG2 cell line and A2780 cell line activity in the micro molar range especially the lead compound 4a and 5a , This results may be useful for developing a new class of inhibitors having a dual function, KSP inhibition and Aurora-A kinase inhibition for the treatment of cancer.

Egypt's Culture, Environment, Economic Development, Natural Resources, Commerce, Education and Workforce Development to Meet the Expected Economic Growth

Reengineering the higher education system in Egypt According to the excellence management Outlook study

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University: Associate professor at the faculty of education Ain Shams University. Egypt

Key words: reengineering –excellence management –higher education

1- Introductory framework

The idea of reengineering starts with Michel Hammer & Dafnport at 1990 . It is about the ability to enhance the organizational performance by achieving best practices .In order to achieve the culture of excellence the higher education system should transfer into the excellence management. The excellence management means how the higher education system transfers from the good practices into best practices through the reengineering process.
Indeed the current state of the higher education system needs much more efforts from the experts of the higher education system. Furthermore the disproportion is big in Egypt among the governmental universities in a side and the private universities in the other side. .

2- Research scope

This study aims to put a strategy to reengineering the higher education system according to the excellence management approaches. So, in order to achieve this goal:-

- . Firstly .:- analyze the gap between current state system and the future state in the higher education system in Egypt.
- .Secondly.: Building the framework of agreements in the higher education system according to the excellence management.
- .Thirdly.: Designing the strategy for reengineering the higher education system according to the excellence management.

3 - Research methodology & approaches

The research methods are:-

- -Gap analysis method –SWOT analysis
- -Scenario technique
- -Best practice technique

The research approaches:-

- -Reengineering approach
- -Total Quality Management (TQM) approach
- Institutional Performance analysis approach

4- Research procedures

First step: Using the gap analysis technique to analyze the gap situation between the higher education current state and the future state.
Second Step: Using the SWOT analysis to analyze the internal and external context of the higher education system in Egypt.
Third Step: Using institutional performance analysis approach & the reengineering approach to put the framework of agreements in the higher education system.
Forth step: Using the Total quality management approach & scenario technique & - Best practice technique to build the strategy for reengineering the higher education system according to the excellence management.

The gap between the current state system and the future state in the higher education system in Egypt

Actually the higher education system now in Egypt is developing through the global openness towards the other broad universities, Such as the partnership, the scientific exchange, the entrepreneurship, marketing the universities services and the global quality practices. However, the university in Egypt needs much more changes towards the quality in action not the quality of documents and papers merely. The Egyptian universities in order to achieve that firstly need to determine the major problems in the higher education system in Egypt.

According to the World Bank there are many problems involved in the students' empowerment in the universities. The capacity and the huge numbers of students every year without chairs or equipments for them caused many problems. Furthermore, most of the contents and methodologies which are introduced to the students don't coming up with their needs and the global context, the lack of the administration performance in planning, organizing, guidance and monitoring and the
administration system needs many qualifications to put the universities in competitive advantages.

According to the World Bank last report 2013 there are 200 million people in developed and developing countries, a disproportionate share of them youth, are unemployed and actively looking for work. An estimated 620 million youth, the majority of them women, are neither working nor looking for work. Just to keep employment rates constant, around 600 million new jobs will have to be created over a 15-year period. (World Bank 2013)
According to the center agency for public mobilization and statistics in Egypt; the enrolled students in governmental universities by sex are 1934561students distributed in 20 governmental universities..(CAPMAS2011). This ratio refers to the huge numbers of students which means the over capacity of students' enrolled in governmental universities.

This result is coming up with the human development report 2013 which declares that the individual achievements in education, health and the income however its importance, but it did not guarantee the progression in human development if the social achievements impedes the individual achievements and the situation is changed towards the progression.(UNDP2013).

Not only the numbers of students in the Egyptian universities which cause the gap , but the knowledge and skills which the students are gained still old and lack of the application of these knowledge and skills . Most universities in Egypt still not apply the credit hour system so far. So the increased number of students cannot achieve the goals of the credit hour system to select any student his /her professor and syllabus at the time he / she prefer through the academic advisor.(Soliman 2007,p80)
The governmental universities in Egypt cannot so far capable of to achieve the knowledge cities which create citizens able to handle the sustainable development in the different fields.

On the other hand, the culture of sustainable leadership not clears in the higher education system because of the lack of communication among the three administration levels, the high level, the middle level and the low level. Furthermore, the lack of professionalism of the university leaders and the administration structure which makes any endeavors for reform may fail. (Reddy 2014, p84)
The researcher held a workshop about the university administration problems and the results of the work shop were:-

- The lack of preparing the graduates
- The lack of the financial resources
- The mal distribution of the students and resources
- The mal of strategic planning
- The low budget of the scientific research
- The lack of co ordination with the Recruiters
- Job absenteeism of the staff
- The scientific research weakness
- The abolition of the porter from all the Egyptian universities
- The administration centralization

Building the framework of agreements in the higher education system according to the excellence management.

The excellence for the organizations considers basic need in the contemporary life. The excellence management is a strategy for leading the change, competitive advantage and success. According to Oracle' strategy to success framework describes a comprehensive set of management processes that lead organizations toward management excellence. The strategy-to-success framework consists of six management processes, in which the output from one becomes the input for the next: (Oracle 2008, pp 15:16).

The strategy-to-success framework		
The process number	Input	Output
Process no.1	Gain to sustain	Understanding of the stakeholder environment.
Process no.2	the investigate-to-invest	Scan or model of the market.
Process no.3	The design-to-	The development of the business model and

	decide	strategy
Process no.4	The plan-to-act process	The creation and management of a business plan.
Process no.5	The analyze-to-adjust process	The maintenance and execution of the business operations.
Process no.6	record-to-report	Collection and receipt of feedback on all levels by measuring business results.

So, according to this strategy the higher education system needs to enhance its internal processes to manage the excellence. Building a framework of agreements among universities will help to reach to the universities performance excellence.(Abo El Nasr2014,p95).

The idea of the framework agreements bases on three dimensions:-

1. **The focal point**
   The focal point Concerns with the criteria which will compare the universities according to them .For instance; standards, ILOs, competitive situation, competitive advantage, strategic administration, international communication.
2. **Points of convergence**
   These points are involved to the universities agreements of the criteria which are mentioned above. The experts will determine these points according to statistics studies based on SWOT and gap analysis to each university.
3. **Points of excellence**
   These points are involved to the universities differences of the criteria which are mentioned above. The experts will determine these points according to statistics studies based on SWOT and gap analysis to each university.

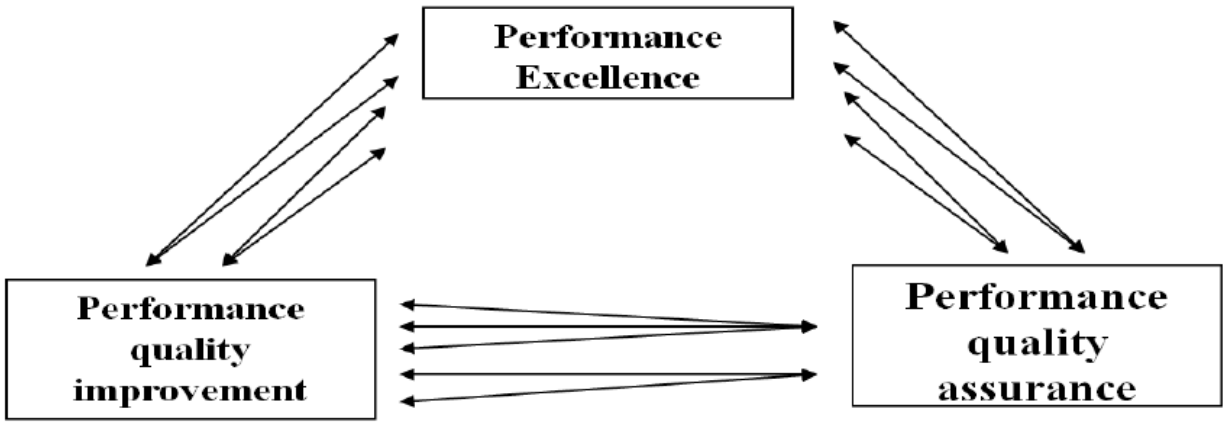
The frame work of agreements		
The focal point	Points of convergence	Points of excellence
Standards	The universities that unit their standards according to the international standards	The universities that plan to put their own standards to tackle their problems and coming up with the global market.
ILOs	The universities that agree in the intended learning outcomes for their students according to the international standards	The universities that have different techniques for achieving the ILOs and create the global citizen.
competitive situation	The universities that have competitive situation among the other national universities.	The universities that have competitive situation among the other international universities.
competitive advantage	The universities that have competitive advantage and sharing in the national development processes.	The universities that have competitive advantage and sharing in the international sustainable development.

strategic administration	The universities that have the same strategic administration processes and follow certain plans.	The universities that have different strategies in the process of the administration and management. Engaging with foreign universities and the global market.
International communication.	The universities that ready to communicate with international institutions to serve the developmental processes.	The universities which have many scientific projects and strategic plans with international universities and institutions.

So, in order to achieve this frame work of agreements among universities there are two approaches:

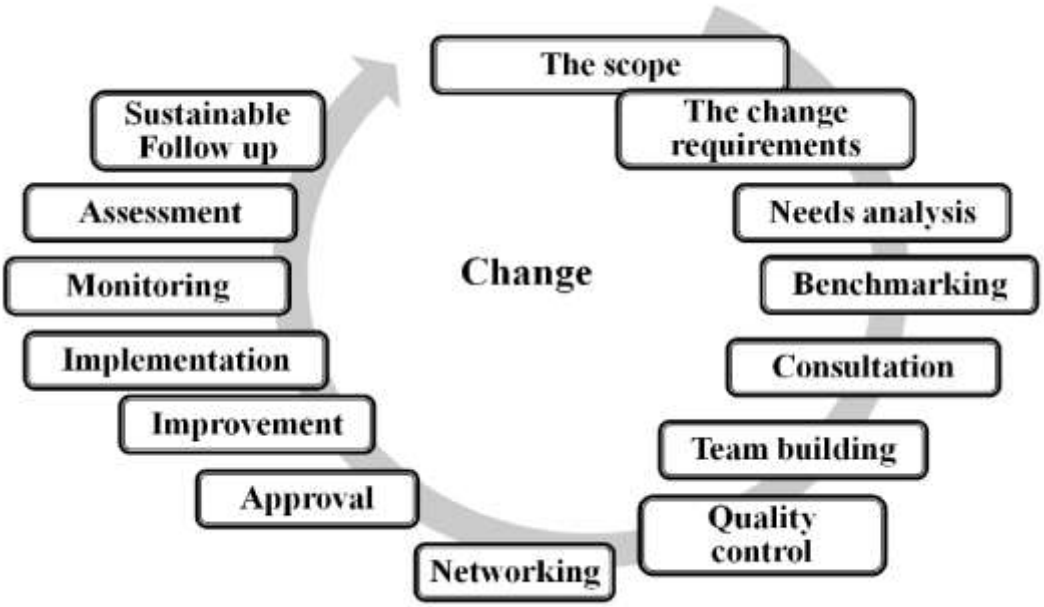
Institutional performance analysis approach

There are relationship between the institutional performance and the excellence management processes. As the quality of the institution performance expresses the amount of the excellence practices in the organization. So, in order to procurement the excellence performance the universities should manage in analyzing all the strengths, weakness, opportunities, and threats (OGC2003). This process requires analyzing the administration levels the high, middle and operational level requirements and needs. This will lead to the matter of change from the performance quality assurance into performance quality improvement. (El Hakeem 2011).



The reengineering approach

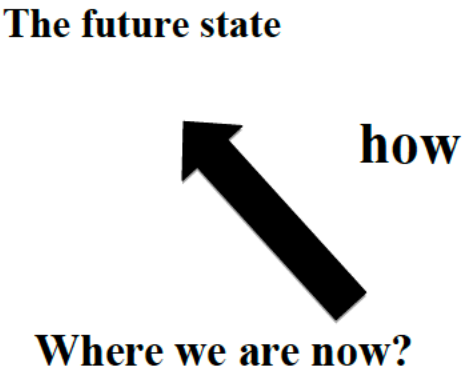
The two main principals of the reengineering approach are the reform and the change. The reform means reconstruction the internal processes of the institution for better practices and achievements based on new global criteria of quality and improvement. The change means the transformation according to the reform processes into new quality of life via effective leadership and management. (James . Nyce 1996,P2).



Designing the strategy for reengineering the higher education system according to the excellence management (learning and growth).

1- The Strategy main questions

-Where we are?
-What is the future state we want to reach?
-How do we can reach?



2- The strategy tenor

This strategy will be based according to the mentioned analysis of the current state of the governmental higher education system of Egypt. So the main issues which strategy supposed to tackle are:-

- -The university student involvement
- -The staff member performance quality
- -Teaching strategies
- -Self assessment techniques

- -Administration processes (El Samraey2014,p32,p83), (Yahia 2014,PP37:57),(El Gamos2013,192).

The field	The prospective role	The activities	The internal assessment	The external assessment
The student	student's empowerment -participation in teaching programmers ,evaluation and assessment processes –sharing ideas & visions -sharing quality management processes. -Sharing in raising the university capacity building -sharing elections and the democratic culture	evaluate the program and course contents ⇨evaluate the teacher methods and teaching strategies evaluate the university life and the administration processes	↳the ability to critic the university system with statistic tools and evidences ↳the students reports about the university ↳committees & seminars about quality assurance(QA) ↳credibility of QA processes ↳students unions ↳ environmental researches and projects.	↳the students' academic achievements ↳The quality experts analysis students' performances ↳the impact of the university life up on the graduates and the community
The staff	↳the staff sharing ability into the university life and processes ↳competences and life skills acquired ↳academic experiences ↳ ⇨credibility of QA processes	↳teachers –students evaluation sheets ↳planning & monitoring strategies ↳students researches evaluation ↳Academic researches and applications	↳monitoring students' performance progression ↳students log book ↳evaluate & discuss students projects and researches ↳Evaluate the student's participation assurance in the university for quality and improvement ↳self-assessment reports & findings	↳The professor rank and value through his \her achievements ↳ ⇨The professor value added to the students ↳The professor awards and projects Of the ILOs
Teaching strategies	↳using new techniques	↳Peer review of teaching attending workshops, visiting each other's lectures, creating teaching portfolios. ↳interview protocols , Web documents on undergraduate education ↳assessment plans, memos, and faculty course portfolios ↳ ⇨active interdisciplinary community focused on the scholarship of teaching ↳students seminars, workshops and presentations	↳Link between teaching improvement and assessment improvement ↳ILOs achievements ↳students reports about the quality of teaching strategies	↳Experts evaluation of the quality of teaching and strategies ↳The students' outcomes
Self-assessment techniques	↳students and professors self-assessment	↳Bench marking between the actual performance and the prospective performance ↳The students' abilities to evaluate themselves ↳The professors abilities to evaluate themselves	↳quantitative and qualitative analysis for students and professors self-assessment report	↳Experts interviews with teachers and students ↳Analyzing the graduates performance according to the adopted criteria
Administration processes	↳sharing quality assurance and improvement processes	↳Raising the ability of the university to making self-assessment and	↳Application of the administration vision and mission through the	↳ ⇨Experts evaluation of the university quality management

	with students and the staff members	creating competitive situation among universities ↳planning strategies for closing the gap between the current state and the future state ↳rehabilitation the employees , the staff and the leaders for the excellence culture ↳Implementation of the university electronic administration	follow up internal committee ↳Measuring the quality planning and quality improvement for the university ↳ ⇨field studies about the university performance assessment	↳ ⇨Using bench marking to evaluate the administration process and quality according to the international standards. ↳ ⇨The ability of the university administration in achieving the ILOs And the outcomes

3- The strategy implementation mechanisms

(Abd Elsalam2013, pp90:100), (Bush,Tony2009,p55),(Dahawy 2010,pp144:150).

First mechanism

University assessment

↳university short and long terms achievements
↳university current state and future state (the gap)
↳ ⇨university administration consistency
↳university vision and mission clarity

Second mechanism:

Student assessment

↳Student performance self-assessment sheet.
↳Student participation in quality processes.
↳Student-lecturer assessment sheet.
↳Student –administration assessment sheet.

Third mechanism

Society assessment

↳ The university services in the society
↳ The university weight in the society sustainable development
↳ The university international participation

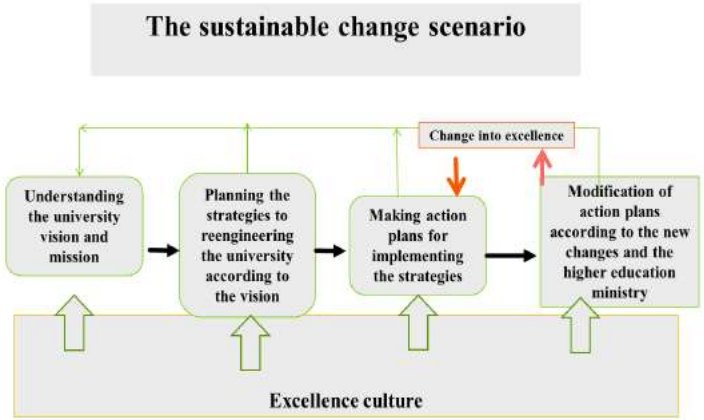
4- Research scenario

The sustainable change scenario

This scenario keens with the institution ability to change into excellence through certain steps:-

- Understanding the university vision and mission
- Planning the strategies to reengineering the university according to the vision
- Making action plans for implementing the strategies

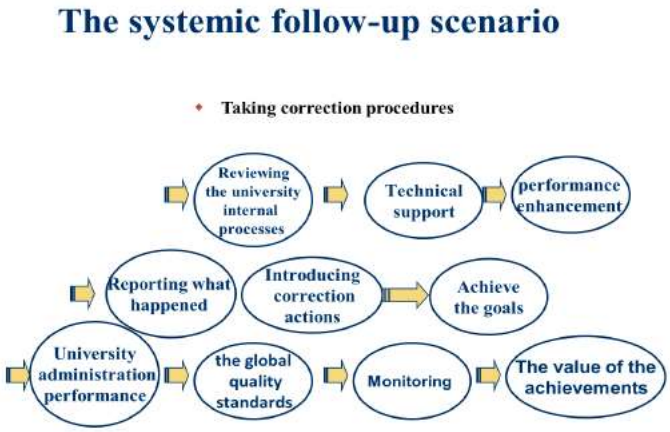
- Modification of action plans according to the new changes and the higher education ministry



The systemic follow up scenario

This scenario will help taking correction procedures to modify the university performance according to the global quality standards .So to apply this scenario in the near and far future there are certain steps:-

- Reoriented the university administration about the criteria which should apply with the students, employees and the staff
- Reviewing the university internal processes and introducing the technical support for performance enhancement
- Reporting what happened right now to achieve the goals
- Introducing correction actions for the university administration performance

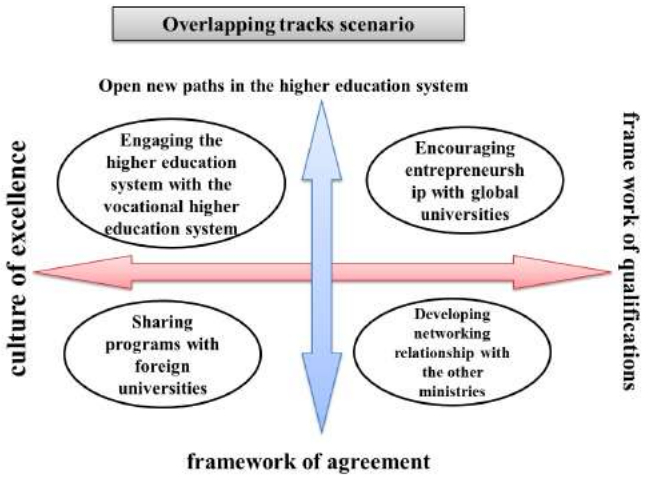


Overlapping tracks scenario

This scenario helps to open new paths in the higher education system to fulfill the culture of excellence according to the frame work of qualifications and the framework of agreement. So in order to achieve this goals there are steps

- Engaging the higher education system with the vocational higher education system
- Encouraging entrepreneurship with global universities

- Sharing programs with foreign universities
- Sharing programs with competitive university
- Developing networking relationship with the other ministries such as ministry of education, ministry of health, ministry of economic, ministry of industry ……



Conclusion

This research concentrates on the process of reengineering the higher education system according to the excellence management. So, this research makes a comparison between the current state and the future state to determine the gap in the governmental Egyptian universities, then building the framework of agreements in the higher education system according to the excellence management. At the end of the research, the researcher designed the strategy for reengineering the higher education system according to the excellence management (learning and growth) with its three scenarios.

5- Research findings

- -There is a gap between the current state and the future state in the higher education system.
- -Establishing the framework of agreements will close the gap.
- -the three powerful proposed scenarios to reengineering the higher education system are:
    - . The sustainable change scenario
    - . The systemic follow-up scenario
    - . Overlapping tracks scenario

-The strategy of the learning and growth for the excellence management.

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How Can the Organization Achieve The Quest Of Excellence? By Using Knowledge Management and Innovation Framework

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***Abstract*—This paper focuses on how can the college of Engineering at ABC (a pseudonym is given to mask the University's name) achieve the quest of excellence and World Class University (WCU)? By using the proposed Knowledge Management and Innovation Framework (KMIF), there was a previous work study focuses on measuring Knowledge Management (KM) Enablers, KM Practices and Innovation revealed a moderate level of KM that's encouraging to propose a KMIF. The study focuses on measuring personal perception and expectations for faculty staff about the efforts of quality and excellence performance by using the Proposed (KMIF) in the college of Engineering. This paper contribute towards filling the gap between the previous work study results and using proposed KMIF to achieve excellence and WCU, seven categories and the outcomes from the expectation of using KMIF were measured, three factors (Senior Leadership Direction, College Performance Review and Public Responsibility & Citizenship) in Category 1: Leadership; two factors (Strategy Development and Quality Goals & Plans) in Category 2: Strategic Planning & Deployment; three factors (Knowledge of student, stakeholder, & Market Needs & Expectations, Student & Stakeholder Relationships & Satisfaction and Knowledge of Student, Stakeholder, & Market Needs & Expectations) in Category 3: Student, Stakeholder & Market Focus; four factors (Performance Measurement, Performance Analysis, Data Availability and Hardware & Software Quality) in Category 4: Knowledge Management System; four factors ; two about Work Systems, Faculty & Staff Education, Training & Development and Faculty and Staff well-being & Satisfaction) in Category 5: Faculty and Staff Focus; four factors (Education Design Process, Education Delivery Process, Student Services and Support Processes) in Category 6: Operations Focus; six factors (Student Learning Results, Student & Stakeholder Focused Results, Budgetary, Financial & Market Results, Faculty & Staff Results and two in College Effectiveness) in Organizational Performance Excellence (Results) and measuring the expectation outcomes by using KMIF. The framework of this study is based on the idea of change and continuous improvement for all process inside the College of Engineering to be more effective than its competitors and based on getting the feedback from stakeholders, self-assessment and benchmarking the final result achieved by the College with other competitors achieved higher rank and making the requirement changes to keep pace with WCU. Measurement items were adopted from previous studies and a few items were adjusted based on the concepts provided by literature review. The questionnaire was used to collect the primary data; questions aiming to measure KMIF criteria. The data were collected from 7 academic departments at College of Engineering by using questionnaire and the data collection in this study analyzed by using the Statistical Package for Social Sciences (SPSS). The analysis revealed there is a positive correlation between the all criteria of KMIF and there is a consensus among respondents in departments on using KMIF, that's ensure the KMIF achieve the positive outcomes, the study proved College of Engineering has significant opportunities for using KMIF to support every part of their mission, sustain quality and achieve the quest of excellence and enhance its ranking between WCU.**

Keywords*—*Knowledge management system; Business Excellence; Innovation; World Class University.

I. INTRODUCTION

Higher education institutions (HEIs) are organizations staffed with experts in all different fields who contribute their expertise and experience in the way of producing and maintaining knowledge. As knowledge organizations, HEIs need to improve their information and knowledge management to respond to the internal and external environments in which they operate. The performance of the experts usually is best evaluated by their peers inside and outside the HEIs and by the relevant community; Experts also tend to identify within their (external) community more than within their own organizations. HEIs are using or planning to use new tools like internet services, document management, e-learning, e-library, centralized system administration (for students and employees), email, information servers, decision support systems, reporting solutions, etc. The modernization of higher education (HE) has forced the institutions to store, manage and use existing information and knowledge stores in a better way in order to meet new accountability, effectiveness and efficiency requirements, this modernization helped HE to understanding its stakeholders' [1]; [2]. The excellence in Higher Education is an integrated approach for self assessment in Colleges and

Universities, the goal of excellence is to offer continuous improvement for academic, student affairs, administrative, and service units within a college or university [3].

II. LITERATURE REVIEW

A. Business Excellence Model

Organizations today operate in a changing and increased competitive environment; successful organizations are those that are effective at change, either through creating new markets or meeting new goals for existing products. Business Excellence Model is an improvement model which includes the concepts of Total quality Management implementation (Plan, Do, Check, Act) and concerns at factor relationships of business excellence; this allows organizations to compare themselves with competing organizations, when applied within an organizations lead to enhanced performance [4]. According to [5]; Organizational Excellence is promising well practices in managing organization and creating value for customers and stakeholders it is defined as creating economic value added to all stakeholder, According to [6]; performance excellence refers to an integrated approach to organizational performance management that results in:-

1. creating value and continuous improving services value to students and stakeholders, contributing to improved education quality and student learning, as well as to organizational sustainability;
2. continuous improvement of overall organizational effectiveness and capabilities; and
3. Organizational and personal learning.

Organizational excellence is like quality management, managing a business to ensure quality of product or service to fulfill customer needs by defining characteristic of business excellence, then dealing with the business process.

B. Malcolm Baldrige National Quality (MBNQ)

The goal of the MBNQ is to encourage companies for continuous improvement and become differentiated in its performance and providing a model for other organizations to establish guidelines and criteria that can be used by other organizations in evaluating their performance (self assessment) and benchmark its results against the best competitors, and make necessary changes and corrective actions to become leaner, faster, and more customer oriented; MBNQ also provide a guideline about how winning organization able to change their cultures and achieve the world class requirements, the success of the Baldrige program led leaders to apply it in different areas like health care, education and industry etc. [7]; [8]; [3]; [9].

MBNQ is an integrated approach to help organizations to achieve excellent performance by focusing on:

- Continuous improvement and value added delivered to stakeholders.
- Comprehensive improvements to the capabilities and effectiveness of the Organization.
- Facilitate sharing best practices and communications inside HEI.
- Organizational learning and Personal learning.

Innovation is a feature of MBNQ which is one of the core values of it; MBNQ criteria provide a comprehensive structure for organizations to align their mission, vision, values, goals, and strategic challenges with the essential resources for long term improvement [10]. MBNQ could apply at every business type small or large organization and helps organization for self-assessment and put a plan in a changing environment [3]. MBNQ used for continuous improvement and has a two tools to apply that which are benchmarking and six sigma, benchmarking is the process of comparing a company's current performance with one of the best in class (World Class Organization) with taking in the consideration condition of to be at the same type and work in the same industry, Benchmarking is a tool for self-assessment and used for organizations' improvement which allows them to compare themselves with others, to specify their strengths and weaknesses and learn how to improve it; benchmarking is a way of finding and adopting best practices; Six Sigma is the second tool for MBNQ to achieve continuous development; it is concerned with measuring the number of defective parts per million, the objective of Six Sigma is First, enhance the quality that helps organizations to improve a reputation and market share; Second, enhance the quality leads to lowest costs and increases profits [11]; [12]; [8]. In brief words Higher education has a desire to learn from other institutions and to share aspects of best practices; benchmarking is the process of continuously comparing and measuring an organization with the business sector at any place in the world to gain information and knowledge, which help the organization take right action to improve its performance and to achieve superior performance.

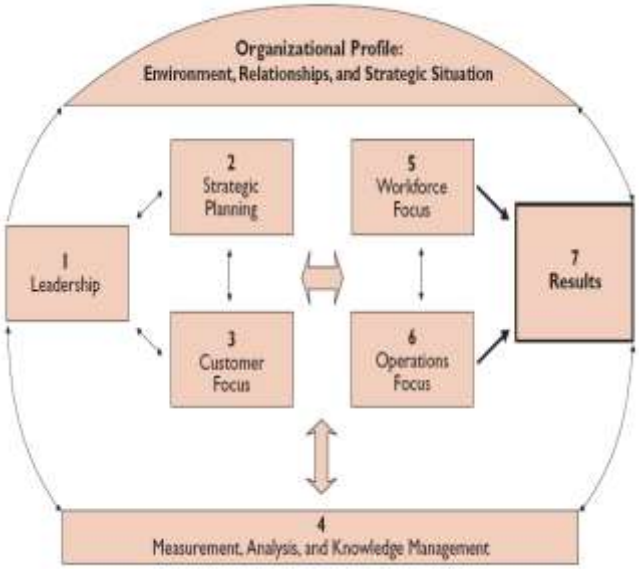


Figure 1 Baldrige Education Criteria for Performance Excellence Framework
Source: (2011–2012 Education Criteria for Performance Excellence)

Organizations recently are implementing and adopting KM in their business processes; the main purpose of KM is to manage the essential knowledge that adds value to organization business; KM comprises a set of actions intended at designing and influencing processes of knowledge has become the most dominant new organization practice, managing knowledge inside the organizations has grown to be more and more critical since numerous organization's activities are knowledge driven and is considered a strategic resource [13].

C. Reasons and benefits of adopting MBNQ

According to [14]; applying MBNQ is an opportunity to evaluate the organization critically and identify strengths and opportunities to improve its strategy. The benefits and importance of adopting MBNQ are:

- Achieves sustainable results in today's challenging environment.
- Helps organizations to think strategically.
- Accelerate organizational improvement efforts by the internal self assessment process and introducing accurate objectives.
- Energize organizational employees by enhancing team motivations and energizes improvement efforts.
- Making better decision faster.
- Learn from feedback process; the self assessment of organizations strengths and opportunities gives the chance for improvement.
- By focusing on the results according to self assessment, this results help organization to determine the most critical performance measures and improve performance.

In a brief word the idea of adopting MBNQ is self assessment and it is delivered a value added to the business; leading to better decision making; identifying process areas that must improve which strengths the relationship between the organization and its stakeholders and allow better deliver service and value; improve organizational performance by focusing on the critical factors which is key drivers for achievement success; cost effective tool to gain benefits form organizations strengths and opportunities, MBNQ energize and motivate employees to achieve the organizational performance excellence and organizational quality; and MBNQ has been an effective method to improve the competitiveness and performance of organizations. MBNQ is the key drivers to a world class excellence.

D. Innovation

According to [32]; the term of innovation refers to ideas or practices that are new, innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption, innovation involves newly introducing method, custom, device etc.; "change in the way of doing things" or doing things differently

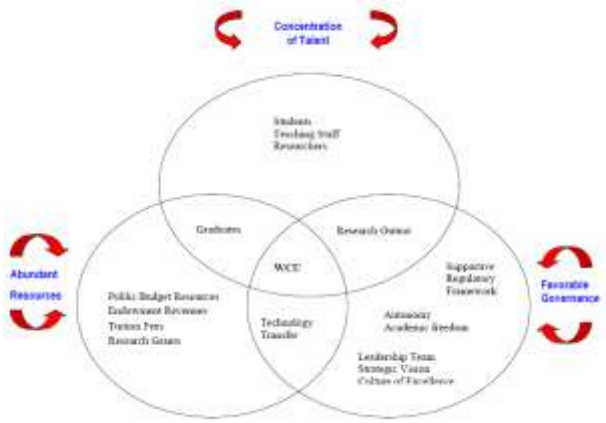
or doing different things. According to [33] defined innovation in many different ways as the creation of new knowledge and ideas to facilitate new business outcomes to improve internal business processes and to market driven products and services in conclusion to improve organization performance, there are some types of innovations which are product innovation, process innovation, administrative innovation, marketing innovation and service innovation, the combination of tacit knowledge and explicit knowledge has been used by the organization which can be an asset for the organization to create advantage. Only knowledge creates innovation which is one of key success factors for higher education quality and performance excellence, the innovation is a key driver for growth of organizations and leads to increase revenue [7]; [10].

E. World Class University

According to [15] world class universities (WCU) are recognized in part for their superior outputs, they well qualified graduates who are in high demand on the labour market, they conduct leading edge research published in top scientific journals and, in the case of science and technology oriented institutions, they contribute to technical innovations through patents and licenses, that's essentially been attributed to three sets of factors that found at top universities namely:-

- A high concentration of talent (faculty and students),
- Abundant resources to offer a rich learning environment and conduct advanced research,
- Favourable governance features that encourage strategic vision, innovation and flexibility, and enable institutions to make decisions and manage resources without being encumbered by bureaucracy.

The combination between these three sets, the concentration of talent; abundant resources and appropriate governance; that makes the difference to be excellent.



Source: Elaborated by [15]

Figure 2 Characteristics of a World-Class University
Alignment of Key Factors

Summary of speech, the establishment of a WCU requires strong leadership, a clear vision of the institution's mission and goals, and a clearly articulated strategic plan to translate the vision into strategic objectives, set new sharp goals, and design and implement a renewal plan leads to enhance performance, reduce the performance gap compared with competitors by benchmarking depends on ambitious vision to future and continuous development.

F. Applying KM in Education

HEI has a significant chance to use knowledge practices to sustain every part of their vision and mission, the span of application includes research, curriculum improvement, educational services (learning process), alumni services, strategic plan enhancement, reach to potential stakeholders, determining the strengths and weakness of organization management [2]. [16] Reported unique and different uses of KM in educational settings; also identified some difficulties while researching KM in academic setting such as:

- Stakeholders needed to be educated in KM.

- Stakeholders needed a KM architecture that articulates the structure that the KM program will operate and that has a feedback mechanism.
- Stakeholders needed dynamic technological support.

The processes and practices associated with managing knowledge are directed at helping educational institutions acknowledge other means of using and reusing their resources, uses of web based data and electronic publishing are altering traditional methods of publishing, research, curriculum development, teaching and learning, in relation to the above mentioned uses of electronic resources, an institution's IT department may store nearly 550,000 various forms of digital collections, the advantage of using KM is that it will structure the output, in knowledge terms, that people within an academic environment produce [16]. KM is an important source of competitive advantage, and it consider as a key factor for successful organizations, sustaining the collective expertise of its employees and partners [17]. KM is considered as an integral part of the quality management process to achieve continuous improvement and performance excellence; the quality management requires gathering and analysis of data in all its steps, without knowledge sharing in the organization, quality management cannot exist [18]. To succeed, KM must be oriented by a strategic vision to fulfill primary organizational objectives such as improving knowledge sharing and cooperative work, disseminating best practices, improving relationships with the external world, and preserving past knowledge for reuse [17].

KM systems capability is identified to include external knowledge likes knowledge about competitors and customers, as well as internal knowledge such as financial, human resource, and product or service knowledge; in the technology perspective, KM is associated with existing technology that comprised their organizational technology infrastructure such as data warehouses, intranets, and the World Wide Web as well as existing tools including search engines, multimedia and decision supporting tools [17]. KM practices at Bangkok University (BU) aiming to facilitate communication among teachers and academic staff, allowing them to work together more efficiently, by accessing the same collaborative portal interface, the learning community can access shared applications such as shared calendars, flexibility and mobility of the users are insured since it is possible to access to the platform from any computer with a web browser and internet access, the user interface in BU system list offered the following:-

- Web mail service.
- Personnel information including pictures.
- Shared calendar.
- Discussion forum.
- Tasks to do for personnel use.
- Online schedule.
- Direct access to other educational systems.
- Automatic email to students registered to the course if it is exist.
- Access to the online assessment systems.
- Room's reservation.
- Student's performance analysis.
- Parent access management is a special service allowing the parents to follow the learning progress or the attendances of their children.
- Etc.

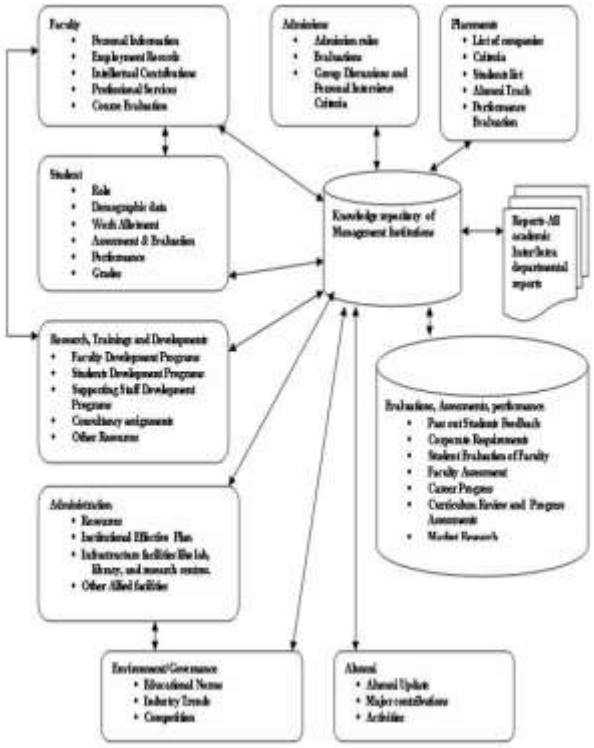
The BU system represents an innovative learning environment where all the described services are integrated into a platform with just a single sign on; BU has developed systems for both undergraduate and graduate students, the initial aim was to offer different services according to the specific requirements of both programs, and the available services include:

- Online registration of the lectures – class and exam schedule.
- E-mail services.
- Grade report and calculator.
- Online payment.
- Online request to be enrolled in a graduate program.
- Online Library access.

Students can get access to the different services via mobile phone, for example information about their grade or about sudden change in the class schedule; students are able to pay the registration courses fees via mobile phone, the system offers additional services such as possibility to control the checklist for the degree plan or

BU forum access, etc. also BU using a learning management system allows faculty and students to communicate, interact and exchange documents related to a particular class, among the main features provided course information, student list, announcements, forums, documents, exercises, and links, the e-learning module at BU provides access to online courses and to some interesting topics to allow students and everyone to learn on their own at their own pace and during their favorite time, the online assessment module is used for course evaluation online, the video online module allows to view online some selected movies and documentaries, the link modules are links to faculty and school resources and finally the e-paper module provides access to the collection of academic papers published in BU Academic Journals [19]. Other example of KM Practices was implemented in India's Test Institute of Management (TIM), (a pseudonym is given to mask the institution's name), Business schools use IT tools for admissions, registrations, time table processing and performance evaluations of their faculty, students, staff and administrations, TIM institute implemented the conceptual framework of knowledge resources in any management institution, students acquire knowledge through their interactions with faculty, inside and outside of class rooms; college share knowledge with students while administration reports and improves the interaction, the administration process shares the knowledge with key stakeholders, TIM has started with some attempts in its management decision support by introducing a web based intranet application that shared knowledge regarding courses, programs, research, all academic related information between faculty, students and administration. These initiatives are considered as Online Learning Teaching Application that's integrates academic, fee, hostel and administration modules; it provides a means for faculty, students, academic program officers, administrators and accounts managers to access and develop online resources to enhance learning and teaching. Figure 3 demonstrates the conceptual framework of Knowledge Resources in Business Schools; it consists of the following criteria:-

- Students query for the marks subject wise or program wise in a term.
- Students submit faculty feedback, select the elective courses for various terms or take an online quiz.
- Students submit assignments online to their faculty directly or submit to the academic program office.
- Students verify attendance records for any course or program.
- Student access timetables term to term.
- Student handbook, timetable and course outlines are available through this interface in the intranet server.
- Faculties assign marks and award grades to students.
- Grades are visualized by line, pie and bar charts.
- Faculty build a question bank to design and conduct online quizzes, quiz is evaluated automatically and marks are submitted, notices regarding the schedule of quizzes are mentioned.
- Faculties check the feedback for their respective courses.
- Students and faculty can view complete reports regarding to subject marks, term marks, program marks year wise, course wise, semester wise.
- Faculty teaching guidelines, course outlines, lecture notes and lecture materials are available in the application.
- Students can verify subject credits and topics of the subjects.
- Monitor the implementation of the exam guidelines for examinations are available.
- The facility of messengers and group mailing system is available between staff, students and faculty.
- This application is integrated with campus intranet.
- Only students, faculty, academic program officers, administrators and account managers use this application.
- Online counselling information regarding registration, like the number of seats filled, the number of seats available etc. can be viewed.
- Students pay different things like; hostel fees, term fees and tuition fees to accounts managers.



Source: *(Ranjan et al., 2007)*

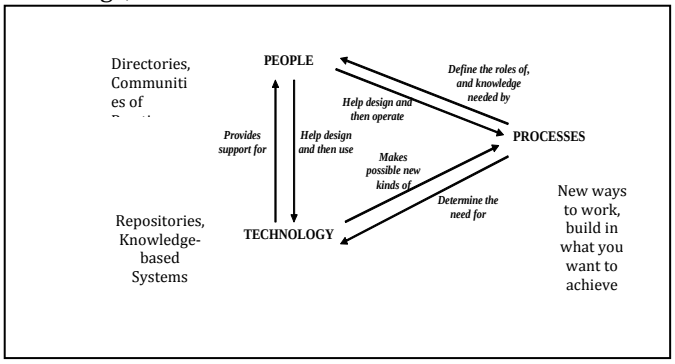
Figure 3 Conceptual framework of knowledge Resources in Business Schools

The successful KM initiatives in business school education are the sharing of all forms of knowledge, both explicit and tacit [20].

G. Knowledge management Systems (KMS):

Knowledge used for descriptive of creating, capturing, collection, organizing, storing knowledge, improving knowledge access and knowledge sharing as well as achieve effective communication between stakeholders, enhancing knowledge environment and managing knowledge as an asset for an organization [16]; [21], Knowledge originates and applied by knowledge workers who are involved in a particular job or task [8]. People use their knowledge in making decisions as well as many other actions, the KM is very important because it helps organizations to gain competitive advantage and effectiveness through sharing and applying knowledge, KM used to systematically leverage information and expertise to improve organizational responsiveness, innovation, competency and efficiency [8]; [21] as seen in figure 4.

[2] and [16] defined KMS as an integrated architecture of computers, systems, people, processes, networks, and communication technology that supports KM for examples include collaborative and application tools such as chat, broadcast, file transfer and distributed decision making, KMS and associated technologies are one aspect of KM, Advances in IT allow knowledge based systems to utilize the tacit and explicit knowledge within an organization and afford greater possibilities for individuals and organizations to create and to share knowledge, as seen in Table 1.



Source: *(Edwards, 2010)*

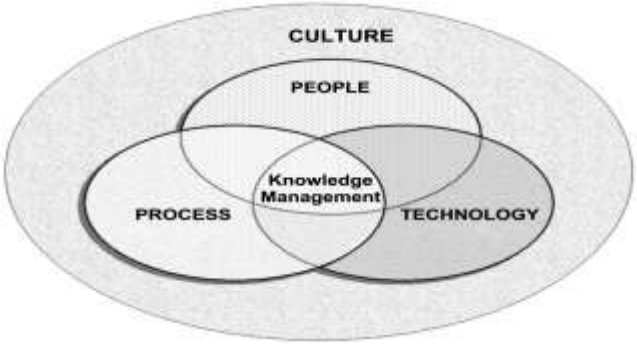
Figure 4 Integration between People, processes and technology

Table 1: KMS Systems

KM Process	Knowledge Creation	Knowledge Codification	Knowledge Transfer	Knowledge Application
Knowledge Management Systems	• Groupw-are	• Knowle-dge reposito r-yies	• Groupw-are	• Intranets
	• Intranets	• Databas-e tools	• Intranets	• Workflow systems
	• E-mail	• Expert systems	• Electronic Bulletin Boards	• Expert systems
	• Expertis-e location	• Search engines	• Expertise location	
	• Discussi-on groups	• Knowle-dge	• Video confere n-cing	
		• Maps Portals	• Discussion groups	
			• Knowle-dge Maps	

Source: *McCarthy (2006)*

The foundation for a KM system requires integrating people, process, and technology within a given culture to ensure performance and learning for sustainable growth, the challenge is to design and implement a system that meets the needs of the individuals, teams, and the organization, shown in Figures 4 and 5 [22].



Source: *(Gorelick, 2005).*

Figure 5 Integration between People, processes and technology within given culture

KM systems capability is identified to include external knowledge likes knowledge about competitors and customers, as well as internal knowledge such as financial, human resources, and product or service knowledge, In the technology perspective, KM is associated with existing technology that comprised their organizational technology infrastructure such as data warehouses, intranets, and the World Wide Web as well as existing tools including search engines, multimedia and decision supporting tools [17].

III. PROPOSED KNOWLEDGE MANAGEMENT AND INNOVATION FRAMEWORK (KMIF)

The purpose here is to provide a KM framework for administrative tasks such as student's registration, as well as leadership duties such as decision support systems to support administration and action indicate which tasks at the HEI should be supported by electronic data processing and which raw data should be collected. Decision support systems indicate how the existing reporting system should gather and process raw data and in what formats it is presented to management for decision making. For example, data from every student and labour market application are entered as raw data; a match between rapid changes in labour market requirements and higher education services helps in choosing right syllabus and valid curriculum courses which effects on student and graduates skills.

KM framework refers to integration of organizational knowledge culture, technology, structure and human resources, effective peoples accomplish higher education goals through the use of effective KM processes and procedures, the organizations that effectively manages knowledge is likely to be considered a learning organization [2]. The KM framework defines the relationships between KM components (KM Enablers and KM Practices) giving understanding about the methodology to use appropriate development for the HE. KM framework constitutes of KM Enablers and KM Practices acting as the backbone and act as guiding principles, providing directions for Innovation as a sound KM implementation. In case of the absence of any of these factors KM system fails to achieve its objective having difficulty to achieve advances.

The integration between KM and Baldrige model requires data collection at all levels of the process, the collected data transformed into information in special quality control units throughout the organizations, these units combine all information into meaningful clusters of information where knowledge is created to feed back into the system to enhance and increase its capacity, KM as an independent process in the framework enable the knowledge flow and sharing across units and departments, and essentially achieving learning in the organization, improve organizational processes and practices; identifying the root causes of services shortages and production defect that prevents achieving organizational standards for the performance outputs [18].

Proposed Framework of Knowledge Management and Innovation Framework (KMIF) contains of two main parts as demonstrated in figure 6:

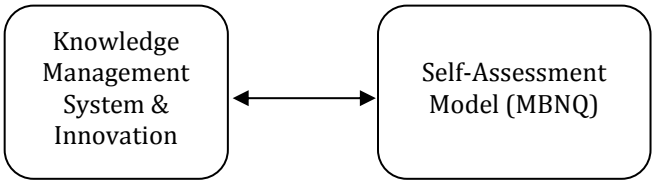


Figure 6: Components of the Proposed Framework of (KMIF)

The framework of this study is based on the idea of change, or the continuous improvement for all process inside the College of Engineering and Technology at ABC University to be more effective than its competitors and based on get feedback from stakeholder, self-assessment and benchmarking the final result with college that achieve higher rank and making that change to be on the road of the world class university, this is considered as continuous process by applying the concept of Plan, Do, Check and Act as shown in figures 7; 8 and 9.

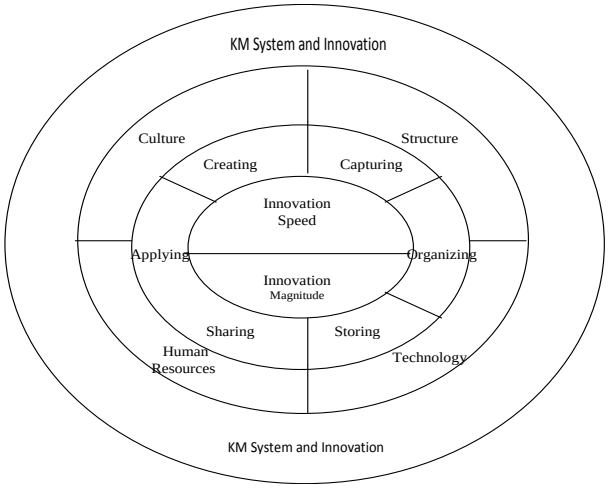


Figure 7: KM system and Innovation (KMSI)

The criteria of KMIF are hypothesized to have particularly related to each other as illustrated in figure 10. This research addressed the following questions:

1- Are the proposed KMIF criteria relationships are valid?

2- Is the application of KMIF will be useful to College of Engineering and Technology stakeholders?

3- What are the differences exist in the perceptions of faculty staff department's concerning and how can the College of Engineering and Technology achieve the quest of excellence (as a World Class University) by applying the proposed framework of KMIF?

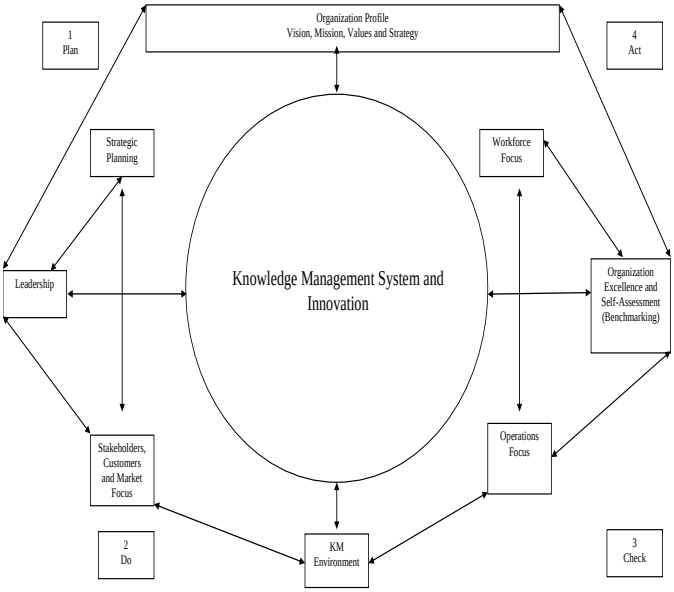


Figure 8 Proposed KM System and Innovation Framework to enhance Organization Quality and Performance Excellence

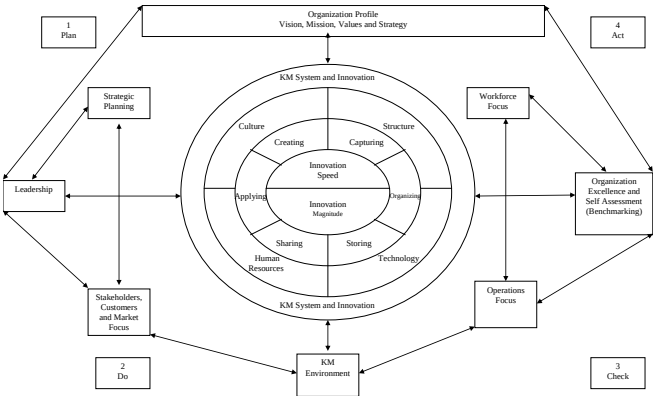


Figure 9 Proposed KM and Innovation Framework to support Organization Quality and Performance Excellence

IV. RESEARCH METHODOLOGY

A. Research model

Research model is based on the idea of change and continuous improvement as shown in figure 10; the research model is based on the following criteria according to [6]:

- Leadership is the key driver of the proposed KMIF, without the involvement and commitment of senior leaders; the quality management becomes difficult and impossible, senior leaders should inspire and motivate the entire workforce and should encourage all faculty and staff to contribute, develop and learn, be innovative, and be creative; senior leaders should serve as role models through their ethical behavior and personal involvement in planning, communication, coaching, development of future leaders, reviewing of organizational performance, and faculty and staff recognition, this is important to achieve college quality and performance excellence.

- Strategic planning is a tool for monitoring keeping pace with marketing changes and needs, and using advanced technology for launching new products and services, the strategic planning in higher education examines how the organization understands student, stakeholder, market, and labour market requirements as input to set strategic directions; this is important to achieve college quality and performance excellence.
- Stakeholders; Customers (Students) and Market Focus concerned about how the organization seeks to understand the needs of current and future students and stakeholders to understand the markets that' achieve by building loyalty and meeting expectations of students, stakeholders and market needs, the objective from this criteria is developing the learning process and curriculum of courses to meet labour market needs, this is important to achieve college quality and performance excellence.
- Knowledge Management system and Innovation; concerning about evaluating the data from the support systems, and evaluating information analysis at different levels of business, evaluate the methods used to achieve continuous improvement through information gathered from all levels of organizations to drive improvement in operational outcomes, and keep information up to date and current to all levels of the organization to achieve quality and performance excellence.
- Work Focus to support and help to achieve organizational goals, the faculty staffs are adopting for change according to market needs changes and directed towards enhancement students and graduate skills, and aligned with the organization's strategic objectives.
- Operations Focus concerns about how new courses (product) and services designed to meet stakeholders (customers and students) needs and taking into account the competitors' movements that achieves effective process management, effective learning process, effective education design and delivery and focus on student learning and taking into account change in the market.
- Organization excellence (Results): regarding the combination's mix of the previous criteria, the organization could achieve superior results of excellence as reflected in operational, financial indicator, student, organizational personal learning and stakeholders satisfaction and satisfy market requirements with superior graduate skills, and should comparison the results achieved with the results of international competitors (WCU) for benchmark through the feedback of information into KMSI to make the requirement changes in the organization process by using the process of Plan; Do; Check and Act to achieve superior results of performance excellence.

B. Measurement Development

The criteria of KMIF were adopted based on [6] and [9]; also the instrument of expected outcomes of proposed KMIF were adopted based on [2]; [23]; [20]; [24].

C. Hypothesis

There was a previous work study by [25]; focuses on measuring Knowledge Management (KM) Enablers, KM Practices and Innovation revealed a moderate level of KM that's encouraging to propose a KMIF and importance of critical success factors of KM in relation to enhance KM practices and innovation to sustain higher education quality and performance excellence. The analysis revealed that's KM enablers are positively affected on KM practice, and KM practices was shown to have a positive impact on its innovation speed also organizational culture was found to positively influence on KM practices. Furthermore, there is a weak positive correlation between KM based technology and KM practices; also there is a weak positive correlation between KM practices and innovation magnitude. Furthermore, the study proved that there was a moderate level of KM practices, ABC University need to improve Information Technology system to spread knowledge for faculty staff and everyone has access to it. Therefore, ABC University has significant opportunities to apply KM practices to sustain education quality and performance excellence to achieve competitive advantage.
The hypotheses of this study are as the following:-

- **H1: KMS and Innovation has a significant positive influence on college quality and performance excellence (Results).**
- **H2: There is a significant positive relationship between the criteria of KMIF.**
- **H3: There are a significance difference in the perceptions of faculty staff department's**

D. Questionnaire

The questionnaire was used and containing both quantitative questions which required closed-ended responses and qualitative questions which required open-ended answers this questionnaire was used to

collect and measure the personal perceptions of faculty staffs and expectations about the efforts of quality and excellence performance in the case of using the Proposed KMIF. Participants were asked to answer and complete both quantitative and qualitative questions. The qualitative section of the questionnaire took advantage of open-ended response; the quantitative section used a five point Likert scale to record responses with the definitions of 5 = strongly agree, 4 = agree, 3 = Neutral, 2 = Disagree and 1 = Strongly Disagree.

E. Population, Sample and Data Collection

The questionnaire used were oriented towards faculty staffs and consultant at the College of Engineering department's level, they represented a stratified random sample and met the conditions stated for the purpose of this study which is to examine the perceptions of faculty staffs of the College of Engineering and Technology at ABC University to determine how well they feel if KMIF (Integration between Knowledge Management System & Innovation and MBNQ) implemented to sustain College Quality and Performance Excellence to be on the road of WCU. The sample was designed to include faculty staffs for selected seven departments which are: Electronics & Communications Engineering, Electrical and Control Engineering, Construction and Buildings Engineering, Computer Engineering, Architectural Engineering & Environmental Design, Industrial & Management Engineering and Basic and applied science. The questionnaire was conducted over a period of two months and the results ended up with 103 respondents from 134 questionnaires sent, giving a response rate of 76.87% (Table 2).

Table 2: Response of Data Collection: measuring the personal perception in the case of using the Proposed KMIF

Departments	Sent	Received	Percentage (%)
Basic and applied science	30	25	83.33
Electrical and Control Engineering	20	17	85.00
Construction and Buildings Engineering	17	13	76.47
Computer Engineering	17	13	76.47
Electronics & Communications	20	16	80.00
Architectural Engineering & Environmental Design	20	13	65.00
Industrial & Management Engineering	10	6	60.00
Total	134	103	76.87

This study oriented towards faculty staffs, that's are more familiar, knowledgeable, able and willing to report the strategic plan of the college and have sufficient awareness to predict the overall policies, two others department (Architectural Engineering & Environmental Design and Industrial & Management Engineering) were added within the data collection to reduce the sampling error rate. The study with a low sampling error results in a high degree of generalizability, so increasing the likelihood that the results can be extrapolated for use at similar colleges [26]; [27]; [28]; [29].

The respondents were randomly identified by determining the department and selected the subject randomly from the population; this method of selection divides the population in strata on the basis of some characteristics and from each of these smaller homogeneous groups or strata draws at random a predetermined number of units. The characteristic or criterion seems to be more relevant in this research work. In this study used disproportionate sampling that means the size of the sample in each unit is not proportionate to the size of the unit but depends upon considerations involving personal judgment and

convenience. This method of sampling is more effective for comparing strata which have different error possibilities.

The collection data were analyzed using the Statistical Package for Social Sciences (SPSS) 16.0, the analysis involved descriptive statistics which include mean and standard deviation. In addition, the findings of the study and presentation of the data were supported with the illustration of tables. The data was also analyzed by using Pearson Correlation to identify the relationship and to test hypotheses between variables; also used Analysis of Variance (ANOVA) to compare mean between College of Engineering departments to understand fitness of proposed KMIF. All of the research study's results were tested at a 5% significance level.

V. RESEARCH ANALYSIS AND RESULTS

A. Reliability and validity analyses:

To ensure the reliability and validity of the instruments, several criteria considered when designing a questionnaire survey, the selection of question wording, questionnaire design and layouts were adopted. Attention is paid to the choice of wording since the language of questionnaires is an important attribute of their effectiveness and should reflect the respondent's own language usage. It is also considered question wording be consistent with the wording and definitions. Items in the questionnaire are designed to be simple, clear, short, and technically accurate and at an appropriate reading level. The questionnaire instrument and variable elements were developed through an extensive literature review, the questionnaire items adopted and chosen from previous studies [6]; [9]. Table 3 describes the Cronbach's alpha for all items of instruments which represent reliability, it was 0.956. The closer the alpha value to 1 means the data is more reliable, Cronbach's alpha attests to a good measuring reliability of the instruments, therefore the data collected about first part is reliable, Cronbach's alpha attests to a good measuring reliability of the questionnaire, therefore the data collected in this research is reliable. The validity for all items together describes by the Communalities-Extraction. All factors have Communalities-Extraction values higher than the 0.50 cutoff values; it shows the Extraction Communalities range from 0.601 to 0.862 so the all variables were retained. Relatively high values of reliability and validity imply that the instruments used in the study are adequate. The value of the KMO Measure of Sampling Adequacy for this set of variables was 0.770, which would be labeled as 'middling'.

Table 3 Reliability Statistics for Propose KMIF

Cronbach's Alpha α	N of Items
.956	49

B. Quantitative Results

Correlation analysis and one-way analysis of variance (ANOVA) were used to understand relationship among dimensions in the framework and tests fitness of the rest of hypothesis. The mean (M) and standard deviation (SD) is used, the mean is a measure of central tendency that offers a general picture of the data. The standard deviation is another measure of dispersion for interval and ratio scaled data and it offers an index of the spread of a distribution or the variability in the data. the mean scores for the seven categories assumed Knowledge Management System and Innovation (Category 4) as independent variable effect on Organization Performance Excellence (Results) (Category 7), assumed all other categories held constant. The mean scores for all criteria of KMIF range from 3.6117 to 4.3689; on the other hand the standard deviation scores for all criteria of KMIF range from 0.61021 to 0.88368; the finding describes that the mean rating for all criteria in descending order from high to low were; Positives from Applying KMIF (M = 4.3689, SD = 0.61021), Category 2: Strategic Planning & Deployment (M = 4.2233, SD = 0.71307), Knowledge Management System and Innovation (M = 4.0680, SD = 0.73113), Category 1: Leadership (M = 4.0583, SD = 0.88368), Category 6: Operations Focus (M = 4.0194, SD = 0.74070), Category 7: Organization Performance Excellence (Results) (M = 3.9029, SD = 0.82265), Category 5: Faculty and Staff Focus (M = 3.9020, SD = 0.65264) and Category 3: Student, Stakeholder & Market Focus (M = 3.6117, SD = 0.83117). From the

previous analysis, the standard deviation scores for the variables which were below one, implying that the respondents have consistently rated on all the elements, when standard deviation is somewhat small then there is small variability and the data are clustered around the mean.

The relationship between the criteria of KMIF was investigated using Pearson Correlation coefficient (r). The Bivariate correlation was subjected to two-tailed test of significance from two difference levels, if significance value (P-Value) less than 0.05 considered as significant, so the acceptance of null hypotheses when P-Value is less than 0.05. Table 4 presents the relationship between the KMIF criteria, relationship between KMS & Innovation and expected positives from Applying KMIF, KMS & Innovation is significantly and moderate positively correlated with organization performance excellence (Results), R (103) = 0.419, P < 0.000 two-tailed, KMS & Innovation is significantly and weak positively correlated with positives from Applying KMIF, R (103) = 0.251, P < 0.011 two-tailed, P-value <=0.05 **Therefore, hypothesis 1: KM System and Innovation has a significant positive influence on organization quality and performance excellence and achieve positive results from applying KMIF so hypothesis 1 supported.** The study revealed the relationship between the categories of KMIF as following:-

- Category 1: Leadership and other categories shown in table 4 explained as following; Category 1: leadership is significantly and moderate positively correlated with Category 2: Strategic Planning, R (103) = 0.461, P < 0.000 two-tailed, Category 1: leadership is significantly and strong positively correlated with Category 3: Market Focus, R (103) = 0.632, P < 0.000 two-tailed, Category 1: leadership is significantly and moderate positively correlated with Category 4: KMS & Innovation, R (103) = 0.495, P < 0.000 two-tailed, Category 1: leadership is significantly and moderate positively correlated with Category 5: Faculty staff focus, R (102) = 0. 356, P < 0.000 two-tailed, Category 1: leadership is significantly and moderate positively correlated with Category 6: Operation Focus, R (103) = 0.433, P < 0.000 two-tailed, Category 1: leadership is significantly and strong positively correlated with Category 7: Organization Performance Excellence (Results), R (103) = 0.615, P < 0.000 two-tailed, Category 1: leadership is significantly and moderate positively correlated with Positives from Applying KMIF, R (103) = 0.451, P < 0.000 two-tailed.
- The relationship between Category 2: Strategic Planning and other categories explained as following; Category 2: Strategic Planning is significantly and moderate positively correlated with Category 3: Market Focus, R (103) = 0.396, P < 0.000 two-tailed, Category 2: Strategic Planning is significantly and moderate positively correlated with Category 4: KMS & Innovation, R (103) = 0.403, P < 0.000 two-tailed, Category 2: Strategic Planning is significantly and weak positively correlated with Category 5: Faculty staff focus, R (102) = 0.158, P < 0.113 two-tailed, Category 2: Strategic Planning is significantly and moderate positively correlated with Category 6: Operation Focus, R (103) = 0.419, P < 0.000 two-tailed, Category 2: Strategic Planning is significantly and moderate positively correlated with Category 7: Organization Performance Excellence (Results), R (103) = 0.489, P < 0.000 two-tailed, Category 2: Strategic Planning is significantly and weak positively correlated with Positives from Applying KMIF, R (103) = 0.282, P < 0.004 two-tailed.
- The relationship between Category 3: Market Focus (Students & Stakeholders) and other categories explained as following; Category 3: Market Focus is significantly and moderate positively correlated with Category 4: KMS & Innovation, R (103) = 0.528, P < 0.000 two-tailed, Category 3: Market Focus is significantly and weak positively correlated with Category 5: Faculty staff focus, R (102) = 0.349, P < 0.000 two-tailed, Category 3: Market Focus is significantly and moderate positively correlated with Category 6: Operation Focus, R (103) = 0.458, P < 0.000 two-tailed, Category 3: Market Focus is significantly and moderate positively correlated with Category 7: Organization Performance Excellence (Results), R (103) = 0.460, P < 0.000 two-tailed, Category 3: Market Focus is significantly and weak positively correlated with Positives from Applying KMIF, R (103) = 0.208, P < 0.035 two-tailed.
- KMS &Innovation has another relationship with other two categories explained as following; Category 4: KMS &Innovation is significantly and weak positively correlated with Category 5: Faculty staff focus, R (102) = 0.350, P < 0.000 two-tailed, Category 4: KMS &Innovation is significantly and moderate positively correlated with Category 6: Operation Focus, R (103) = 0.450, P < 0.000 two-tailed.
- The relationship between Category 5: Faculty Staff Focus and other categories explained as following; Category 5: Faculty Staff Focus is significantly and weak positively correlated with Category 6: Operation Focus, R (102) = 0.212, P < 0.033 two-tailed, Category 5: Faculty Staff Focus is significantly and moderate positively correlated with Category 7: Organization Performance Excellence (Results), R (102) = 0.441, P < 0.000 two-tailed, Category 5: Faculty Staff Focus is significantly and weak positively correlated with Positives from Applying KMIF, R (102) = 0.122, P < 0.220 two-tailed.
- The relationship between Category 6: Operation Focus and other categories explained as following; Category 6: Operation Focus is significantly and strong positively correlated with Category 7: Organization Performance Excellence (Results), R (103) = 0.598, P < 0.000 two-tailed, Category 6: Operation Focus is

significantly and weak positively correlated with Positives from Applying KMIF, R (103) = 0.353, P < 0.000 two-tailed.

- The relationship between Category 7: Organizations Performance Excellence (Results) and Positives from applying KMIF explained as following; Category 7: Organizations Performance Excellence (Results) is significantly and weak positively correlated with Positives from Applying KMIF, R (103) = 0.287, P < 0.003 two-tailed.
- **Therefore, hypothesis 2: There is a significant positive relationship between the criteria of KMIF so hypothesis 2 accepted,** the Strategic Planning is significantly and weak positively correlated with Category 5: Faculty staff focus, R (102) = 0.158, P < 0.113 two-tailed, P-value > 0.05 so this both criteria are not supported, Category 5: Faculty Staff Focus is significantly and weak positively correlated with Positives from Applying KMIF, R (102) = 0.122, P < 0.220 two-tailed; P-value > 0.05 so this both criteria are not supported.

C. Analysis of Variance:

To determine whether the proposed KMIF differed between department or not, one-way analysis of variance (ANOVA) was employed to identify differences in means between respondents of College of Engineering departments to understand fitness of proposed KMIF between departments. If a difference existed, that fact provides evidence that, there is no relationship existed between departments about specific category of KMIF. An ANOVA was conducted for all criteria of proposed KMIF to determine whether differences existed in the perception of faculty staff of the seven college departments as provided in table 5.

- For Category 1: Leadership, (F=1.671, P=0.136), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about leadership. F Value: Fisher value, a statistical distribution, used here to indicate the probability that an ANOVA of KMIF is good. In the ANOVA calculations, it is the ratio of squared variances. A large number translates to confidence in the KMIF [30]; [31].

Analysis of Variance (ANOVA) indicated that:

- For Category 2: Strategic Planning, (F=.684, P=0.663), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Strategic Planning.

Table 4 Correlations

		Leadership	Strategic Planning	Market Focus	KMS & Innovation	Faculty Staff Focus	Operation Focus	Organization Performance Excellence (Results)	positives from Applying KMIF
Leadership	Pearson Correlation	1	.461**	.632**	.495**	.356**	.433**	.615**	.451**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	103	103	103	103	102	103	103	103
Strategic Planning	Pearson Correlation	.461**	1	.396**	.403**	.158	.419**	.489**	.282**
	Sig. (2-tailed)	.000		.000	.000	.113	.000	.000	.004
	N	103	103	103	103	102	103	103	103
Market Focus	Pearson Correlation	.632**	.396**	1	.528**	.349**	.458**	.460**	.208*
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.035
	N	103	103	103	103	102	103	103	103
KMS & Innovation	Pearson Correlation	.495**	.403**	.528**	1	.350**	.450**	.419**	.251*
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.011
	N	103	103	103	103	102	103	103	103
Faculty Staff Focus	Pearson Correlation	.356**	.158	.349**	.350**	1	.212*	.441**	.122
	Sig. (2-tailed)	.000	.113	.000	.000		.033	.000	.220
	N	102	102	102	102	102	102	102	102
Operation Focus	Pearson Correlation	.433**	.419**	.458**	.450**	.212*	1	.598**	.353**
	Sig. (2-tailed)	.000	.000	.000	.000	.033		.000	.000
	N	103	103	103	103	102	103	103	103

- For Category 3: Market Focus (Students & Stakeholders), (F=2.256, P=.044), the low p-value (<0.05) suggests that the difference in mean scores is a statistically significant variable. That's indicates there is a significant difference between faculty staff departments perceptions about Market Focus. The Levene test is used to test if samples have equal variances, Equal variances across samples is called homogeneity of variances. The test for homogeneity of variances has a p-value 0.059, which is not significant enough to say the variances are different, so cannot be reasonably certain that the variance of the Market focus score differs across the faculty staff departments' perceptions (equal variances assumed) presented in table 6.
  Tukey Post-Hoc comparison results indicated that the faculty staff participants of Electrical & Control Engineering had a significantly more positive perception than Electronics & Communication Engineering, Computer Engineering, Basic & Applied Science and Architectural Engineering and Environmental Design departments, also had a negative perception than Construction & Building Engineering and Industrial & Management Engineering departments presented in Table 7.
- For Category 4: Knowledge Management System and Innovation, (F=1.611, P=0.152), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Knowledge Management System and Innovation.

- For Category 5: Faculty Staff Focus, (F=1.024, P=0.415), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Faculty Staff Focus.
- For Category 6: Operation Focus, (F=.786, P=0.583), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Operation Focus.
- For Category 7: Organization Performance Excellence (Results), (F=.761, P=0.602), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Organization Performance Excellence (Results).
- For Positives from Applying KMIF, (F=1.238, P=0.294), the high p-value (>0.05) suggests that the difference in mean scores is not a statistically significant variable. That's indicates there is no significant difference between faculty staff departments perceptions about Positives from Applying KMIF.
- **Therefore, hypothesis 3 was rejected (hypothesis 3: There is a significance difference in the perceptions of faculty staff department)**

The quantitative results revealed cohesion between perceptions of faculty about KMIF and there are positive correlations between all criteria of KMIF.

D. Qualitative Results

Qualitative results covers only second part of this study, the respondents to the qualitative questionnaire was 22 people out of 103 of the total respondents to the questionnaires, during personal interviews with respondents who did not respond to qualitative section they indicated that the positive points have been mentioned in detail in the quantitative section, The two open-ended questions generated a total of 23 positive outcome statements and 6 negative outcome statements. Based on a content analysis of the positive outcome statements, five distinct themes emerged:

- Recognition as a Excellence Center,
- Strengthen and improve the communications,
- Capturing Opportunities available in the market,
- tools for Continuous Improvement, and
- Enhance Effective Communication.

Table 5 ANOVA: Test Results for KMIF and Positives from Applying KMIF

		Sum of Squares	df	Mean Square	F	Sig.
Leadership	Between Groups	7.532	6	1.255	1.671	.136
	Within Groups	72.118	96	.751		
	Total	79.650	102			
Strategic Planning	Between Groups	2.127	6	.355	.684	.663
	Within Groups	49.737	96	.518		
	Total	51.864	102			
Market Focus (Students & Stakeholders)	Between Groups	8.707	6	1.451	2.256	.044
	Within Groups	61.759	96	.643		
	Total	70.466	102			
Knowledge Management System and Innovation	Between Groups	4.988	6	.831	1.611	.152
	Within Groups	49.536	96	.516		
	Total	54.524	102			
Faculty Staff Focus	Between Groups	2.613	6	.435	1.024	.415
	Within Groups	40.407	95	.425		
	Total	43.020	101			
Operation Focus	Between Groups	2.619	6	.437	.786	.583
	Within Groups	53.342	96	.556		
	Total	55.961	102			
Organization Performance Excellence (Results)	Between Groups	3.135	6	.522	.761	.602
	Within Groups	65.895	96	.686		
	Total	69.029	102			
Positives from Applying KMIF	Between Groups	2.728	6	.455	1.238	.294
	Within	35.252	96	.367		

	Groups					
	Total	37.981	102			

Table 6 Test of Homogeneity of Variances
Market Focus (Students & Stakeholders)

Levene Statistic	df1	df2	Sig.
2.106	6	96	.059

Table 7 Multiple Comparisons
Tukey Post Hoc
Dependent Variable: Market Focus (Students & Stakeholders)

(I) Department	(J) Department	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Electrical & Control Engineering	Construction & Building Engineering	-.09955	.29551	1.00	-.9896	.7905
	Electronics & Communication Engineering	.44853	.27937	.679	-.3929	1.2899
	Computer Engineering	.05430	.29551	1.00	-.8357	.9443
	Basic & Applied Science	.62353	.25214	.181	-.1359	1.3829
	Architectural Engineering and Environmental Design	.05430	.29551	1.00	-.8357	.9443
	Industrial & Management Engineering	-.17647	.38087	.999	-1.3236	.9706

A content analysis of the 6 negative outcome statements revealed the following six themes:

- Increased the costs of educational process.
- The failure of the system as a result of the lack of interest to participate in the activation of the system by members of the faculty and staff as a result of lack of sensation and perception of the value of the application of this system to the intensity of effort and time.
- Lack of faculty response to the idea, although they are very good and help the process of continuous development of the facility.
- Increase the burden of documentary work and effort on the employees.
- Need more time to implement and assessment.
- Faculty Staff and employees don't accept change easily according to human being nature.

College of Engineering and Technology could achieve the quest of excellence (as a World Class University) by applying the proposed KMIF and identify core concepts and values that are beliefs and behaviors of high performing organizations for achieving performance excellence and to be on the road of excellence by strong leadership, a clear vision of the institution's mission and goals, and a clearly articulated strategic plan to translate the vision into strategic objectives, set new sharp goals, and design and implement a renewal plan leads to enhance

performance, reduce the performance gap compared with competitors by benchmarking depends on ambitious vision to future and continuous development.

VI. CONCLUSIONS

This study used a mixed method design, both qualitative and quantitative questions to collect data from faculty staff regarding measuring the perception of the expectations about the efforts of quality and excellence performance in case of using the Proposed Knowledge Management and Innovation Framework (KMIF) to enhance student skills and keep pace with WCU at the College of Engineering in the ABC university. An examination of the quantitative data was conducted by using Pearson Correlation analysis and tests fitness of each hypothesis. The mean (M) and standard deviation (SD) were used for measuring KMIF criteria; the data was also analyzed by using Pearson Correlation to identify the relationship and to test hypotheses between variables, also uses Analysis of Variance (ANOVA) to compare mean between College of Engineering departments to understand fitness of proposed KMIF. All of the research study's results were tested at a 5% significance level. ANOVA revealed; there are no significant differences in perceptions between faculty staff department's participants for Leadership; Strategic Planning; Knowledge Management System and Innovation; Faculty Staff Focus; Operation Focus; Organization Performance Excellence (Results) and Positives from using KMIF but the ANOVA analysis indicated about Market Focus (Students & Stakeholders) there is a significant difference between faculty staff departments perceptions; test for homogeneity of variances indicated there is no significant enough to say the variances are different, Tukey Post- Hoc Tests were conducted to determine where significance existed for Market Focus (Students & Stakeholders) the Post-Hoc test indicated that the faculty staff participants of Electrical & Control Engineering had a significantly more positive perception than Electronics & Communication Engineering, Computer Engineering, Basic & Applied Science and Architectural Engineering and Environmental Design departments, also had a negative perception than Construction & Building Engineering and Industrial & Management Engineering departments.

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The Role of Education and Innovation in Global Transition

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SUMMARY: Global Transition is a continuous process that aims at global growth and sustainable development, and the improvements of human quality of life by promoting *smart*, *sustainable* and *inclusive* growth. To achieve successful transition, all driving forces including demographics, economics, social issues, culture, technology, environment, and governance should be considered. Sustainable development cannot be achieved without sound innovation on science/technological, business, and social fronts. This requires building the human capital needed for innovation, where the role of education becomes so apparently critical.

This presentation addresses issues related to the role of education and innovation in global transition. It examines how an education system and innovation affect driving forces for sustainable development. It also addresses what is needed to achieve successful programs for sustainable development in Egypt.

Women and Horse Riding in the Pharaonic New Kingdom

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Past-Dean of the Higher Institute of Ancient Near East
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The existence of representation of horsemen in the Egyptian art has long been well known, there was an opinion among Egyptologists that the horse was never ridden in ancient Egypt, and was used only to pull the chariot, but modern scholars now refusing this opinion. At Serabbit El-Khadim in Sinai there are four pictorial graffitt, dating to the reign of Amenmhet III, which depict the concept of riding or the concept of a human being utilizing the back of donkey to transport himself, and the riders were Asiatics[1].

Ancient Egypt knew the riding of back of the animals by Asians, who came to it on the back of donkeys, since the time of Hyksos riding horseback had been spread in Egypt, especially in chariots. The Egyptian army during 18th and 19th dynasties consisted of infantry and the chariotry in addition to mounted scouts who furnished the army with information of enemy movements, the infantry was not qualified for such a task, as well as chariots riders due to their need to move on level ground, which showed the need for special Mounted suitable for highlands. [2].

We have a representation of mounted scouts, a small but important branch of the Egyptian army in the New Kingdom.

From that period we have many examples of Horsemen from the Metropolitan Museum , Bologna Museum, Edinburgh Museum, represent the Horsemen in explain the Egyptian military life during that period.

The earliest known example of riding horseback in the New Kingdom is found on a plaque of glazed steatite, now in the Metropolitan Museum of Art, The scene, shows an Egyptian horseman wielding a mace and a bow and riding over the prostrate figure of an enemy. On the reverse of plaque is a cartouche beaing the phenomena " Men-Kheper-re" of Thutmosis III. It is not certain if the rider is the king himself. From the late Eighteenth Dynasty we have the following examples of horsemen: **(a)** A limestone ostracon picturing King Thutmose IV worshipping a divinity who is seated on horseback, **(b)** A limestone relief of a horseman riding past a group of soldiers, now in the Bologna Museum, **(c)** A fragment of a limestone relief of a horseman, now in the

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[1] Alan Richard Schulman: Egyptian representations of Horsemen and Riding in the New Kingdom, Journal of Near Eastern Studies, Vol. 16, No. 4 (Oct., 1957), pp. 263-264.

[2] Alan Richard Schulman: op. cit, pp. 263-264.
The Egyptians had no cavalry in our sense of the word, though the horse had been introduced into Egypt by the Hyksos. The place of our cavalry was taken by a strong chariot force which supported and cleared the way for the infantry to charge. The Hyksos chariots were manned by three soldiers, but the Egyptians were content with two, one to fight, the other to drive: in some cases the reins were tied round the waist and managed by movement of the thighs, and the driver carried a shield to protect himself and his master. This chariot force numbered some thousands, and was very effective in breaking the ranks of the enemy.
Tirard, H. M.: The Soldiers of Ancient Egypt, The Journal of Egyptian Archaeology, Vol. 2, No. 4 (Oct., 1915), pp. 229-233.

Royal Scottish Museum at Edinburgh, **(d)** A painted wooden statuette of a horse and rider, now in the Metropolitan Museum of Art, **(e**) The right side-panel of a toy chariot with the representation of a horseman painted on it, now in the Metropolitan Museum of Art, **(f**) A bronze battleaxe with the figure of a horseman set in the hollow-work, now in the British Museum**, (g)** a bronze razor(?) whose handle is in the form of a horse and rider, now in the British Museum, **(h)** A glazed terra cotta statuette of a horse and rider, now in the Oriental Institute Museum.The limestone ostracon, unfortunately broken, shows the king adoring a divinity seated on horseback[3].

The Bologna relief, now believed to have come from the Memphite tomb of Haremhab, shows a scene in two registers of a martial nature: In the upper register at the right two charioteers stand waiting behind their chariots. To their left a soldier on foot and armed with a bow is hurrying up a hill. In the lower register to the right squads of soldiers carry a trimmed log. In the center of the register a horseman rides astride his mount. He holds the reins in both hands and in his right hand is also a whip. He wears a plain, short kilt which is held in place by a belt whose ends hang down in front. His wig is short and elaborately curled. To the left and in front of but facing away from him stands an officer. Since the other men in the relief are soldiers, it is probable that the horseman is also a soldier and that he is not a groom, as Winlock thought, but is more likely a scout, returning to camp and bearing a message to the officer who is in front of him.

The fragment of relief in Edinburgh is unfortunately damaged. What is preserved is the rider, with the exception of his upper left arm and elbow, and all of the horse save for the lower part of its front legs and all of its hindquarters. The preserved portion of the relief is carved in incised relief and is almost identical with the horseman depicted on the Bologna relief, which, however, shows a more graceful plasticity of modeling in the details of the horse and rider, while the Edinburgh group appears flat and less lifelike. The other differences between the two pieces are not very great: the harness of the Edinburgh horse is slightly less detailed and delineated. The facial features of the rider are more completely preserved. He wears an earring and there is a topknot on his short, elaborately curled wig from which a ribbon hangs down. In all other details the two examples are identical [4].

The panel of the toy chariot is quite similar in attitude to the preceding two examples. His costume differs in that he wears a striped kilt, a wide collar, and a red cap. It is his horse which commands our main attention, for it is decorated with vertical white stripes painted on its flank, chest, neck, and legs. The horse of the wooden statuette is decorated similarly in the same areas with vertical and horizontal white stripes, and the tails of both animals are painted white. There is still a controversy as to whether these stripes were meant as pure decoration or whether they were intended to represent the markings of a piebald horse. It is to be noted that from this same period

[3] Alan Richard Schulman: op. cit, pp. 264-265.
[4] Alan Richard Schulman: op. cit, pp. 265-266.

we have at least one representation of actual piebald horse, and its markings are quite unlike this type of striping.

The horseman depicted on the bronze battleax is executed rather crudely. There appears to be no modeling at all. The details are indicated by incision. The horse-man is apparently nude except for a wig. In his left hand he bears an object which may be a mace or a battleax. There are no indications at all of harness or reins. Despite its crudity the representation has an air of vigorous action about it.

The horseman worked on the handle of the bronze razor(?) is a graceful work of art. The attitude of the horse is that of the so-called "flying gallop". The rider sits erect, his legs tucked under the belly of the horse, his knees pressing hard against it. He grasps the mane of the animal with both hands. Again, as in the preceding illustration, there is a complete absence of harness and reins, and again the rider is nude save for a short wig. Behind the horse's hind legs the handle is skilfully terminated in an elaborate ornamental design. A graceful fluid modeling permeates the entire piece. The pose of the rider parallels that of the rider of the wooden statuette as well as that of the horseman in the next example.

The rider of the Oriental Institute statuette is very similar to those of the last two examples. He also is nude except for a short wig, which in his case is very elaborate. He sits hunched slightly forward, his hands before him as if he were grasping reins. Unfortunately the head of the horse and the hands of the rider are broken away, and we have no way of knowing whether there were any harnesses or reins. The traces of colored glaze which remain indicate that the horse was a piebald. The color of the horse was apple green with brown patches. The tail was completely brown. The legs of the animal are not shown. They terminated flush with the horse's underside to form a flat base. The presence of a dowel-hole in the middle of the underside of the base is an indication that the figurine was meant to be fastened either to another object as a decorative ornament or to a larger base[5].

These group of horsemen all bear features in common which indicate to me that they should be assigned to the same period. Taking the Bologna relief, which is dated with a great degree of certainty to Haremhab, i.e. the late Eighteenth Dynasty, as a starting point, we find the following features in common among all the examples: the Bologna and Edinburgh reliefs are almost perfect parallels. The horsemen of the Bologna relief, the Edinburgh relief, the Oriental Institute statuette, and possibly the bronze razor(?) have identical, short, elaborate wigs. The horsemen of the razor(?), the Oriental Institute statuette, and the bronze ax-head are all nude. The three figures in the round are all in similar attitudes. There is no harness present on the horses of the toy chariot, the bronze axhead, the bronze razor(?), and possibly the Oriental Insti-tute statuette, though this cannot be certain since the horse's head is missing. In the case of the horseman of the Metropolitan statuette, the rider grasps the reins of his horse the same way as do the riders of the Edinburgh and Bologna reliefs, but no other form of harness is present. Finally, the markings of the horse of the Metropolitan statuette and the horse of the toy chariot are of the same type. Although this is not true of the horse of

[5] Alan Richard Schulman: op. cit, pp. 266-367.

the Oriental Institute statuette, the phenomenon of design of the horse's tail in respect to its color markings, distinct from the color of the rest of its body, tallies with the same phenomenon in the case of the other two, and may perhaps be an indication that the argument that the striping was meant to imitate piebald markings is correct. Thus, working on the principle that if A and C are equal to B, then A is also equal to C, I am inclined to date these examples to the same period as that of the starting point, the Bologna relief. They may be a little earlier or a little later. But I should think that very late Eighteenth to the very early Nineteenth Dynasty is their probable date.

In the Nineteenth Dynasty the reliefs of the battle of Kadesh provide us with four examples of Egyptian horsemen, of whom two from the Abu Simbel reliefs and the one from the Luxor relief are specifically designated as "scout." The four horsemen are similarly dressed in kilts and headcloths and are variously equipped with quivers and bows. All have whips, that of one Abu Simbel horseman being more elaborate than those of the others. Another of the Abu Simbel horsemen differs from the others in the details of his kilt, which has a long triangular codpiece, and is similar to the kilts worn by the soldiers in the upper register of the Bologna relief, and by the fact that he is unarmed. These four horsemen are obviously soldiers. The Luxor horseman is the only one of the four who is shown riding side-saddle. The horses of all four wear a simple harness rather than the more complicated harness worn by the chariot-horses in the same reliefs[6].

Also dating from the Nineteenth and possibly early Twentieth Dynasties are the following examples of horsemen:

(a) A painted limestone ostracon with the representation of a horseman, from Deir el Medineh, now in the Cairo Museum.

(B)The Edgerton Ostracon, A painted limestone ostracon with the representation of a horseman, from the vicinity of Luxor, now in the possession of Professor Edgerton[7].**(Fig. 1).**

(C) a second painted limestone ostracon with the representation of a horseman, from Deir el Medineh;

(D) A painted and incised block of limestone with the representation of a horseman, from Luxor.

The Cairo ostracon from Deir el Medineh shows a horseman wearing a full wig and an elaborate gown similar to that worn by the officer in the lower register of the Bologna relief, mounted side-saddle upon a piebald horse. In his left hand he carries a whip. All that is visible on the second Deir el Medineh ostracon is the back and hind-quarters of the horse and the body of the rider, who wears the same type of long robe

[6] Alan Richard Schulman: op. cit, p. 267.

[7] Alan Richard Schulman: op. cit, pp. 264-268, Says that: I am grateful to Professor Edgerton for his kindness in allowing me to publish this ostracon from his collection. It was purchased in Luxor, but no information concerning its exact provenience is known. It is of creamy limestone, length 15.2 cm.; height 10.5 cm., with the representation painted in outline with a reddish-brown coloring.

and wig as the rider in the preceding example. An interesting and important feature to note is the appearance in out- line of a saddle-blanket upon which the rider sits[8].

Fig. 1: The Edgerton Ostracon, A painted limestone ostracon

The Syrian goddess Astarte, worshiped by the Egyptians from the Eighteenth Dynasty on, appears quite frequently represented on horseback**(Fig. 2)**[9]**.**

Fig. 2: Astarte, appears quite frequently represented on horseback

From the Eighteenth Dynasty there is the example quoted previously. From the Nineteenth Dynasty on there are the following examples:

(a) a representation of Astarte on horseback from the Temple of Seti I at Redisiyeh;

(b) a painted limestone ostracon with a representation of the goddess riding a horse, from Thebes, now in the Berlin Museum**(Fig. 3)**[10];

(c) Another ostracon with the same representation, now in the Fitzwilliam Museum, Cambridge**(Fig. 4)**[11];

[8] Alan Richard Schulman: op. cit, pp. 267-268.
[9] Erman, A.: Die ägyptische Religion, Berlin 1909, Taf. 60.
[10] Schaefer. H.; Andrae, W.: Die Kunst des alten Orients, Berlin 1925, ss.381, 616. see also: Alan Richard Schulman: op. cit, p. 269, (in Berlin Staatliche Museum Acc. No. 28126?).
[11] Murray, M.A.: The splendour that was Egypt, A general survey of Egyptian culture and civilisation, London 1950, pp. 222-240, 242, Pl. LXXXII(1).

(d) the upper portion of a limestone stela with a representation of the goddess on horseback, now in the Turin Museum;

e) a limestone stela with a representation of Astarte on its upper portion, from the Ramesseum[12].

Fig. 2: A painted limestone ostracon of Berlin

Fig. 4: A painted limestone of Fitzwilliam Museum Cambridge

The relief from Redisiyeh shows the goddess on horseback, brandishing a weapon. On the Turin stela she is depicted as about to loose an arrow from her bow while she rides her horse. On the Ramesseum stela, again, she is brandishing a weapon from horseback. In each of these three representations the goddess wears the tall white crown surmounted by two maat feathers. **On the Berlin ostracon she is shown riding in a warlike stance, but the crown and weapons are missing, having been on that part of the ostracon which is broken away. On the Fitzwilliam ostracon, again, the crown is missing, and the attitude of both horse and rider is a peaceful one, but there is no doubt that the rider is a female, and, unless she was a goddess, she would apparently be unique as the only human female rider**[13].

The **Berlin Ostracon is different** scenery and unique in Egyptian civilization dates back to that period, which is of a woman riding a horse. The limestone ostracon,

[12] Alan Richard Schulman: op. cit, p. 269.
[13] Alan Richard Schulman: op. cit, pp. 269-270.

unfortunately broken, shows the king adoring a divinity seated on horseback. The king is clearly visible, but of the rider, obviously a divinity, and probably the earliest-known representation of the goddess Astarte on horseback, all that remains visible is the head and chest of the horse, and an arm holding a spear and shield.

The **Berlin Ostracon**, although representing the Syrian goddess Ishtar on horseback in several scenes dating back to that period but the scene of the Ostracon is unique because the attitude of both horse and rider is a peaceful one different than that of goddess Ishtar.

Ishtar was a Syrian and Mesopotamian goddess and in South Arabia, her worship entered Egypt in New Kingdom and represented riding a horse with weapons as arrow and spear and battle axe[14]. She worshipped at Tanis and Pr-Ramsis specially in the Ramesside period[15]. And The Phoenician goddess **Innat** (ᶜn3t, ᶜnti, ᶜntt) worshipped in Egypt specially at Tanis and Pr-Ramsis, the king Ramsis II was one of those worshipped her, he gave her name to his fovorite doughter and horse. There is connection between goddess Innat and the chariots of the king, she represented with arms as a shield, battle axe, bow and spear[16]. Also **Atargatis** is a goddess connected with horses and represented ridding a horse as Innat and Ishtar. **And ᶜsit** is a Syrian goddess similar to Ishtar and worshipped in Egypt as a woman riding a horse without Bridle and had weapons as spear and battle axe[17]..

When we compare the representation of the goddesses (Ishtar) Ashtarte, Innat, ᶜsit, and Atargatis on a horse back with the scene of **Berlin Ostracon** we find that there is a complete difference between them because the lady on the horse of Ostracon scene dose not holding any weapons as the goddesses used to hold.

So, we can assure that the scene of **The Berlin Ostracon** is unique as it represents the first case of a woman riding the horseback through the Pharaonic New Kingdom, specially Egyptian women in the New Kingdom played a great role in the state and its society, a lady become a queen (Hatshepswt) and used to imitate kings in every thing they used to do.

[14] see:Wolfgang Helck, Götter, fremde in Ägypten, LÄ II(Wiesbaden 1977), 643.
[15] see: Mercer, S.: The Religion of Ancient Egypt, London 1949, p. 221.
[16] see: Mercer, S.: op. cit, pp. 220-221.
[17] Mercer, S.: op. cit,, p. 221.
See also: Helck, W. LA II(Wiesbaden 1977), 643; Jeffrey R. Zorn: Reconsidering Goliath: An Iron Age I Philistine Chariot Warrior, Bulletin of the American Schools of Oriental Research, No. 360 (November 2010), p. 10.

Impact of Urban Landscape on City Environment – A GIS based study on urban plants

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Keywords: Urban Trees, Environmental Impact, Urban Factors, Landscape Assessment, Geographic Information System (GIS)

Abstract

Trees have been an integral part of city environment through centuries. Over the past decades, cities have been experiencing rapid urbanization, which have been one of the major factors progressively altered landscape in past and will continue to do so in future. This dramatic reduction in urban landscape has a visible influence on our ecosystem, since trees doesn't only beautify the cityscape or act as the city lungs, but also plays a role in stabilizing the built environment with services such as air purification, temperature mitigation and noisiness reduction. To maintain a healthy & livable city environment, well-preserved urban trees are required. Different severe defiance facing cities nowadays like extreme heat, population growth and lack of water availability; are causing pressure on the built environment, services and quality of life. As a matter of fact, trees are facing a very high death rate in cities. This deterioration aspect, impacts our built environment; since there is an equivalent relationship between trees and environment, they are mutually impacting each other like two sensitive balance sides, when one of those sides yield to a change; correspondingly, the other side is influenced by that change. The research aim to validate the balanced relationship between city environment and urban trees, through two landscape assessment, where the first one illustrates the influence of urban factors on tree performance and evaluate the degree of deterioration, while the second assessment will proof the impact of urban trees on city environment. The landscape in urban context is a heritage, which needs to be maintained and preserved from deteriorating; using a quantitative tool such as Geographic Information System (GIS) is to contribute in emphasizing and preserving the heritage.

Background

In past generation or two, cities have been facing a rapid growth and development due to urbanization and industrialization. One of these impacts is explosion of population in the urban footprint throughout the world, especially in developing mega cities, according to UN figures 45% of human beings are living in urban areas and by the year 2025 it will increase to 65 %. This has created a number of problems that largely affect the existence and quality of landscape. Urban green spaces are for millions of people, the space where they relax, work, cycle, socialize and learn about nature. It is a part of the urban fabric and acts as the city lungs, balance of ecosystem and recreational spots. Their design and quality can considerably affect the resident's quality of life. The benefits of urban plants need strategies for realizing its value and development planned framework. Therefore, the development and maintenance of urban landscape are essential for a healthy environment, sustainable and competitive community.

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Greening the city is important, since it makes the places livable and brings a very tangible environmental, socio-cultural and economic benefits. Elements of landscape help to alleviate and adapt to climate change. Green areas mitigate the negative impacts from urbanization and climate change through cooling and absorption of pollutants. Furthermore, green areas are fundamental for the preservation of natural habitats and biodiversity. They offer opportunities for a socio-cultural recreation spaces for the interaction of people and a suitable place for the encouragement of children's creative thinking. Landscape is a shared resource which has a direct impact on the city economic value as they lead to increase property value.

Quality of life in urbanized cities could be improved by the existence of landscape, especially for developing countries such as Egypt, which needs a huge improvement in the quantity and quality of landscape pattern. Therefore the research will analyze the Egyptian context, the factors affecting the landscape pattern and its impact on the environment. City Environment controls tree growth by multiple factors such as: site management, location, human activity and local circumstances. On the other hand, Landscape have a major impact on the environment, these factors could be an ecological impact (species, population, habitat and ecosystem), environmental pollution impact (water, air, land & noise) and aesthetic impact (land, air, water, biota, composition, and man-made objects). Now days, climate change and human activities, gradually transforms the region and results in fundamental imbalance with the natural environment, dramatically obstructs the ecosystem, and greatly threaten permanent feature causing damage to biodiversity and landscape.

Today, many countries are directed for the importance of landscape to the city environment and for the role of urban trees as an element of landscape. Trees are important assets in the whole world, just as streets, alleys, utilities, public facilities and recreational areas are a part a community's every day use. The city is a sterile landscape of concrete, brick, steel and asphalt without trees. The natural and urban factors threaten urban trees, causing its deterioration. Therefore, trees must be treated as a heritage property and requires a development preservation framework and treatment for city trees. Applying this framework needs a database, which means documentation for all the city trees & it's often not available in our developing countries. City trees database are well developed in some North American towns, cities & for some urban settlements in Europe.

To guide future planting, a series of tools and programs will continue to be developed. Trees assessment could be used as one of the tools to manage both existing landscape and future development. Monitoring trees condition, species diversity, canopy dimension, and useful life expectancy are important aspects for managing landscape. Quantitative assessment are used when failure occurs, to investigate all the parameters surrounding trees; firstly to discover the failure reasons, secondly to develop a successful management framework and finally to avoid the repetition of failure. The research will outline the principles needed for decision-making of future planting.

GIS stands for Geographic Information System. According to ESRI it’s a computer based system that "integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information". GIS is used to analyze and work with data that's referenced by spatial / geographical coordinates. Landscape and trees assessments are recently greatly improved using GIS, since it allow the user to better manage and manipulate these valued resources.

Method

Study Area

Shallalat Park is located in Alexandria city, Egypt. Alexandria is the 2nd largest metropolitan area in Egypt. It extends nearly 32 Km along the coast of the Mediterranean Sea, and accommodates a population of 4.5 million. Alexandria was founded around a small Ancient Egyptian town 331 BC by Alexander the Great. Alexandria is a tropical city, and its climate could be classified as a hot wet dessert (BWh) according to Köppen classification.

The Shallalat garden is one of the most significant cultural and historical parks in the city. It's positioned at latitude 31° 12' 10" N, east of Alexandria downtown area. It's built up area covers nearly 8 acres. The park was constructed in the 19th century AD, between 1887 and 1900. It's was originally designed by "Nubar Pasha" one of Mohamed Ali family's prime ministers. The organic contoured design of the park was inspired from the famous American architect "Frederick law Olmsted" (1822-1903). The park contains historical parts from Alexandria ancient wall, which extends 15m along the park & 3m in height, and also has one of the largest and oldest water tanks, with an area of 200 m^2 and 3 floors underground. It overlooks four streets; three of them are main roads while the fourth is a secondary one.

The study area map is shown in (Figure 1).

Figure 1: Illustrated the study area map, Shallalat Park – Alexandria, Egypt

Tree Survey

The study area was selected for evaluation, due its important historical value, which needed to be preserved. In the study area, 100 trees representing approximately 40 % of the park's tree population were sampled based on sample inventory technique, to

entail an estimation of the relationship between urban trees and city environment. A two-leveled assessment strategy was adopted. The first will clarify the impact of trees on environment to proof its benefits, while the second will obtain an estimate evaluation of the environment influence on trees condition.

All the data used in the assessments where analyzed with the aid of: GIS-Software (Program: ArcGIS 9, ArcMap version 9.3), SPSS Software, High Resolution Aerial Photography, Microsoft Excel, Pollution Devices **, Experienced Arboriculture Professor.

** Kamal Hamed Noweir (PHD). Prof. of Occupational Hygiene & Air Pollution – High Institute of Public Health, Alexandria University – Alexandria, Egypt.

Figure 2: Illustrates the Geographical Position at which the environmental measures were taken

First Assessment

The first assessment aimed to investigate the effect of urban trees on reducing the noise levels, air pollution and solid particles.

It's an environmental monitoring assessment, for describing the impact of landscape on the quality of environment. A random environmental sample for trace analysis was designed to establish the significant difference between the air quality inside the Shallalat Park and outside it.

The impact on the environment is a multi-factorial, but for the scope of the research, it was decided to discuss one parameter only which is trees and made an assumption that the other factors are stable, and it was ignored.

The environmental samples were measured by three devices: Sound Level Meter, MultiRAE detector, and HazDust – EPAM 5000. The sound level meter is an instrument that is used for measuring sound pressure level, and mainly used for the study of noise pollution. The MultiRAE it is used to detect and monitor toxic volatile compounds and gases such as carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). While the HazDust is used to sense airborne particles, measuring the total suspended particles (TSP - mg/m^2) and the coarse particulate matter (PM_{10}). The three devices are portable, wireless and provide immediate accurate data.

Data Management and Analysis

The method entails going on the site to measure the environmental readings, using the devices three times a day, one at the early morning (8 am), the second at the midday (11 am), while the third & last reading was taken in the afternoon at the rush hour of the day (2 pm). The process will be repeated in each one of the four streets surrounding the park. At each street 2 steps were processed:

1- Measuring 2 times at 2 places, one is outside the park near the street pavement, while the other is inside the park (the park is outlined with a light short handrail, nearly 50 cm in height). Both measurement takes about 20 minute's total (10 for each place), and the average results are calculated.
2- While measuring the readings, the car flow should be calculated roughly on each side of the street.
After recording the data into tables, it was arranged for analysis and comparison against the standards. The statistical independent T-test and the coefficient correlation test were adopted to assess the relationship between the results.
Refer to appendix (1) for the primary results and the standard data. Table (1) will show the results (Noise, NO_2, SO_2, CO, TSP & PM_{10}) at 3 different timing for each street. Table (2) will show the air quality standard levels given by the Egyptian Environmental Affairs Agency – EEAA.
The above map shows the readings position on the site (Figure 2).

Second Assessment:
It's a process of evaluating the condition and performance of an individual tree with in a distinguished group. This method is known as SULE – Safe Useful Life Expectancy. It was originally founded in the early 1980's by *"Jeremy Barrell"*. Through years SULE has been supervised & undergone a vast appraisal and it was broadly approved as advancement in trees assessment.
SULE can be considered as a subjective method rather than objective one, which means that the perspective of judging trees could be changed from one point of view to another, so there is always an extreme to the rule.
It can be carried out with the help of an experienced arboriculture, who is knowledgeable with the management of trees.
SULE is an estimation of the average age that a tree could remain alive in a landscape before it dies, based on seven different parameters influencing trees life – Environment, Health, Location, Structure, Management, Amenity and risk on other. This could help to make a development framework plan for the durability of urban landscape. Moreover, it helps in expecting the tree population mortality phases, which will help in preserving urban trees with either treating, replacing or removing it.

Figure (3) shows the tree decline life stages.
This assessment helps in presenting a huge amount of complicated data about trees in to a simple way, where a non-tree expertise can understand the results and plan for future investigation upon the results of tree category. Since the assessment simply can categorize the situation into good, medium or bad. Beside that it's not a time consuming method, since each tree could be assessed in a few minutes, as well as it's not a cost effective one.

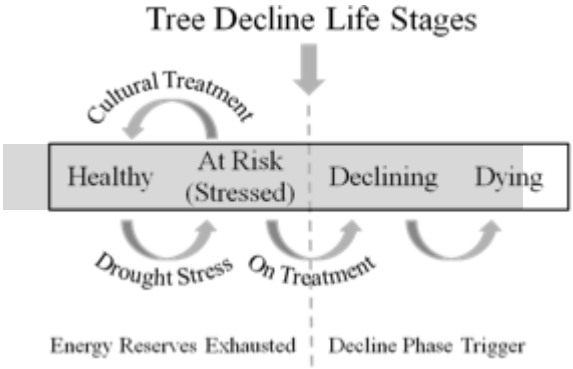


Figure 3: Illustrated the four stages of tree life (adapted from urban forest strategy – city of Melbourne)

The following Figure (4) shows the different parameter influencing trees.

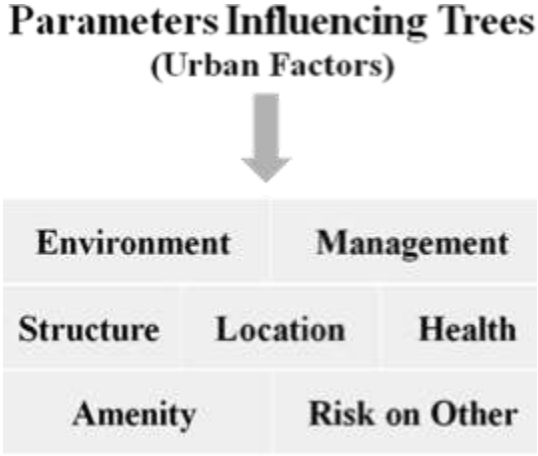


Figure 4: Illustrated the seven parameters influencing trees

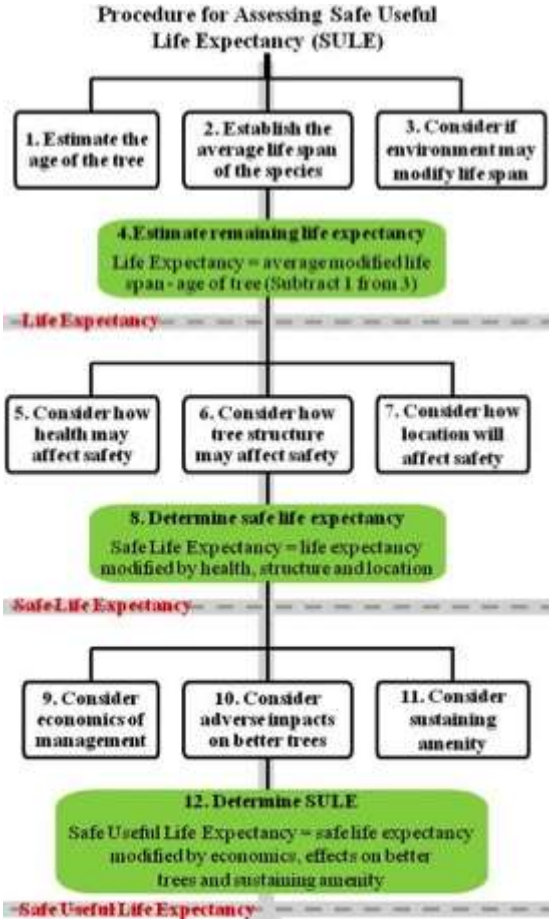
The SULE is executed for every tree, it engage 12 steps for each one. Before conducting the assessment each step should be widely described to understand the method character, which will facilitate its use. The steps require going into the site, inspecting each tree and collecting suitable data. The steps will be illustrated below:

A- Identifying the tree species & its family.

B- Getting the latitude & longitude (x,y) for each tree, for locating it into the GIS map.

C- Measuring the tree: Height, Trunk Diameter (DBH), Crown Spread, and photographing the trees & leaves.

D- The arbor culturist inspects each tree, and its parameters, according to the following 12 steps:



Those twelve steps are adopted from *"Jeremy Barrell"* assessment.
E- Fill the data into the data collection form and then convert the manual sheet to excel table for being able to analyze the data.

SULE Categories Table	
Long	more than 40 years
Medium	15 – 40 years
Short	5 – 15 years
Remove	Dead/Dying
Small	Less than 15 years

Table 1: Illustrate the SULE categories

F- Decide the SULE category of each tree (the sub-category is not used in that research for the ease of method). Table (1) illustrates the range of years of each category of life expectancy.
G- Conducting SULE MAP, using GIS (ArcMap program) for analyzing the data, and manipulate a data base documentation with all the information about Shallalat Park.
H- Figuring out from the results and analysis the limiting factor/s.
I- Decision making and recommendations for preserving the park.

Usually not every single step should apply for each tree. At the same time, it's unusual that a tree don't have any feature that reduces its life expectancy. The benefit of the assessor experience is helping in identifying the limiting factor or attribute.
Figure (5) shows the SULE map of Shallalat Park, with the categories of trees life span.
The study of the urban character of a city can be achieved at different scales. The observation of an urban park is considered as a medium-scale. The medium-scale observation reflects the human activities like traffic impacts & vandalism, and the growing space availability for tree planting & management.
The city environment controls the tree growth by a major number of urban factors, that's not available in natural areas. The SULE assessment observed seven main parameters, which mainly affects the trunk, branched, foliage and the trees life span as a result.
The experienced arbor culturist who helped in evaluating the trees SULE assessment is Professor Hosny Abdel-Azim Abou-Gazia, Faculty of Agriculture, Alexandria University – Egypt, Department of forestry & Wood Technology.

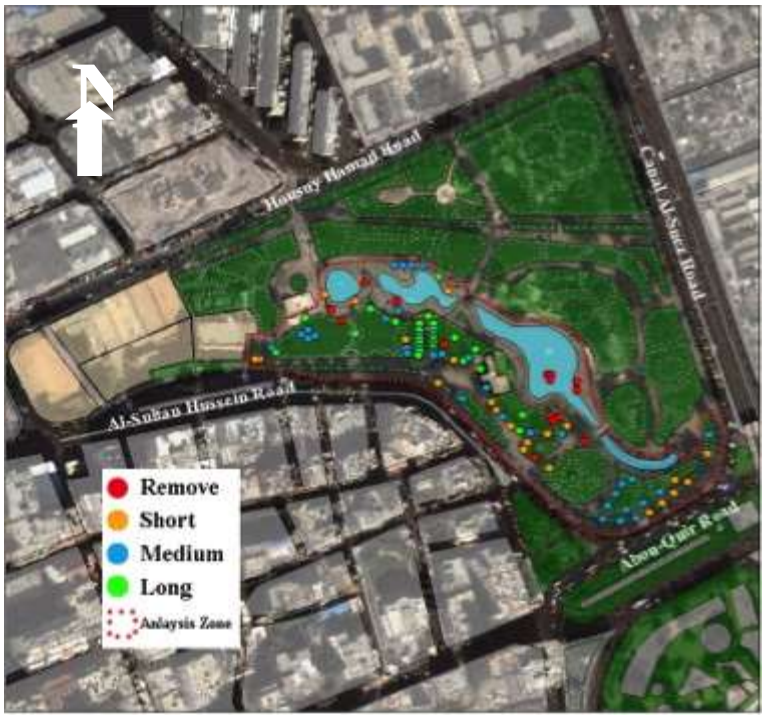


Figure 5: The USLE Map showing the tree categories available at the park

Results

Fist Assessment

The data were entered into excel program and imported on the statistical SPSS Software for analysis. Following descriptive analysis for calculating the following values: (Mean, Standard Deviation, Standard Error Mean, T-value and P-Value).
The independent T-test was selected to study the significance relation between trees and environment, by the capability of trees on decreasing pollutants and improving air quality of the city,
basically the six measured parameters in the study (noise, NO_2, SO_2, CO, TSP & PM_{10}).
In order to proof the significant difference between the degree of pollution inside the park and outside it using the t-test, an alternative hypothesis (H_1) was adopted stating that trees "have significant impact on decreasing gas pollution, noise and suspended

particles in air"; against the null hypothesis (H_0) stating that trees "have no significant impact on decreasing gas pollution, noise and suspended particle in air".

The average readings were taken in the site, mean while standard deviations of the six variables were calculated, St.D = (6.069, 10.968, 1.377, 0.313, 17.794, and 7.139) respectively. The t-value were also calculated, t = (15.280, 13.804, 12.866, 8.844, 8.842, and 9.057) respectively. The P-value for the six done t-test showed a value of 0.00, which is less than 0.05 indicating that all the relation proofed statistically by the calculated t-test are statistically significant, so that the alternative hypothesis (H_1) were adapted and the null hypothesis (H_0) were rejected. The T-test result is attached in Appendix 2.

By comparing the mean values to the environmental standards approved by the Egyptian government, it was noticed that all are much higher to the supposed values, which affects the human's quality of life.

To increase the reliability and validity of the study the coefficient correlation test was used to proof the relation between cars and pollution, which directly increases the degree of deterioration of trees.

Second Assessment

The results indicate that the trees in the study area are highly harmed. SULE assessment for the Shallalat Park assessed 100 trees which nearly represents 30 % of the total tree population of the park. It was found that 15 % of the trees will be at the end of its useful life in the landscape with in 5 years and 22 % within 15 years. The following table (2) shows the SULE assessment results of the trees.

Useful Life Expectancy of Shallalat Park Trees	
< 1 to 5 years **Remove**	**15 %**
6 – 15 years **Short**	**22 %**
16 – 40 years **Medium**	**34 %**
40 + years **Long**	**29 %**

Table 2: The SULE Assessment Results

Unfortunately, it was indicated that 37% of the trees sampled are in a severe decline & will likely to be removed if no treatment or management plan are used within the range of 1 – 15 years.

The most damaged species were the palm trees, especially the "Washingtonia Robusta" and "Washingtonia Filifera" were found very diseased.

These palm trees are considered as a heritage amenity. Their age is nearly ranges from 80 to 120 years old. As they age they require an increase in manage management and special care treatment. Dramatically none of the above requirements were found at the park. This lead to loss of many palm trees and threaten the planting of this species in all Alexandria.

The location of trees played an important role in its growing performance. It was found that the trees which were used as windbreaker were exposed more to health &

structure problems. Furthermore, the trees located near the main roads had a lower useful life expectancy than those in the middle.

To know the limiting factor among the 7 parameters, a GIS analysis were used. The results demonstrated the site management were the limiting parameter, were 94 % of the trees are facing problems due to mismanagement found at the park. On the contrary the environment parameter was the second limiting factor with 82 %. The health parameter risk will be increasing slightly with time if the situation remains the same.

The diminishing availability of water was one of the main challenges facing the tree population of Shallalat Park. The ageing tree population is another challenge, since it was observed that the trees age average between 50 – 100 years old, a very few were noticed under the age of 20. This means that during the last 20 years no new planting occurred at the park. If it was assumed that this action of no new planting or replanting continue to takes place, with the ongoing loss of existing trees, the park could approach a dramatic and eternal phase.

Conclusion

On the basis of the assessment results, it can be found that the next 5 – 20 years will be critical in the way of managing the urban landscape park to make it more applicable to the future demand and more volatile to face the influence of urbanization & climate change.

It's aimed to slow down the deterioration process and to increase trees efficiency by planning for future protection and treatment framework.

After categorizing each tree condition and knowing the reason behind its situation, decision should be taken for preserving the urban trees by treating, replacing or restoring them. A number of actions are needed to be done in order to achieve a useful and reliable urban landscape in the future: increase the trees useful life expectancy by improving its health, replace the dying trees with small new ones, adapt new methods and techniques in trees management, and finally creating a database for the ease of monitoring the tree population for yearly assessments.

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APPENDIX 1- Table 1 Illustrates the Environmental Assessment Primary Results

Abou-Quir Street							
Measurement Time	Location	Noise	NO_2	SO_2	CO	TSP	PM_{10}
8 AM	Outside	101.3	126	8	1.5	178	65
	Inside	73.1	91	2	0.6	116	42
11 AM	Outside	91.7	110	5.7	1.4	121	51
	Inside	57	52	1.4	1.1	98	39
2 PM	Outside	99	130.2	9.4	2.1	188	71
	Inside	76.4	92	3	0.8	141	46
Canal Al-Suez Street							
8 AM	Outside	86.3	110	6	1.4	163	61
	Inside	67.5	73.9	3	0.6	104	41
11 AM	Outside	91.7	110	5.7	1.4	118	39
	Inside	57	52	2.4	1.1	92	35
2 PM	Outside	91	117	11	1.8	182	68
	Inside	70	74	3.6	0.9	107	43
Housny Hammad Street							
8 AM	Outside	77.1	110	6	1.4	168	61
	Inside	53.7	73.9	3	0.6	113	48
11 AM	Outside	73.9	110	5.7	1.4	129	54
	Inside	53	52	2.4	1.1	113	43
2 PM	Outside	78.8	117	11	1.8	166	67
	Inside	57.4	74	3.6	0.9	120	45
Al-Sultan Hussein Street							
8 AM	Outside	82.5	110	6	1.4	161	67
	Inside	52.8	73.9	3	0.6	108	45
11 AM	Outside	83.3	110	5.7	1.4	132	58
	Inside	51.7	52	2.4	1.1	101	39
2 PM	Outside	88.4	117	11	1.8	169	69
	Inside	54.1	49	5.8	0.8	117	41

Table 2: Air Quality Standards – The maximum level of concentrations allowed

Pollutants	Limits Allowed)mg/m²(	Maximum Period of Exposure
Sulfur Dioxide (SO_2)	350	Hour
	150	Hour24
	60	Yearly
Nitrogen Dioxide (NO_2)	400	Hour
	150	Hour24
	40	Yearly
Carbon Monoxide (CO)	30 µg/m³	Hour
	10 µg/m³	Hour8
Total Suspended Particles (TSP)	230	Hour24
	90	Yearly
Coarse Particulate Matter (PM_{10})	150	Hour24
	40	Yearly

Appendix 2

Table 3: Environmental sample assessment, T-test results

T-Test						
	Mean	**Std. Deviation**	**Std. Error Mean**	**t**	**df**	**Sig. (2-tailed)**
Noise (outside the park) - Noise (In the park)	26.77500	6.06991	1.75223	15.280	11	**.000**
NO_2 (outside the park) – NO_2 (In the park)	43.70833	10.96826	3.16626	13.804	11	**.000**
SO_2 (outside the park) – SO_2 (In the park)	5.11667	1.37764	.39769	12.866	11	**.000**
CO (outside the park) - CO (In the park)	.80000	.31334	.09045	8.844	11	**.000**
TSP (outside the park) - TSP (In the park)	45.41667	17.79407	5.13670	8.842	11	**.000**
PM_{10} (outside the park) - PM_{10} (In the park)	18.66667	7.13931	2.06094	9.057	11	**.000**

TECTERRA: A Unique Organization Leading the Commercialization of Innovative Technology in Canada

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TECTERRA is a not-for-profit organization established with funding from the Government of Canada and the Province of Alberta. Over its three years of operation, TECTERRA has supported the commercialization of innovative geomatics technology through a strong portfolio of over 150 companies across Canada and 25 applied research groups in Alberta. TECTERRA employs a unique model of investment in up and coming innovative technologies and helps stimulate the growth of the Canadian economy through its investment programs and support services to the small and medium technology companies.

The presentation will showcase TECTERRA's successful model for technology commercialization and economic development through the support of government to science and technology. TECTERRA's success will be presented in the form of direct and tangible economic metrics. These metrics include projected three-year commercial revenue from commercialization projects, number of small and medium companies supported, number of applied research projects engaged, number of new jobs created, number of highly qualified personnel trained, number of breakthrough technologies supported, number of patents filed and supported and many more. On all accounts, TECTERRA has exceeded its targets and has created a buzzing success across the innovation system in Canada.

The presentation will explain the key elements of TECTERRA's model and its advantages. Several examples of successful ventures supported by TECTERRA will be presented.
Conclusions and recommendations will be drawn to help governments in other jurisdictions to establish similar models of commercialization support for economic development and the generation of regional benefits to industry and society.

مشروع توثيق التراث بمركز الخطوط بمكتبة الاسكندرية

الاستاذ الدكتور عصام السعيد
استاذ التاريخ و اثار مصر و الشرق الادنى القديم
كلية الاداب جامعة الاسكندرية

اضاف التقدم العلمي في مجال التكنولوجيا بصفة عامة والرقمية منها على وجه الخصوص إلي مجال علم المكتبات والمعلومات أبعادًا جديدة أكثر تطورًا من ذي قبل ، ووسط هذا التطور الكبير وأشكال الثورة التكنولوجية كان من الطبيعي أن تتبنى مكتبة الإسكندرية إيمانا برسالتها تجاه التراث والمعرفة الرائد مفهوم النشر الرقمي لإتاحته لكل الباحثين المهتمين بالعلم و المعرفة، وهو ما دفع مركز الخطوط إلى القيام بدوره في إتاحة دراسة النقوش والخطوط والكتابات في العالم عبر العصور، منذ عصر ما قبل التاريخ حتى العصر الحالي في كافة أنحاء العالم ، فتولدت من هذا المنطلق فكرة استخدام التكنولوجيا الحديثة في توثيق التراث القديم.

ويأتي مشروع توثيق التراث القديم من اهم المشروعات التي يقوم بها مركز دراسات الكتابات والخطوط بمكتبة الاسكندرية للحفاظ على نقوش العالم لما تمثله من سجل للنشاط الانساني في مختلف العصور تحت مسمى المكتبة الرقمية للنقوش ، وقد أخذ على عاتقه مهمة نشر النقوش والكتابات المختلفة في مختلف الاماكن والعصور وإتاحتها للعلماء والباحثين والهواة في محتوى رقمي مبسط عبر الموقع الإلكتروني .

و يعد مشروع المكتبة الرقمية للنقوش والخطوط بمثابة سجل رقمي للكتابات الواردة على العمائر والتحف الأثرية عبر العصور، وتُعرض هذه النقوش للمُستخدِم في صورة رقمية تتضمن موجزًا عن بيانات النقش، وعرض صور فوتوغرافية له، كما تسجل ما دُوِّن عليه من كتابات.

وقد تبنَّى المشروع في الوقت الحالي تسجيل مجموعة من لغات العالم القديم والحديث بخطوطها المتعددة وهي اللغة المصرية القديمة، واللغة العربية، واللغة الفارسية، واللغة التركية، واللغة اليونانية، مع محاولة اضافة وتنمية هذه النقوش على مراحل متعددة ، وكذلك البدء في تسجيل وإضافة مجموعة جديدة من خطوط اللغات الأخرى حيث أنه من المقرر في المرحلة التالية لهذا المشروع بإضافة أقسام خاصة بنقوش الخط العربي القديم و نقوش الشرق الأدنى القديم والنقوش القبطية و تُعرض البيانات الأساسية لتلك النقوش بالاضافة الى الوصف الخاص بها للمستخدم باللغتين العربية والإنجليزية.

و حرص القائمون على هذا المشروع على أن يخرج الموقع الإلكتروني للمكتبة الرقمية للنقوش والخطوط في شكل مبسط للمستخدمين ؛ لتمكين أكبر عدد ممكن من ازائرين من الاستفادة من ما تعرضه المكتبة الرقمية من نقوش كتابية أثرية فصلا عن الاستزادة بالصور والمراجع الخاصة بكل نقش على حدة ، كما يمكن تصفُح النقوش على المكتبة الرقمية للنقوش حسب اللغة التي كُتب بها النقش ، أو حسب التصنيف كالعمارة والفنون والنحت وغيرها، وكذلك نوع الأثر ، كما يتيح البحث المتقدم للمستخدم البحث برقم الأثر ، أو مكان الحفظ ، أو مكان العثور عليه، وأيضًا بواسطة البحث عن طريق الحقبة الزمنية التي يرجع إليها النقش الكتابي، وحينئذ سيجد الباحث كل ما له علاقة بالأثر من صور عالية الجودة، وتفريغ للنقش الكتابي، ومعلومات ووصف موجز للأثر فضلاً عن ترجمة النقش.

ويسعى مركز الخطوط لأن تكون المكتبة الرقمية للنقوش واحدة من أهم المكتبات الرقمية المتخصصة في مجال النقوش والكتابات على شبكة المعلومات الدولية.

Quality in E-Learning Accounting Courses…Is it Possible?

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Abstract
Electronic Learning (e-learning) refers to the use of Information and Communications Technology (ICT) to enhance and support learning through providing access to a range of resources and materials which may not otherwise be available or accessible, for example graphics, sound, animation, multimedia.
E-learning is one of the vital tools in modern teaching practices. It provides opportunities for developing cross-cultural teaching programs in developing countries like Egypt that expect promising future in its educational process from the use of the modern Information and Communication, although E-learning in Egypt still has many challenges, such as the immature infrastructure, unawareness, resistance to change, and computer/Internet illiteracy.
An E-learning accounting course comprises all forms of electronically supported learning and teaching which should enable students to possess the necessary skills for work place. Accountants need intellectual skills such as problem solving and critical thinking. Teaching accounting effectively and efficiently was thought that it requires face-to-face interaction between learners and instructors in order to gain essential skills and basic accounting knowledge. Nowadays, accounting students should be encouraged to take responsibility for their own learning. The overall objective is to develop students' capacity for self-directed learning.
Since, quality competence is a key element in the successful implementation of education and training concepts. The aim of this research is to investigate and identify factors that influence the use of internet and e-learning in accounting education and to assess the student's attitudes and acceptance towards accounting e-learning and their perceptions of the effectiveness with respect to quality of instruction, interaction, and learning outcomes compared to traditional classroom instruction. In addition, both the advantages and challenges of Internet education and e-learning are addressed and identified to be considered by accounting educators.
The research design was a cross-sectional survey design by employing the administration of self-administered questionnaire to gather the required data for the research from the Arab Academy for Science, Technology and Maritime Transport (AASTMT) - College of Management and Technology (CMT) accounting students.
Findings indicated that AASTMT students are willing and able to use 21st century emerging technology. In addition, they are much satisfied and have positive attitude toward improve the quality of their learning experience by increasing flexibility to learn in their own time and pace. This study shows that there is a significant positive correlation between student satisfaction and quality of blended learning. In addition, the study shows that learning outcomes, higher interaction between student-faculty/student-student, efficiency and

effectiveness of instruction and course administration, and student assessment and feedback are indicators for the level of quality of blended learning approach.
Analysis of the results helps in identifying the aspects of e-learning that are useful in supporting accounting student learning. AASTMT online students expect to perceive high quality instruction and learning, as well as quality interaction with the instructor and other students compared to students in traditional course sections.
Keywords: E-Learning, Blended Learning, Quality, Challenges and Opportunities, Students Perception and Satisfaction, Higher Education, Egypt.

Introduction

E-learning, distance education, distance learning or mobile learning was introduced in 1995. It was called Internet-based Training (IBT) then Web-based Training (WBT) then Online Learning and finally e-learning.
E-learning refers to the use of Information and Communications Technology (ICT) to enhance and support learning and to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner.
The advances in communication and computer technologies have provide great opportunity for universities and a constant demand in developing countries to improve their teaching and learning processes by incorporate increasing levels of technology into the design and delivery of their curriculum. These new technologies allow for more flexibility in learning and a wider reach for education in many countries worldwide (Salawudeen 2010).
The Internet is portrayed as an education delivery platform enabling students to receive and interact with educational materials and to engage with teachers and peers in ways that previously may have been impossible (Sigala 2002). E-learning can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio. The focus is on internet education and distributed learning; it shifts from a teaching-centered environment to a learning-centered environment; to learners rather than students in a classroom and to learning facilitators rather than instructors (Jensen and Sandlin 1997).
E-Learning can innovative solutions to problems to conventional educational problems that faces Egypt. it will ease off the overloaded classes in the Egyptian colleges, and a low teacher-to-student ratio, high prices of traditional educational books, transportation problems, need for continued education and specialized training, interaction with the international educational community and the enhancement of the level of national education.
Business education is very rewarding area to teach, thus both the opportunities and the threats of Internet based education and distance learning should considered by accounting educators. In addition, students should be encouraged to take responsibility for their own learning and come to higher education with a wide variety of skills, abilities, backgrounds and expectations. The overall objective is to develop students' capacity for self-directed learning.
AASTMT student perception about e-learning is that it provides a positive learning environment: good teaching, clear goals and standards, appropriate workload, appropriate assessment, and emphasis on independence and it develop intellectual and thinking skills through teaching students to analyze ideas or issues critically. However, not all of this can

be achieved without quality assurance, which is a key factor in the strength, improve, and assure the quality of higher education.
This paper organized as follows: Section 1 presents the study literature review, research objectives and hypotheses. Section 2 introduces E-learning definitions, approaches, advantages, disadvantages and implementation challenges-generally in developing countries and in Egypt specifically. Section 3 shows the progress of Egypt toward E-learning. Section 4 define and points the advantages, disadvantages and challenges of the blended learning system as an alternative teaching approach appropriate for the Egyptian higher educational institutes. Section 5 assesses the quality in blended learning accounting courses. Section 6 includes a description of the research methodology and the results of SPSS data analysis presented and discussed. Section 7 includes conclusion and recommendations.

1. Literature Review

Poon (2013) investigates the use of blended learning to enhance students' learning experiences, from an institutional perspective. Students' experiences and perceptions of blended learning as a delivery method were examined. The study suggests for institutions that intend to implement blended learning are that they must be realistic about the investment of time, effort, and resources that are required for development and implementation.
Wong (2012) did a survey of first- year accounting students to gauge their attitudes towards e-learning and their perceptions of the effectiveness of online options. The results indicate that students strong support traditional approaches of teaching as they ranked the delivery of face-to-face lectures as the most effective in assisting their learning and potentially affecting their assessment outcomes, closely followed by face-to-face tutorials.
Chen et al. (2010) examine online and traditional classroom students' perceptions of instruction and course administration, student-faculty interaction, and student-student interaction based on survey responses. The results found that online students perceive high quality instruction and learning, as well as quality interaction with the instructor and other students.
Shroff and Vogel (2010) assess the effect of blended learning on perceived individual student interest, utilizing a blend of online and face-to-face discussions. Results from the study suggest that there was no statistical difference in subjects' perception of interest in both the online and face-to-face discussions, utilizing a blended learning approach.
Mohidin et al. (2009) stress working in groups, as these enabled accounting students foster greater participation with colleagues, inculcate self-confidence and enhance leadership ability, Farrell (2008) emphasis on teamwork as the best method of preparing accounting students for participation and relevance in the workplace.
Jones and Chen (2008) reported that MBA accounting students in blended learning sections had more positive group work experiences and more positive perceptions of instructor feedback compared to students in traditional classroom sections.
Lai (2008) assess the state of technology readiness of professional accounting students in Malaysia, to examine their level of internet self-efficacy, to assess their prior computing experience, and to explore if they are satisfied with the professional course that they are pursuing in improving their technology skills.

Kavanagh and Drennan (2007) advise that accounting teaching models should place greater emphasis on students' professional accounting competencies rather than the basic traditional accounting skills.
Zakaria and Iksan (2007) stress the need for intensive group work and practical assignment as the best method for grooming student accountants.
Grandzol (2004) investigated MBA statistics course student's responses to blended learning and traditional delivery methods, but found inconclusive evidence about learning outcomes as measured by examination scores. The results show that student's perceptions in terms of enthusiasm; preparation, grading and clarity of instruction were similar for the two sections.
Vamosi et al. (2004) examined students' satisfaction and perceptions in an undergraduate accounting principles course. Their results suggested that students were less satisfied with distance learning, which considered less effective in the delivery of course materials compared to learning in a traditional classroom.
Hodson (1988) argued in favor of teaching accounting students ability to identify and solve unstructured problems in the business world using multiple information sources.

1.1 Research Objectives

The main objectives of this research have three folds:

1. Identify status and factors that mostly influence the adoption of e-learning in Egypt as a developing country.
2. Assess the technology readiness of students at AASTMT - College of Management and Technology to ascertain their personal attitudes, perceived usefulness, satisfaction and ease of use of the blended learning system.
3. Investigate the quality of accounting blended learning courses.

1.2 Research Hypotheses

The objectives of this research achieved through testing the following hypotheses:
H_1: Students are more satisfied from the blended learning courses and perceived it as an appropriate alternative teaching approach to the face-to-face traditional approach.
H_2: The achievement of learning outcomes, higher interaction between student-faculty/student-student, efficiency and effectiveness of instruction and course administration, and student assessment and feedback are indicators for the level of quality of blended learning approach.

2. E-Learning at Higher Learning Institutions

2.1 E-Learning Definitions and Approaches

E-Learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. **E-learning defined as follows:**

- A planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning (Greenberg 1998).

- The delivery of education activities through various electronic media, such as, Web-based learning, computer-based learning, virtual classrooms, and digital collaboration, the electronic medium could be the Internet, intranets, extranets, satellite broadcast, video/audio tape, interactive TV and CD ROM (Koohang and Harman 2005).
- The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration.
- Distance education is a formal educational process in which the majority of the instruction occurs when student and instructor are not in the same place (Teaster and Blieszner 1999).
- Online learning is the use of Internet to access learning materials, to interact with the content, instructor and other learners, and to obtain support during the learning process, in order to acquire knowledge to construct personal meaning and to grow from the learning experience.

The importance of appropriate interaction (synchronous or asynchronous) between instructor and students and among students is reflected in the design of the program and its courses, and in the technical facilities and services provided. **E-learning approaches (Farhat 2013):**

1. **Synchronous approach:** involves geographically dispersed interaction of students with instructors and with each other at the same time via the Web site at the same time.
2. **Asynchronous approach:** allows the participant to complete the WBT, without live interaction with the instructor. It is an embedded learning where information is accessible on an own pace self-help basis, 24/7.
3. **Blended method**: involves the integration of traditional classroom face-to-face learning experiences with online learning experiences (Garrison and Kanuka 2004).

2.2 Advantages of E-Learning

There are many benefits that can be derived from e-learning and opens up new opportunities in higher education. Some of them are listed below (Farhat 2013) (Jensen and Sandlin 1997) (Omidinia et al. 2011):

- E-learning can help reach out to the masses. Because of global access, the classroom may be the world. Learning service delivery will become more ad-hoc and on-demand at any time. Capacity of individuals and groups is increased, reducing the need for specialized services.
- E-learning ability to cover distances, learners can study wherever they have access to a computer and Internet disintermediation by being able to connect learners and teachers directly.
- The reduced cost of hardware and software and increased availability of Internet continues to make internet-based delivery more accessible to a wider population especially for rural and other traditionally underserved populations (e.g., those facing barriers of time, distance, physical disability, and those working or balancing family and other demands with education).
- It affords the opportunity for the information to be stored in various mediums and formats over long periods and accessible over long distances.
- Cultures can be shared through e-learning.

- Electronically mediated education allows matching the goals of specific parts of the curriculum to the available and emerging technology.
- Gender may not be an issue.
- Learning becomes more personalized; learners can access the e-materials at anytime and s and helps them to progress at their own pace and place. As all trainees are treated as having unequal abilities, skills and aptitudes. The content can repeated until the trainee understands it. Computers have infinite patience in teaching that entails drill and repetition.
- Flexibility of e-learning is being learning available for anyone, anytime, anywhere (Broadbent 2000**).**
- E-learning provides different media for education delivery (Andersson 2008). It can make compelling and interesting with multimedia. Technologies offer new dimensions of combining audio-visual aids, animated graphics, etc. to text for understanding difficult concepts.
- E-learning allows students to experience interactive learning. It promotes collaborative learning thus resulting in a more engaging and richer learning experience. E-learning will reduce the burden face by scholars in making learning conducive.
- Internet driven, web-based instruction viewed as cost effective for institutions and time effective for the learner (Dibiase 2000), since the information can accessed at any time from any location that has an Internet connection (Annetta 2004). Digitization of content and knowledge makes them very economical to reproduce and distribute.
- E-learning encourages students to access world-wide information without the constraints of time and location for self-directed learning. Learners may have the option to select learning materials that meet their level of knowledge and interest. Hard copy books are difficult to search in comparison to electronic searches of computer files.
- Different learning styles are addressed and facilitation of learning occurs through varied activities.
- It enables the teaching material to be customized, easily and regularly updated, and instantly available to all learners.
- Successfully completing online or computer-based courses develop critical thinking, builds self-knowledge and self-confidence and encourage students to take responsibility for their learning.

2.3 Disadvantages of E-Learning

For all the previous advantages, E-learning system is not without limitations, which may include:

- E-learning does not require physical attendance, which could reduce the social and cultural interaction. The learners may feel isolated or miss social interaction due to lack of teacher feedback, technical difficulties and time management Cornell (1999), since the instructors and instructions are not always available on demand. They may become bored with no interaction (Alkharang and Ghinea 2013), so it is not suitable for unmotivated or poor study learners. In addition, teachers felt a sense of diminished control over the course (Annetta 2004). Participation by e-learning students may be less than in a face-to-face learning environment, as social presence is strongly related to amount of participation; educators should seek ways to enhance participation.

- E-learning initiatives require considerable investment in both IT infrastructure and staff, comparing to conventional education. Staff and students development for using new technologies are required to being prepared for teaching and learning through distance education formats (Raimi et al. 2011).
- The learners need to have access to resources such as computers, internet and software (Alkharang and Ghinea 2013). Slow or unreliable Internet connections can be frustrating.
- Some courses can be difficult to simulate. It is important to know the merits and demerits of e-learning to enable learners make decisions with learning software selection as well as on line distant learning programs structure and selection (Aginam 2006).
- Internet and distance learning requires not only new kinds of resource support and alliances but also new policies and guidelines with respect to the continuous involving issues of intellectual property rights (Jensen and Sandlin 1997).
- Removal of a vital link of communication between students and instructors for the purpose of evaluation and performance assessment because of the constraint of distance (Raimi et al. 2011).

2.4 Challenges in E-Learning in Developing Countries

There are many ICTs implementation challenges that need to overcome in order to enhance the effectiveness of e-learning in higher learning institutions:

1. In developing countries, wherein educational institutions depend on limited resources of governmental to get and support the infrastructure and determine policies, institutional support plays a crucial role in the acceptance of e-learning (Lubis et al. 2009).
2. Integration of ICTs in e-learning needs to be fully conceptualized and defined from the beginning. Lack of awareness among the students and their parents of the effectiveness of e-learning. Many institutions fail to integrate ICTs into teaching and learning because they are using ICTs to replicate their traditional practices, content and control (Ehrmann 1995).
3. Lack e-content, inadequate infrastructure and connectivity limitations, slow downloading. This creates frustration among learners and affects the ease of learning. Thus, technical support is an important part of the implementation and integration of ICT in education system. It includes issues like installation, operation, maintenance, network administration and security (Sife et al. 2007).
4. A large segment of the population is computer illiterate. This hinders the introduction and implementation of e-learning.
5. Online learning requires a high degree of self-motivation, which found lacked among developing countries learners that found it difficult to change from the traditional learning mode to the new e-learning mode. In addition, e-learning need to have a motivated staff, enough number of academic staff, and e-learning development professionals.
6. Most of e-learning contents are in English, which is not the language of many developing countries like Egypt where learners are not much confident with the contents in English.

7. Administrative support and commitment of the top management in providing the conditions, such as ICT policy, incentives and resources are critical to the successful integration of ICTs into teaching and learning processes (Sife et al. 2007). For the integration of ICTs to be effective and sustainable, administrators themselves must be competent in the use of the technology, and they must have a broad understanding of the technical, pedagogical, administrative, financial and social dimensions of ICTs in education (Dwyer et al. 1997).
8. The processes involved in e-learning courses should be aggregated with the tasks of design, delivery and assessment often carried out by different teams, which affected co-ordination and communication among team members, particularly affecting the allocation of responsibilities for quality assurance processes.
9. E-learning course teams were found to be composed of a mixture of full and part-time tutors, tutors with fee-based contracts and tutors working from home or elsewhere. All of them should have full information about quality assurance and enhancement processes in place.
10. The limited access that tutors had to students resulted in low response rates and so course teams tried a variety of strategies to improve this, including changing the timing at which feedback was requested and modifying the tools used to collect it.
11. Course teams should increasing the formalization of the communication and co-ordination channels by establishing formal and frequent meetings either face to face or online.

Abdelraheem (2006) points out that e-learning faces increased challenges in almost all the universities of the Arab states. **These challenges summarized as follows:**

- **ICT infrastructure**: generally, Arab countries score below world averages on all connectivity indicators.
- **Culture, leadership and e-learning strategy:** there is a need for a culture that will embrace e-learning with strong leadership.
- **Leadership support:** efforts towards using technology for learning have not been sustainable because many leaders have underestimated the complexities of the interactions between e-learning and the working environment, and how difficult it is to change people's attitudes about what learning events are and what they can be.
- **Local content:** there are few relevant applications for the general population. Few organizations use the Web to deliver significant quantities of information or to carry out transactions with their user base.
- **Copyright issues:** there is a lack of awareness of copyright issues.
- **Special skills:** there is a need for instructors who have the special skills and talents to deal with e-learning.

In addition to the previous challenges and despite the progress and steps taken in Egypt in order to disseminate the information technology in the education sector there are major challenges exist and can face the adoption of e-learning as follows:

1. Students may lack the discipline required for self-paced learning, in addition, not many in Egypt know what e-learning is really about, or how it can be used to improve the quality and reach of education.

2. The salaries of academic staff are very low, and their workload allocation leaves little time to prepare for teaching which has a direct impact on the average quality of graduates.
3. The working environment in most faculties does not appear to be conducive either to innovative teaching or to carrying out research. Office spaces are not sufficient or adequately used.
4. In Egypt the administrative-to teaching staff ratio of 4:3 is high by international standards, and university officials cannot readily remedy this because personnel management is constrained by regulations that make termination difficult.
5. The large number of students that a lecturer has to deal with.
6. The share of public spending devoted to the educational sector is low.
7. There is no mandatory retirement age, resulting in more senior faculty members and fewer junior teaching staff to meet the teaching needs of students.
8. The environment at most universities does not foster research productivity or innovation by staff members. The main incentive to initiate and publish research is to fulfill the two formal promotion requirements rather than to produce quality and innovative research. There are no mechanisms to measure quality of teaching or accountability, such as annual reporting by staff on the work, they have done.
9. Setting an e-learning strategy for organizing the educational process, defining its objectives, its components and the implementation mechanisms.
10. Empowerment of students in all educational levels through an active educative system, where scholars can choose the courses they would like to study.
11. Designing the educational courses and subjects and defining the personnel responsible for periodic maintenance and continuous improvement of the program and its electronic means.
12. Accreditation and evaluation criteria that would be used by the e-learning educational institution to guarantee its success and excellence.
13. The financial support for the faculty member since they find that selling their books is one of most important source of income and no clear policy about the financing operation of e-learning.
14. Focusing on equipment rather than training, concentrating on copying current education curricula on CDs rather than modifying them to match modern technologies.

According (Shahid 2005) to bring e-learning benefits to Egypt some issues to be addressed:

1. National strategy and plan for e-learning programs where government has to play the lead role in partnership with academician.
2. Development of ICT infrastructure, both government and private sector have to contribute, building partnership and cooperation in the process.
3. Developing expertise (like academician, promoters etc.) on e-learning teaching modalities.
4. Ensuring quality of the e-learning materials, government institutions and academicians.
5. Developing local relevant contents for local communities, government and development partners have direct role to play.
6. Ensuring copyright and intellectual copyrights issues.

7. Promotional campaign to make students fully aware of e-learning regarding technical aspects and technological support services provided to them in the courses in which they enroll. Familiarize students with the new technologies reduces the negative aspects of the transitions.
8. **The e-learning learners should possess the following characteristics:**
   - Being able to learn independently and view learning positively.
   - Being able to make the best use of their time, have self-disciplined and enjoying working alone most of the time.
   - Being able to clearly express themselves in writing.
   - Having good computer and Internet skills.
   - Having the need for knowledge, but incapable of attending traditional training or education.
   - Being revel in solving problems.

3. Egypt E-Learning Progress

This section provides a review on the status of higher education and ICT in Egypt. The Egyptian government identified ICT as a national development priority, and the country aspires to become a regional and international ICT provider.

In 1999, a new Egyptian Ministry of Communications and Information Technology (MCIT) was established. The MCIT national plan main objective is to create a strong, exportable IT industry in Egypt. By 2005, the national plan was being revised through the Egyptian Information Society Initiative, it focus on e-learning applications aimed at spreading knowledge and information using electronic means through the Internet.

With regard to e-learning, the framework includes the development of policies to ensure that ICTs are integrated into education and training at all levels, including teacher development, curriculum development, institutional administration and management, and in support of lifelong learning. It involves collaboration between private sector education service providers, network operators, data centers, content providers, local and international companies and educational institutes. To remove language barriers, content providers are being encouraged to supply Arabic educational content through e-libraries nationally and regionally.

The E-Learning Competence Center (ELCC) founded in 2004 by MCIT in cooperation with Cisco Systems. the ELCC is Egypt's leading organization in e-Learning with a track record of developing and delivering a wide array of state-of-the art e-Learning courses, web communications and e-content; setting and disseminating the quality standards of e-Learning; providing best practice research and expert consultancy in e-Learning and engendering the first wave of facilitators and e-trainers into the market.

To this end, the purpose of the ELCC is to act as a hub for the integration, development and dissemination of e-Learning content of relevance to the Egyptian market.

In addition, at 2009 the National E-Learning Centre (NELC) begins to use the e-learning objects system in the e-course production. The concept of learning object is based on the use of a full interactive environment, which makes the learning operation more exiting and effective due to the huge number of multimedia, assessment and other facilities given to the user.

The objectives and strategies of the NELC are to provide an e-learning infrastructure and a range of e-learning tools to defined, high quality specifications and provide information, training and support for staff and students in the use of e-learning tools and facilities, in collaboration with the universities.
The NELC aims to develop a robust infrastructure at each of the public universities, capable of facilitating an effective e-learning system through the establishment of an e-learning center at each of the Egyptian public universities.
These centers are able to develop pedagogically sound e-courses that fully utilize the potential of ICT in an interactive way; the staff of each center will include a center director, instructional designer, e-content developers, graphics designers and subject-matter experts. The NELC monitors the progress of the university centers and develops national standards. The university centers are networked with the NELC through the Egyptian Universities Network (EUN).

NELC developed several software tools in order to improve and facilitate the process of production and publishing of e-courses:

- **E-course situation directory:** is a special system to register all courses and recorded data and to view reports and display courses situation filtered by (university, faculty, department, course name, production phases) at the official web site.
- **E-course evaluation status directory:** is a special system to display the current evaluation phase (instructional design, and e-content) of the e-course.
- **Instructional designer system (IDS):** NELC provided IDS to the University community to guide the subject matter experts when planning and authoring their courses to be developed as electronic courses.
- **E-course generator (ECG):** an authoring tool helps authors to create their course content in a fast and easy way. The output of ECG is the modules zipped packages that can be uploaded and displayed in Learning Management System (Moodle).

4. Blended Learning System

E-learning suffers from a lack of social interaction between learners and instructors, although it may increase access flexibility for students and educators. The blended learning came along to solve this problem. Blended learning the conveniences of online courses are gained without the loss of face-to-face contact. In so doing, a learning environment is created that is richer than either a traditional face-to-face environment or a fully online environment.
The main component that differentiates blended from face-to-face instruction and e-learning is the use of more than one delivery method, which includes the use of computer-based instruction that can be implemented in a traditional classroom-based format (Shroff and Vogel 2010).

4.1 Blended Learning Definitions

Blended learning is a practical framework that used to encapsulate a range of effective approaches to learning and teaching. It encourages the use of contemporary technologies to enhance learning, and the development of flexible approaches to course design to

enhance student engagement (Queensland University of Technology 2011). **Blended learning defined as**:

- Learning using a variety of instructional modalities, it is the use of two or more styles of content or context delivery or discovery.
- An opportunity to fundamentally redesign how we approach teaching and learning in ways that higher education institutions may benefit from increased effectiveness, convenience and efficiency.
- Blended learning is the effective integration of various learning techniques, technologies, and delivery modalities to meet specific communication, knowledge sharing, and information needs.
- Combining any form of instructional technology with face-to-face instructor-led training such as web-based technology to accomplish an educational goal.

4.2 Advantages of Blended Learning Courses

Blended learning has the ability to foster a professional learning community and at the same time allow for the development of social cohesion due to the inclusion of a face-to-face component. It is a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning (Thorne 2003).

The integration of e-learning environment and traditional learning environment may combine ideally the useful aspects of both methods. **Blended learning benefits students and institutions in many ways such as:**

- Create interest and increase the knowledge gained because they involve focusing and thinking.
- Greater flexibility of time, responsibility and control to students for their learning.
- Increase flexibility of access to learning that reinforces the student's autonomy, reflection and powers of research.
- Ensure continued ease of access to curricular materials and instructional/learning processes.
- Blended course help instructors to identify best practices to engage students and encourage them to be active participants in the course through developing online learning environments that provide opportunities for interactive and collaborative learning.
- It facilitates improved learning outcomes, effective use of resources, and student satisfaction. Thus, blended courses have higher success rates and lower withdrawal rates than their comparable face-to-face courses and fully online courses.
- Enable the students to become more motivated and involved in the learning process by enhancing their commitment and perseverance.
- Creating and sustaining a community of inquiry beyond the classroom. Creating a community of inquiry allows learners to connect and collaborate with their peers and to create a learning environment that integrates social, cognitive and teaching elements in a way that will precipitate and sustain critical reflection and discourse.

- Blended learning focuses on optimizing achievement of learning objectives by applying the "right" learning technologies to match the "right" personal learning style to transfer the "right" skills to the "right" person at the "right" time.

4.3 Challenges to Blended Learning Courses

The use of blended learning can pose challenges for students and universities as follows:

- Additional funding needed to support the technological infrastructure and increased demands of advanced learning technologies. Technical support staff and web-based development are needed to support distance delivery of online curriculum and programming.
- Students may have difficulty with more sophisticated technologies. Students need to ensure they have the knowledge and accessibility to resources necessary to be successful with the online learning.
- Students may assume that fewer classes meant less work, and have inadequate time management skills.
- Students may experience a lack of motivation and accepting responsibility for personal learning.
- Students may feel isolated due to the reduced opportunities for social interaction in a face-to-face classroom environment.
- Lack of university support for course design, which involve deciding what course objectives can achieved through online learning activities, what can best be accomplished in the classroom, and how to integrate these two learning environments.

5. E-Learning or Blended Learning Accounting Courses

Accounting serves as a language of business for both internal and external communication. The accounting curriculum should enable students to acquire business knowledge to deal with the dynamic business environment. The changing nature of knowledge in business is an important influence on business education (De Lange et al. 2006).

Blended learning accounting courses instructional designers should take into their account learning goals and desired outcomes as guides when they describe the links between selection of technological platform, instructional strategies and the learning objectives of the course.

Accounting education aims to develop student's relevant knowledge and skills, positive values and attitudes to create value through identifying needs, generating ideas and transforming them into business opportunities. Accounting educators need to address the expected shift in accountants' skills by developing courses and teaching models that are more interdisciplinary and analytical in their orientation (Howieson 2003).

Accounting stresses the development of decision-making skills to solve business issues through various activities in which students learn how to identify problems, investigate issues, generate and evaluate possible solutions and make reasoned decisions. As such, it requires students to go beyond facts and information accumulation and move to meaning making and application of knowledge.

Accounting education emphasises the importance of teaching accounting students problem-solving skills. Kavanagh et al. (2009) defined problem solving as the ability to apply theory to practice, as well as critical analysis and thinking skills. Mohamed and Lashine (2003) defined critical thinking as the ability to reach justifiable conclusions to questions that cannot be answered definitively and where all relevant information may not be available.

Teaching of accounting should enable students to develop the necessary communication and business skills. Communication skills are concerned with the ability to transfer and receive information easily (Ballantine and Larres 2009). Students need to develop central skills as self-awareness and the ability to reflect on their experience. Accounting educators should ensure that clear goals and standards allow students to know where they headed and thus encourage them to take responsibility for their own learning (Abraham 2006).

Interpersonal skills also included in accounting learning, it is the ability to interact with and influence different kinds of people from different backgrounds and with different value systems, and to negotiate work collaboratively. It also includes the ability to organize and delegate tasks, motivate, resolve conflicts, and enhance client relations and decision-making.

Blended learning develops students' academic skills by fostering their self-discipline and self-reliance, more responsibility and independence in learning, learns them to trust their own judgment more, and acquire the skill of time management.

A fully distant learning environment affects collaborative accounting learning, as students did not participate as much as compared to a face-to-face environment. It is important that lecturers listen to students and take account of different student perceptions. It is essential to promote a collaborative culture in which students create and share knowledge rather than acquire it passively in isolation.

Mohidin et al. (2009) stated that by working in groups, accounting students fostered greater participation, self confidence and leadership ability.

DeSanctis and Gallupe (1987) define Group Support Systems (GSS) as an integrated computer based systems that facilitate the solution of semi-structured or unstructured group problems. GSS are text-based communication, tools that have positive effects on collaborative work. According to Vogel and Nunamaker (1990) GSS have been acknowledged as supporting group processes, such as the generation of alternative ideas, sharing of ideas, communication, planning, negotiation, problem solving, consensus building, and decision making, in both face-to-face and dispersed business meeting environments (O'Connor et al. 1996).

Effective monitoring, evaluation and impact assessment remain a priority for the development of e-learning accounting courses. A good assessment represents a comprehensive evaluation of the learner, requires standardization of content, process, faculty competence, and careful documentation throughout the learners' tenure.

To assess student understanding of the technical tools, quizzes developed for various chapters in the textbook to illustrate how managers use accounting in business decisions, students worked in groups to discuss complex, real life case studies. Students also were assigned practice problems from the textbook and solutions provided in the course website for self-checking (Bento and White 2010). For accounting students, periodic visits to audit firms, accounting departments of reputable organizations and seminars on accounting standards are recommended.

The author believe that the blended accounting learning system is seen to be the most appropriate approach that may result in benefits to both students and instructors in terms of increased effectiveness, convenience and efficiency.

5.1 Quality in Blended Learning Accounting Courses

The issue of quality of higher education institutions and e-learning environments depends on a range of factors relating to students support, instructor, curriculum, instruction, technology used, instructional and learning design, institutional mission, resources of the institution, faculty characteristics and support, and student learning outcomes.
Lack of quality in e-learning or blended learning can cause low interactivity and moderate impact on learners. Main issue in e-learning include the quality of instruction, lack of quality e-content, hidden costs, misuse of technology, and the attitudes of instructors, students, and administrators. Each one of these has an effect on the overall quality of distance learning as a product.
The challenges to quality assurance raised by electronic learning as how is this distance learning monitored when the instructor does not have face-to-face contact with a student, and how well can learning be assessed when there is a limited control over the circumstances in which it takes place.
Thus, educators and quality assurance agencies must look to the actual results or outcomes of an instructional process and should focus on what the student learns.

Improved learning is the ultimate goal of blended learning. **For successful and effective blended learning accounting course, attention should be paid to the following major quality aspects:**

- Provide accounting technical knowledge and understanding of procedures and terms of accounting.
- Alignment with the learning objectives that should also be made known to students so that they have a full understanding of what is expected of them.
- Enable application of accounting knowledge.
- The course incorporating different levels of difficulty and diverse modes should be used to cater for students with different aptitudes and abilities.
- Admission requirements and procedures.
- Structure and management of the delivery system.
- Quality of instructional materials used for teaching and promotion of learning.
- The student support services.
- Monitoring, evaluation and feedback systems, a range of student assessment practices can used to track learning progress such as essays, group discussion, case studies, projects and fieldwork that allow student contact with the actual business world.
- Availability of adequate human and material resources for the operation of the program.

For examining and evaluating, the overall quality of an e-learning course, a scorecard can be build to give weight for each quality measure to ensure a more objective outcome. It would help if most of the input **came from learners. According to Bento and White (2010) quality measures standards were developed and organized around eight dimensions:**

1. **Course overview and introduction:** assess if the course design and objectives are clear to students from the very beginning of the course, as students benefit from seeing all course components built into one consistent design, instead of having those elements added as the course progresses.
2. **Learning objectives:** all elements of the course are linked to and support the achievement of the learning objectives.
3. **Assessment and measurement:** in the online learning environment, frequent using of a variety of testing strategies consistent with the learning objectives and effective assessment and measurement is strongly associated with student satisfaction and performance.
4. **Resources and materials:** evaluate the academic content, in terms of their suitability for the achievement of the learning objectives and the reliability of their sources.
5. **Learner engagement:** includes standards aimed at promoting the various forms of interaction to motivate learners to commit to the learning process.
6. **Course technology:** correct media and technology selection, effectively use and a presentation supportive of individual / group learning styles help maximize engagement and achievement of the learning objectives.
7. **Learner support:** examine the extent to which the course informs students about institutional resources available significantly affects the quality of the learning experience.
8. **Accessibility:** increase the flexibility for all learners and help students realize some of the benefits that online education promised to offer.

In addition, in order to evaluate e-learning quality, the following checklist can be used to objectively measure quality:

- E-learning course content and its presentation are interesting and the learner recognizes the relevance of the content to workplace tasks.
- E-learning course accommodates differences in individual learning styles. These styles may be related to sensory perception (seeing, hearing, moving, touching) or intellectual processing (reading, thinking, abstract reasoning).
- E-learning applications should stimulating independent creative thinking and problem solving.
- E-learning course design presents information in an organized, coherent manner while allowing user control of learning (cognitive usability).
- The technical ability to link to external resources presents extraordinary opportunities for the user to extend learning and reinforce the learning objectives.
- E-learning course should be supportive adaptive learning application, the courseware will monitor interactions and usage patterns, then customize content delivery to accommodate learning styles, pace, and perhaps prerequisite knowledge and skills. Adaptive courseware exhibits the human qualities of understanding, patience and persistence.
- Confidentiality and integrity of student records and other program and course materials ensured by electronic security measures that is in place to address issues of reliability, privacy protection, safety and security.
- Users of online learning can easily access the content with a minimum of effort, from enrollment to completion. Barriers in the form of complex sign-up procedures, software

installs, under-performing connections, and ineffective interfaces detract from the mission of learning.
- The e-course content should be accurate and developed by subject matter expert with high in-depth knowledge of the content area.

6. Study Methodology

The 15 weeks duration accounting course designed and developed as a blended learning course for the purpose of this study. The online component delivered using the asynchronous course management system (e-class) (using Moodle service available on the AASTMT site). E-class included course description, course schedule, course content, assignments, online quizzes and self-evaluation assessment exercises, relevant library reference materials for background information, and announcements.
In this blended learning environment, the students have both the opportunity to meet each other and the instructor, in the face-to-face sessions students provided with an in-class orientation to the online portion of the course. The online environment used to create active learning opportunities for students that helped them engage with challenging concepts and provide self-assessment, self-paced learning time and self-reflection opportunities.
Students can log onto the Moodle from anywhere, read and download course material and assignments. The blended course assignments focused on active-learning exercises, which emphasized practical application complemented with textbook readings. Students provided with feedback and correction weekly. Students could interact with the instructor and with each other by e-mail or the Moodle, where they can post their comments regularly and generate ideas with other students while the instructor moderated the procedure. The instructor encourages student's online interaction, participation and tied this to grading. Students' evaluation was based on their interactive online and in-class participation, submitting online assignments and on three exam papers during the semester.

6.1 Questionnaire Design

A questionnaire with two sections developed to collect data from students at the Arab Academy for Science, Technology and Maritime Transport, College of Management and Technology - accounting classroom - to assess students' attitudes, usage intentions, readiness and their perceptions of the effectiveness, usefulness and ease of use of online options. Analysis of the results helps to identify the aspects that can supports blended learning system. The first section in the questionnaire assesses the students' perception and satisfaction. It evaluated students' perceived blended-learner satisfaction from the blended learning course. Student satisfaction and perception are an important quality factor. A key element in defining quality is the capacity to show that the outcome from the teaching process is meeting the student needs. Student satisfaction can be viewed both as an outcome of the learning process and a requirement for successful learning process.
The second section assesses the blended learning quality aspects from the students' perceived interaction and collaboration with each other's and the instructor, the learning outcomes, the instruction and course administration, and the assessment and feedback.

Participants in this study were 108 blended learning accounting students. The response rate was high 83 percent. To examine the two hypotheses in this study, students who consented to take part in the study filled out 82 item blended learning experience questionnaire. Students responded on a Likert scale from 1 (strongly disagree) to 5 (strongly agree).
Table (1) summarizes the list of explanatory variables examined by the first and second hypotheses, their definitions and the number of questions used to test each variable.

Table (1) Definitions of variables tested in the first and second hypotheses

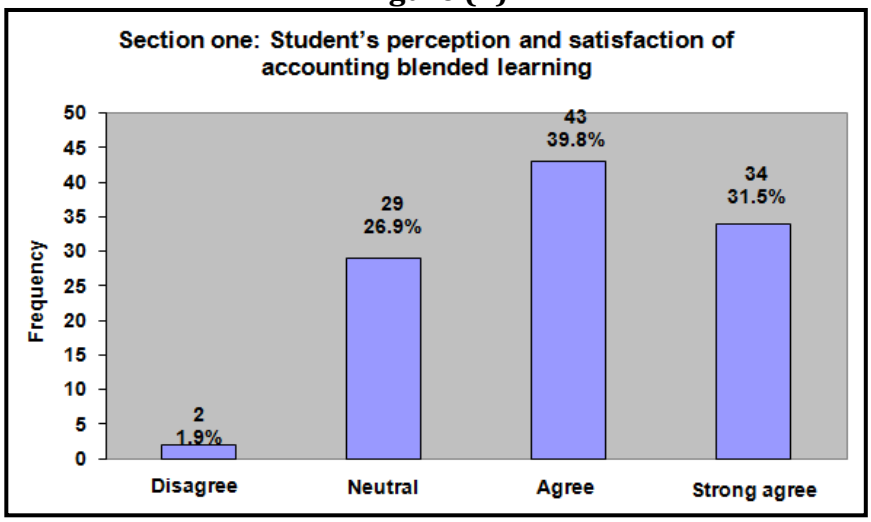
Hypotheses	Variables	Definitions	Questionnaire
First hypothesis	**Student satisfaction**	It is the consequence of the expectations and experiences of the subject and blended learning course.	**Satisfaction and perception aspect is measured by 27 questions.**
	Student perception	Student performance in face-to-face and online courses relies on student perceptions of their learning experiences including: how well or how much they have learned.	
Second hypothesis	**Learning outcomes**	Learning outcomes are Concise measurable statements of a learning achievement and expressed in terms of what the learner expected to know, understand and be able to do on completion of the program/course. Outcomes usually expressed as knowledge, skills or attitudes.	**Blended learning quality aspects are measured by 55 questions as follows:** • **Learning outcomes aspect: 6 questions.** • **Student-instructor, student-student interaction and collaboration aspect: 20 questions.** • **Instruction and course administration aspect: 19 questions.** • **Assessment and feedback aspect: 10 questions.**
	Student-instructor, student-student interaction and collaboration	Collaborative learning commonly illustrated when groups of students actively engaged and work together to search for understanding, meaning or solutions or to create an artifact or product of their learning.http://en.wikipedia.org/wiki/Collaborative_learning#cite_note-Chen-7	
	Instruction and course administration	Education instructions and administrators organize and manage the administration, support systems and activities that facilitate the effective running of an educational institution.	
	Assessment and feedback	Assessment is a process of gathering information, which tells staff not only about student problems and difficulties but also about their competencies, how they have gone about their learning and what they have achieved. Feedback defined as information communicated to the learner that intended to modify the learner's thinking or behavior for improving learning.	

6.2 Results and Discussion

From the SPSS statistical analysis, the alpha Cronbach reliability coefficient of the satisfaction scale was 89.1 percent indicating that the instrument was reliable. This result shows satisfactory internal consistency of the measurement scales.

The statistical data analysis for section one in the questionnaire supports the first hypothesis. As show in figure (1), the results indicate that 39.8 % (agree) and 31.5% (strong agree) of the students much prefer blended learning system where they have both face-to-face and online lectures, along with tutorials. Students were quite satisfied with the overall blended learning experience. Satisfied students are more motivated and are more likely to accomplish their learning goals. Students in the sample tested seemed to have quite positive perceptions of their interaction in this blended learning course.

Figure (1)

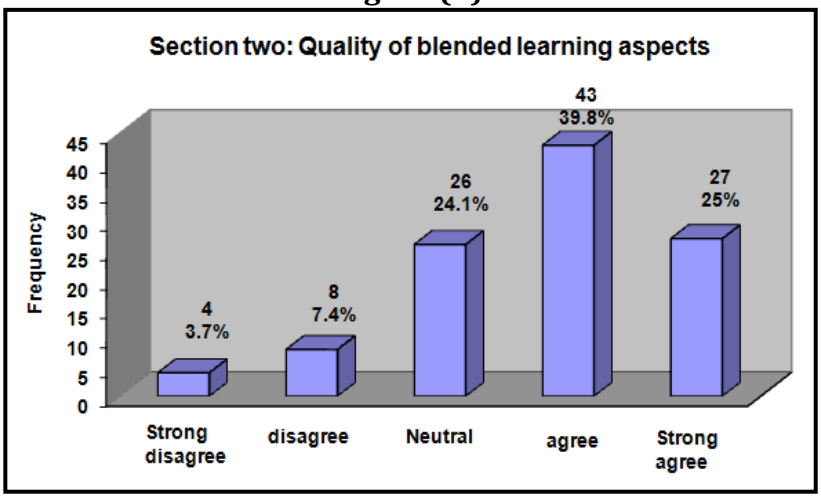


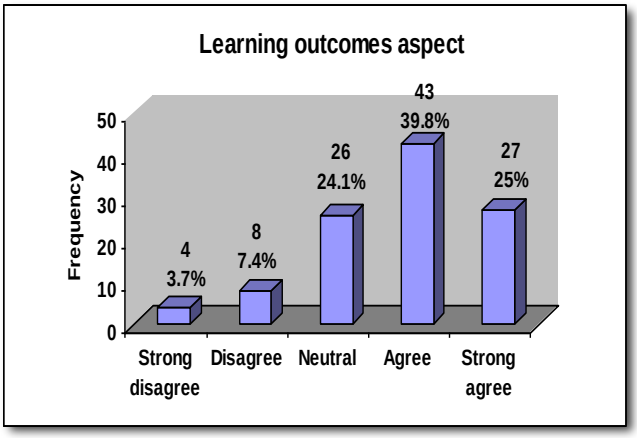
The statistical data analysis for section two in the questionnaire supports the second hypothesis. As show in figure (2),the results indicate that 39.8% (agree) and 25% (strong agree) of accounting students perceived improved overall performance and learning outcomes from the blended learning environment and better understanding of accounting knowledge, procedures, terms and principles. In addition, students were more satisfied as they perceived many other benefits from the blended learning environment as immediate feedback, motivation for taking responsibility for their own learning, learning at their own pace, increased learning flexibility.

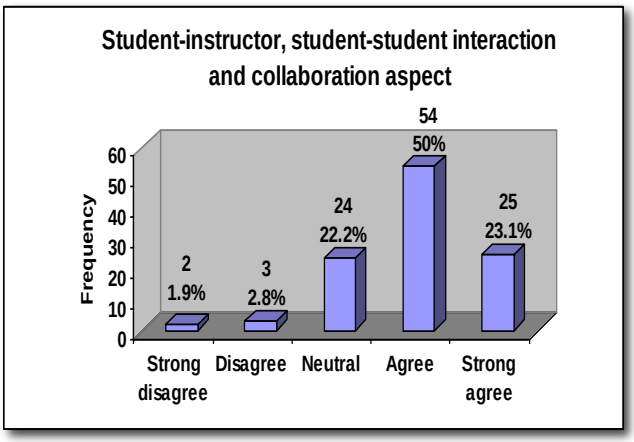
The inclusion of face-to-face sessions within blended courses provides students with an opportunity to continuous access the instructor, receives immediate support, guidance, and management of the course as they lack fully online learning skills.

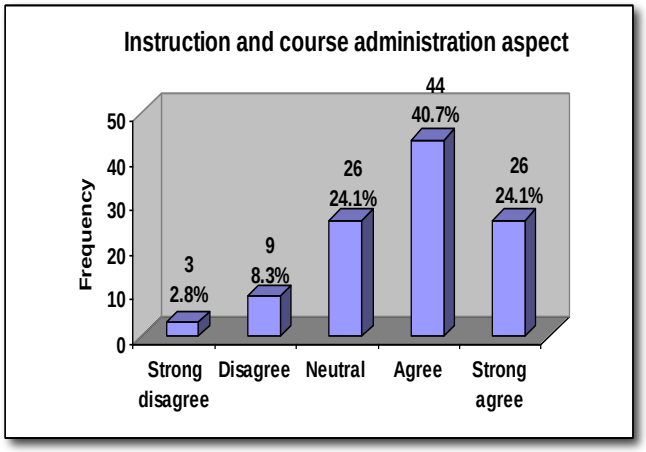
In addition, the results reveal that assessment and feedback are a central part of the learning process and are strong related to blended learning quality as they are used to improve it and it should linked to the aims and objectives of course design.

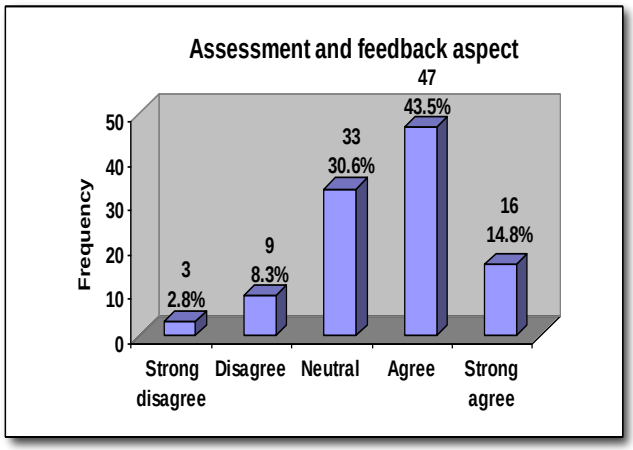
Figure (2)


Section two: Quality of blended learning aspects
Frequency
45
40
35
30
25
20
15
10
5
0
4
3.7%
8
7.4%
26
24.1%
43
39.8%
27
25%
Strong disagree
disagree
Neutral
agree
Strong agree


Learning outcomes aspect
Frequency
50
40
30
20
10
0
4
3.7%
8
7.4%
26
24.1%
43
39.8%
27
25%
Strong disagree
Disagree
Neutral
Agree
Strong agree


Student-instructor, student-student interaction and collaboration aspect
Frequency
60
50
40
30
20
10
0
2
1.9%
3
2.8%
24
22.2%
54
50%
25
23.1%
Strong disagree
Disagree
Neutral
Agree
Strong agree





The results of this study highlight the students perceive the blended learning environment as one that requires more responsibility. Online classes' students are motivated learners with strong self-discipline and are comfortable in expressing themselves in writing**.** They can access computer and has experience with word processing, navigating the Internet, and saving, uploading and downloading files.

The descriptive statistics and the mean shown in table (2) indicates that students believe that using blended learning interactive technologies helps them to increase learning productivity, promote the development of communication skills and improve their understanding of accounting course content.

Table (3) shows that Student-instructor, student-student interaction and collaboration, affects quality of blended learning. Students consider this the most important aspect when evaluating the quality of learning (mean 3.89) then comes second equally, the learning outcomes (mean 3.75) and the instruction and course administration (mean 3.75).

The mean value of all the variables presented in tables (2) and (3) is greater than 3.5, which indicates higher student satisfaction and perception for the quality of blended leaning.

Table (2) Descriptive Statistics

	N	Mean	Std. Deviation
Student's perception and satisfaction of blended learning	108	4.0093	0.81453
Quality of blended learning aspects	108	3.7500	1.03332

Table (3) Descriptive Statistics: Quality of blended learning aspects

	N	Mean	Std. Deviation	Rank
Learning outcomes aspect	108	3.7500	1.03332	2
Student-instructor, student-student interaction and collaboration aspect	108	3.8981	.85314	1
Instruction and course administration aspect	108	3.7500	1.00582	2
Assessment and feedback aspect	108	3.5926	.93766	3

*** All mean values are on a five-point scale, anchored on 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree).**

The correlation analyses shown in tables (4 and 5) identified a significant positive association between students' satisfaction, course interaction and communication, course design, the blended learning environment, learning outcomes and assessment and timely feedback.

Table (4) Correlations between Student's perception, satisfaction and quality of blended learning

		Student's perception and satisfaction of blended learning	Quality of blended learning
Student's perception and satisfaction of blended learning	Pearson Correlation	1	.680
	Sig. (2-tailed)		.012
	N	108	108
Quality of blended learning	Pearson Correlation	.680	1
	Sig. (2-tailed)	.012	
	N	108	108

Table (5) Correlations between the four aspects of quality of blended learning

		Learning outcomes aspect	Student-instructor, student-student interaction and	Instruction and course administration aspect	Assessment and feedback aspect

			collaboration aspect		
Learning outcomes aspect	Pearson Correlation	1	.619	.654**	.610
	Sig. (2-tailed)		.001	.001	.001
	N	108	108	108	108
Student-instructor, student-student interaction and collaboration aspect	Pearson Correlation	.619	1	.701**	.629
	Sig. (2-tailed)	.009		.000	.006
	N	108	108	108	108
Instruction and course administration aspect	Pearson Correlation	.654**	.701**	1	.799
	Sig. (2-tailed)	.001	.000		.001
	N	108	108	108	108
Assessment and feedback aspect	Pearson Correlation	.610	.629	.799	1
	Sig. (2-tailed)	.001	.006	.001	
	N	108	108	108	108

**** Correlation is significant at the 0.01 level (2-tailed).**

7. Conclusion

Many efforts done so far in the field of e-learning by many private and public Egyptian institutions like the NELC and the ELCC, but still there are much required from them and from all educational institutions. Higher educational institutions in Egypt should implement e-learning or blended learning systems especially after the evolution in the ICT and the increase cost and demand on education and the overloaded classes.

The purpose of this study was to report the findings of the adoption of a blended learning approach for the delivery of accounting courses. The results of the study suggest that students consider the blended approach as a positive innovation to their learning experience. It showed that students are willing and motivated toward using blended learning system in there learning due to its increased flexibility that lead to an improvement in their performance and learning outcomes. The findings show an overall positive student attitude and satisfaction with the blended learning course and acceptance for responsibility of their learning but they need direct support and development for their time management skills. Students prefer blended learning environment rather than fully online learning, as they perceived that student-instructor, student-student interaction and collaboration is an important issue in the quality assurance of learning.

7.1 Recommendations

In order to cope with the increasing trend in using blended learning as an alternative to the full face-to-face learning and to benefit from its promising advantages, **some recommendations AASTMT should consider:**

1. It should have a clear and articulated mission and/or strategic plan focus on the relevance of the blended learning programs and courses.
2. The organizational structure of AASTMT-CMT should be established in a way that ensures effective planning, evaluation systems, and appropriate administrative structures that allow the college to achieve its e-learning goals.
3. It should sustain adequate financing to provide e-learning courses that meet generally accepted norms for quality.
4. It should have updated curriculum and design of instruction to offer quality e-learning. This includes appropriate academic student support for the educational programs of the college, including library facilities, research resources, bookstore services, registry services, counseling/advising, databases, electronic books and documents, as well as Internet tools and other resources are vital to successful student activities.
5. The students should be provided the needed advising, equipment, facilities, technical support and instructional materials to pursue e-learning. Student interaction with college is central to the quality of e-learning. The institution provides students with reasonable technical support for each educational technology, hardware, software, and delivery system required in a program.
6. It should sustain a comprehensive system for the evaluation of the e-learning educational effectiveness in relation to student learning and achievement, and link the student outcomes to the degree it meets its e-learning educational mission and goals.
7. Blended learning can successfully implemented only if the learners have sufficient training and knowledge of, and are ready to use, the newly introduced technology.
8. Quality accreditation agencies should modify existing or specifically develop new standards and processes to assure the quality of distance learning.
9. Obtaining student feedback about their perceptions of blended learning environment on timely and systematic basis is important for continuous improvement.
10. The AASTMT-CMT administrative structure, appropriate policies and procedures, and interdepartmental communications, updated technical infrastructure should provide a supportive system for delivery of online curriculum.

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Appendix

Questionnaire

Please rate the following statements according to the following five Likert scale as follows:

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5

No.	Statements	1	2	3	4	5
	Section one: Student's perception and satisfaction of accounting blended learning.					
	Blended learning course experience has:					
1	Provide accounting technical knowledge.					
2	Enable application of accounting knowledge.					
3	Broaden and deepened my interest in accounting.					
4	Enable to judge value of accounting information.					
5	Improved my opportunity to access and use the class content.					
6	Brainstorming and finding relevant information helped me resolve content related questions.					
7	Reflection on course content and discussions helped me understand fundamental concepts in this class.					
8	Improved my ability to integrate facts and develop generalizations from the course material.					
9	Online discussions were valuable in helping me appreciate different persp					
10	Develop student's ability to communicate clearly about the subject.					
11	Provide flexibility in accessing the class content anytime and anywhere online.					
12	I prefer using technology in learning.					
13	Increase in student control, responsibility and ownership of learning.					
14	I felt motivated and interested in course issues.					
15	Helps me better understand course material.					
16	I prefer extensive use of the Web, but still some face-to-face class time in other courses.					
17	I have ready access to the technologies required in the course.					
18	My analytical, interpersonal and time management skills have improved because of this course.					
19	My computer skills have improved because of this blended learning course (using Moodle).					
20	I find online class delivery of accounting materials more effective than traditional in-class delivery.					
21	I satisfied with interaction with peers and instructors.					
22	I found a match between actual and expected learning experiences.					
23	I satisfied with advising, registration, and access to access to materials.					
24	The orientation for how to learn online was satisfactory.					

25	In comparison to the traditional classroom teaching, I perceive that the quality of interaction experienced with lecturers/tutors and other students in blended learning classes is much better.					
26	Given the opportunity, I would take another course in the future that has both online and face-to-face components.					
27	Overall, I am interested and satisfied with the use of blended learning as a teaching method.					
	Section two: Quality of blended learning aspects					
	A- Learning outcomes aspect					
28	Instructions to students on how to meet the course learning objectives are adequate and stated clearly.					
29	The learning activities promote the achievement of the stated learning objectives.					
30	My blended course experience has increased my opportunity to access and use information.					
31	I have more opportunities to reflect on what I have learned in blended courses.					
32	Outcomes of online learning are useful for career and profession development as well as academic development.					
33	Blended learning improve learning outcomes, decrease in drop and failure rates.					
	B- Student-instructor, student-student interaction and collaboration aspect					
34	The course conducted in an interactive manner.					
35	The amount of actual, real-time interaction experienced between the instructor and students was sufficient.					
36	The instructor was effective in motivating the students to put in their best work.					
37	There are more opportunities to interact and collaborate with others in a blended course.					
38	The instructor helped to keep course participants engaged and participating.					
39	Instructor actions reinforced the development of a sense of community among course participants.					
40	The technology component of blended course increased the amount and q of interaction with the instructor and other students compared with face-to-fa courses.					
41	The instructor's answers to the questions by other students enhanced my understanding of materials.					
42	I find the instructional lecture notes to be helpful in learning course content.					
43	The instructor was helpful in guiding the class towards understanding cour in a way that helped me clarify my thinking.					
44	Combining tradition face-to-face classroom learning with blended learning approach provides students with the best quality-learning environment.					
45	I feel comfortable providing my input in class discussions.					
46	The instructor usually answers student's questions promptly.					
47	Online or web-based communication is an excellent medium for social interaction.					

48	Reading other students' on-line submissions clarified and helped me understand my ideas from a new perspective and encouraged me to investigate further sources of knowledge.					
49	Online discussions help me to develop a sense of collaboration.					
50	Online and face-to-face course components of this course were relevant and enhanced each other.					
51	The instructor is helpful and responsiveness to students.					
52	The instructor is willing to listen to student questions and opinions.					
53	An online course allows for social interaction.					
	C- Instruction and course administration aspect					
54	Instructions make clear how to get started and where to find various course components.					
55	Course goals and objectives/outcomes are present and explicitly stated to the students.					
56	Students made aware of expectations for participation online.					
57	The course Moodle site is well organized and easy to navigate.					
58	Purpose of learning activities clearly presented.					
59	Content sequenced and structured in a manner that enables learners to achieve the stated goals.					
60	The comments from the instructor in class and through e-mails are constructive.					
61	The practice assignments (individual / group case) were helpful in learning course content.					
62	The web instructional materials and e-library resources are helpful and sufficient for the student to learn the subject.					
63	The tools and media support the learning objectives appropriately chosen to deliver the content of the course and to guide the student to become an active learner.					
64	The relationship between the instructional materials and the learning activities clearly explained to the student.					
65	The instructor provided clear instructions on how to participate in course learning activities.					
66	The online portion of the course integrated with the in-class portion of the course.					
67	The online course contains reading list, links to appropriate e-resources and assignment information.					
68	The instructor clearly communicated important due dates/time frames for activities.					
69	Blended course let me utilize a variety of information sources to explore is posed in this course.					
70	The online course contains course information, announcements and administration details including timeline.					
71	The designed on-line teaching materials made the topics interesting and helped me to learn during the face-to-face sessions.					
72	When I encounter a problem with the use of the Moodle in this course, the instructor helped me with my problem in a timely and effective manner.					
	D- Assessment and feedback aspect					
73	The instructor kept students informed of their progress.					

74	The instructor provided feedback that helped me understand my strengths weaknesses.					
75	Provide timely feedback to students.					
76	The assessment instruments selected are sequenced, varied and appropriate to the content assessed.					
77	Students provided with online self-assessment.					
78	Summative and timely feedback more efficiently achieved when assignments submitted electronically.					
79	Information given to students about how they graded on assignments and exams stated clearly.					
80	Exam questions are clear and cover all aspects of the course.					
81	The instructor is concerned for student progress.					
82	Assignments help in understanding course material and used in assessments.					

THE COMPETITIVE ADVANTAGE OF IT IN EGYPTIAN FIRMS: A RESOURCE BASED PERSPECTIVE

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Abstract

Management has been challenged to achieve competitive advantages using Information Technology (IT). However, how to utilize IT still remains ill-defined. Accordingly, the study at hand intends to assess the effect of Information System resources and capabilities on companies' performance. The theoretical framework has been adopted from the widely used Resource Based theory in order to examine the relationships between the identified constructs. A quantitative method was employed where a structured questionnaire was devised to survey a large number of senior managers and the data collected was analyzed statistically using the Partial Least Squares multivariate technique. A positive relationship was recognized between IS Resources and IS Capabilities. Similarly, but rather hypothetically, the relationships between IS Capabilities and IT support for Core Competencies; and consecutively company performance, were positive as well. Conclusions were derived and a structural model is proposed to suit the Egyptian context.

Keywords: Competitive Advantages, IS Resources, IS Capabilities, Information Technology.

1 INTRODUCTION

Information Technology continues to play a vital role in business organizations. In this essence, the revolution in information technology has altered the sources of competitive advantage for businesses, in addition in greatly influencing how information, services and products are handled and exchanged (Peslak, 2012). There are various theories which attempted to analyze the role of a company's available resources and capabilities as a source of profit (Roxas and Chadee, 2011). These ideas would fuse into a general

analytical model known as the resource-based view (RBV) of the firm (Barney, 1991). The expanded use of RBV as a cornerstone for firm strategy is the result of two developments. First, as the global market for many industries has become volatile, a focus on internal resources and capabilities rather than unpredictable external market forces has been viewed as a more secure basis for the development of strategy. Second, it has become clear that having and maintaining a competitive advantage is the primary source of profitability for a firm rather than the attractiveness of its industry (Mahoney and Pandian, 1992).

Management has been challenged to understand how firms gain and maintain competitive advantages. Still, how best to utilize IT in order to achieve a competitive advantage remains ill-defined. This brings a calling need for having a full structural model which accurately depicts production relationships and demand drivers in order to relate IT investments to organization changes and measure economic performance. Accordingly, the research at hand aims to provide a road map for

Egyptian business managers by measuring and analyzing the extent to which organizational investments influence the value of IT investments and whether the benefits of IT investments are disproportionately difficult to measure or not.

2 ACHIEVING COMPETITIVE ADVANTAGE

The challenges facing companies differ based on the development of countries (Porter, 2001). Resources and capabilities interact in a dynamic process to enable firms to establish core competencies. The shaping of strategy to achieve competitive advantage is an ongoing process (Rothaermal, 2008) (Laudon and Laudon, 2012). Therefore, firms must strategically position themselves so that product or service mimicry by competitors is difficult. The complex interactions between a company's various processes explains why competitors often find it difficult to imitate each other (Rothaermal, 2008). Porter (1998) also suggests that a differentiation strategy focuses on some advantage inherent in the product, such as higher quality even at premium prices. Competitors will find it difficult to mimic the product, and differentiation strategies can be undertaken through a variety of means.

IT –Organization Performance: Although IT investment has a significant role and has an undeniable impact on companies' performance, it has not been the focus of wide interest in Arabic literature and it did not attract many Arab studies. A review of literature shows that studies have either investigated the impact of investment in IT on the overall performance of the company or the impact of investment in IT on the financial performance of the company (Laudon and Laudon, 2012).

In a study by Sriram and Stump (2004), the role of IT in strategic communication, developing internal relations among companies, and improving the purchasing process has been studied and analyzed. The two researchers developed a model consisting of the previous variables to show the incentive of investing in IT. The sample of the

study consisted of 530 companies. The study showed that IT investment affects performance and specially the purchasing process. They also concluded that it reflects the common understanding in the IT literature that IT is the engine that develops and improves productivity and performance in companies. In addition to that, they stated that IT investment can lead to development and improvement of internal relations among different companies, which reflects on improving overall performance. Not to mention all the other intangible effects for IT investment on companies either direct or indirect.

Ren and Dewan (2006), conducted a study about IT and its relation to risk and return in American companies. The study aimed at exploring the role of IT and its effect on company risks. It was conducted on a sample of 243 companies. The researchers stated that IT has an impact on risks; technology helps in decreasing the risk rates in companies that have high levels of IT systems. They also found that IT helps in increasing the return rates of the sample companies. Later in 2007, Huang's study about the effect of investment in IT on the performance of companies manufacturing rubber, an indirect relation between investment in IT and the performance of the employees in terms of the ease of work, and time saving and energy saving was found.

Richardson and Zmud (2001) studied the impact of advertising the investment in IT on the return on stocks and their market value. The study was conducted on a sample of 97 companies, and the two researchers concluded that on average there is no extra ordinary return caused by advertising the investment in IT, meaning that there is no reaction from investors or appreciation to the investment in IT, particularly if this investment is characterized by being not effective or necessary.

In an article by (Chan et al., 2012), the association between the strength of information technology controls over management information systems and the subsequent forecasting ability of the information produced by those systems is investigated. It examined three dimensions of information technology material weaknesses: data processing integrity, system access and security, and system structure and usage. Results support the contention that information technology controls, as a part of the management information system, affect the quality of the information produced by the system.

Resource Based Theory: A large portion of the IT-business literature has used the Resource-Based View (RBV) (Roxas and Chadee, 2011) as a framework over the last two decades. RBV has been used in numerous fields such as Human Resource Management, Knowledge Management and Strategic Management in order to explain how a given resource affects company performance and interacts with other resources. This study evaluates IT under the rubric of RBV in order to better understand the relationship between IT capabilities, other resources, and ultimately company performance.

RBV suggests that a firm is a collection of resources, tangible and intangible, human and non-human, collected together in an administrative framework. Proponents of the theory

have used RBV to analyze the heterogeneity of resources and their effects on company performance (Baradwaj, 2000). Baradwaj further defined the properties of resources which provide competitive advantage. These properties are a resource's value, rarity, inimitability and non-substitutability.

Information System Resources: This section will build upon the premise that resources are the bedrock of an organization's capabilities. Ravichandran and Lertwongsatien (2005) suggested three broad classifications of IT resources. The first classification is that of Human Resources (HR). In this study, HR refers to the skill and proficiency of staff to perform IT related functions. The expertise of a company in relation to IT is determined by its HR, which is often influenced by factors such the tenure of staff and company specific training and knowledge. The second classification is IT infrastructure sophistication. This classification refers to the capability of IT infrastructure to respond to strategic changes and meet business needs. IT infrastructure must be flexible, enabling a business to take advantage of opportunities and quickly adjust its strategy, and it must deliver accurate, relevant information. The third classification is IT Partnership Quality. This classification includes both internal and external partnerships. Internal alignment between IT and the other resources of a business is essential so that IT providers may understand the relationships between the resources and objectives of the organization (Schryen, 2013). Relationships with external vendors can aid in establishing skills in areas which IT staff have not yet mastered. External vendors can therefore help improve internal IT functions and increase performance.

IS Capabilities: Resources have been described as either tangible (such as IT infrastructure) or intangible (such as Partnership Quality). Capabilities refer to an organization's coordinated use of such resources which correlate with business objectives and provide results (Jarvenpaa and Leidner, 1998). As capabilities are coordinated, they are also "shared." Schreyogg and Kliesch-Eberl (2007) suggest that capabilities are to be found throughout a company. They also identified three general areas of capabilities: problem solving and complexity, practicing and success, and reliability and time.

Core Competencies: A core competency is an aggregation of competencies that is cross- organizational. As an aggregation of competencies, a core competency is a source of diversification strategies which help reduce risk and transfer knowledge. The relevant literature describes three classifications of core competencies: market-based access competencies, integrity-related competencies, and functionality-related competencies. Ravichandran and Lertwongsatien (2005) describe market-based access competencies as those which engender the understanding of the prevailing customer base, as well as the recognition of opportunities in new markets. Integrity-related competencies are those which enable a company to produce dependable products and services that are of superior quality. Functionality-related competencies are those that guarantee the delivery of value- driven products and services to customers.

3 RESEARCH METHODOLOGY

The goal of this study is to carry out an empirical analysis of the effect of IT within the Egyptian economy. A quantitative study focuses more on numbers and measurement of variables, which makes it more suitable when dealing with a large number of research objects. Structured questionnaires were designed and distributed. The questionnaire results were statistically analyzed. The existence and

relative strengths of the relationships between the variables were analyzed using the Partial Least Squares (PLS) technique (Maitra and Yan, 2008) (Abd El-Aziz, 2012). PLS is useful as an analytical tool due to its capability to measure relatively small sample sizes (Pirouz, 2006). In addition, PLS is also a components based modeling tool which can simultaneously measure structural paths as well the measurement model.

3.1 Questionnaire

The questionnaire was sent out to senior IT managers and CEO within the survey population via mail and as well as interview. Respondents had the opportunity to assess company performance over the last three years based on operating performance four-item scale and market based performance three- item scale.

In measuring IT support for market-access and IT support for integrity-related competencies, a five- item scale was utilized for each of them. In order to measure IT support for functionality-related competencies, a seven-item scale was utilized. IS capabilities, including planning, systems development, support, and operations, were all measured along a six-item scale.

IS Human Capital, defined as the skill of the personnel, was measured on a four-item scale. IS Human Resource Specialization was measured along a six-item scale. The flexibility of IT infrastructure, composed of the sophistication of network and planning, was measured by a six-item scale. Data and core applications were measured along a four-item scale. IS partnership quality, defined by both the internal and external qualities of the partnerships, was measured using a six-item scale. Information intensity was measured using a three-item scale.

3.2 Population and Sampling

The population sampled within this study includes manufacturing and services, telecommunication, insurance, retails, utilities, services, and banks. As well as, other companies listed on the Egyptian Stock Exchange have also participated. The questionnaire was tailored for the senior management of IT departments and CEOs at the respective firms.

The survey questions were mailed to senior executives and management working in IT department within Egyptian companies. 79935 listed companies in Egypt were

selected the companies due to the ease of access to information (The General Authority for Investment, jan-2012). There is no specific sector in Egyptian Market was selected. Four hundred questionnaires were sent out and three hundred forty nine responses were received, resulting in an 87% response rate. Although a high response rate was achieved, the number of respondents in this study was considerably bigger than that achieved by Ravichandran and Lertwongsatien (2005).

Sixty three percent of the companies that responded to the survey belong to the Manufacturing and services group within the Egyptian market. The remaining thirty seven percent was made up of the groups such as Services seven Percent, Telecommunication three percent, Insurance three percent, Retails twelve percent, Utilities seven percent, Others four percent and Bank one percent. These companies had staff numbers ranging between 100 and more than 1000 employees. All of the responding companies had the head office located in Egypt.

4 RESEARCH FINDINGS

PLS is interpreted in two stages. The first step evaluates the measurement model and the second step in the analysis examines the structural model as a whole. "The measurement model subsumes the composition of the latent variables while the structural model depicts how the latent variables are interrelated" (Allen and Rao, 2000).

All of the factor loadings are highly positive. This represents the first step of the PLS analysis, indicating whether these measures should be included in the model. The factor loadings indicate how the individual indicators contribute to the construct, whereas the path coefficients (discussed in section 4.5) indicate how they contribute to the overall relationships between the constructs, P-value is the chance that the relationship you are observing is observed by pure chance. So if you obtain a p-value of 0.01, it means that there is a 1% chance that the relationship between the independent variable(s) and the dependent variable that your model established doesn't actually exist.

IS Human Resource Capital is also well measured by SKILLS_2, SKILLS _3, SKILLS _4, SKILLS _5, SKILLS _6, SKILLS _8, SKILLS _9 with all factor loads highly positive at 0.48, 0.45, 0.48, 0.45, 0.41, 0.28, 0.06 respectively and significant at the 90% significant level in contrast with their small standard errors.
Estimated factor loadings for IT Infrastructure Flexibility are highly positive for ITFlex_4, ITFlex _5 and ITFlex _7, at 0.54, 0.67 and 0.34 respectively and significant at $P < 0.1$ (90% significance level).

IS Partnership Quality construct is also well measured by ISQ_4 with a factor loading at 0.34, ISQ_5 with a factor loading at 0.38,ISQ_6 with a factor loading at 0.54, with ISQ _10 and ISQ _11 following as measures with a factor loading at 0.21 and 0.24 respectively.
IS Capabilities is well measured by ISCAP_7, ISCAP_21 with factor loads highly positive at 0.54, 0.54 respectively and significant at 90% significant level in contrast with their small standard errors.

IT Support for core competencies is also well measured by ISSUP_6, ISSUP _7, ISSUP _8, ISSUP _9, ISSUP _10, ISSUP _11 with all factor loads highly positive at 0.64, 0.63, 0.66, 0.57, 0.44, 0.38 respectively and significant at the 90% significant level in contrast with their small standard errors.
Firm Performance construct is also well measured by PERF_2 with a factor loading at 0.52, PERF _3 with a factor loading at 0.52, PERF _4 with a factor loading at 0.70, with PERF _5 and PERF _6 following as measures with a factor loading at 0.76 and 0.61 respectively.

Information Intensity is also well measured by with INT_1, INT _2, INT _3 all factor loads highly positive at 0.27, 0.50, 0.32 respectively and significant at the 90% significant level in contrast with their small standard errors.

The P-values for all variables are less than 0.1. The R2 or variances explained for endogenous variables are all greater than .10 with the exception of SKILLS_9, ISQA_10 and ISQA_11. Given the tenability of the measurement model reflected in section 4.4, the structural model can be assessed to focus on the structural causal relationships among IT Infrastructure Flexibility, IS Partnership Quality, IT Support for Core Competencies and Business Performance.

4.1 Research Hypotheses

The test to determine whether the structural model was consistent with the observed data was done with the use of the software LISREL. Allen and Rao (2000) indicated the importance of noting the fact that the causal model is never explicitly proven. On the other hand, the relationships structural model can be tested to check consistentcy with what was reflected in the data. The path coefficient in the causal analysis reflects the values of the direct contribution of a given variable on another variable, given the effects of the other variables are also taken into account.

Hypothesis 1: Structural Equation: IS_Capability = 1.995 + 0.171 IT_Flexibility + 0.291 IS Quality The path coefficient between IS Human Capital and IS Capability is positive at 0.17. The p-value is less than 0.1 therefore significant at the 90% level. The structural equation model therefore provides support for Hypothesis 1 which stated that there is a positive relationship between IS Human Capital and IS Functional Capabilities.

Hypothesis 2: Structural Equation: IS_Capability = 1.995 + 0.171 IT_Flexibility + 0.291 IS Quality The path coefficient between IT Infrastructure Flexibility and IS Capability is positive at 0.19. The p- value is less than 0.1 therefore significant at the 90% level. The structural equation model therefore provides support for Hypothesis 2 which stated that there is a positive relationship between IT Infrastructure Flexibility and IS Functional Capabilities.

Hypothesis 3: Structural Equation: IS_Capability = 1.995 + 0.171 IT_Flexibility + 0.291 IS Quality

The path coefficient between IS Partnership Quality and IS Functional Capability is positive at 0.27. The p-value is less than 0.1 therefore significant at the 90% level. The structural equation model therefore provides support for Hypothesis 3 which stated that there is a positive relationship between IS Partnership Quality and IS Functional Capabilities.

Hypothesis 4: Structural Equation: IT Support for Core Competencies = 3.167 + 0.163 IS_Capability

The path coefficient between IS Functional Capability and IT Support for Core Competencies is positive at 0.17. The p-value is less than 0.1 therefore significant at the 90% level. The structural equation model therefore provides support for Hypothesis 4 which stated that there is a positive relationship between IS Functional Capability and IT Support for Core Competencies.

Hypothesis 5: Structural Equation: Firm Performance = 2.716 + 0.210 IT Support for Core Competencies

The path coefficient between IT Support for Core Competencies and Firm Performance is positive at
0.21. However, the p-value is less than 0.1 therefore significant at the 90% level. The structural equation model therefore provides support for Hypothesis 5 which stated that there is a positive relationship between IT Support for Core Competencies and Company Performance.

A positive and significant path coefficient was witnessed between the latent constructs. IS Human Capital, IT Infrastructure Flexibility and IT Partnership Quality both have a strong positive path coefficient to IT Capabilities. However, the path coefficient between IT Capabilities and IT Support for Core Competencies is strong. Finally, IT Support for Core Competencies presents a positive path coefficient with Firm Performance.

5 CONCLUSION

This study extended the research conducted by Ravichandran and Lertwongsatien (2005) by using Resource Based theory to explain how company performance can in component be explained by IS resources and capabilities. The research model presented in this study supported in particular for the positive influence that a flexible IT infrastructure and partnerships at the right level, deliver to the business. After the data were collected and analyzed, significant positive relationships were found:

- IS Human Capital and Information System Functional Capability.
- IT Infrastructure Flexibility and Information System Functional Capabilities.
- IS Partnership Quality and Information System Functional Capabilities.
- IS Functional Capabilities and Information Technology Support for Core competencies.
- IT Support for Core Competencies and Company Performance.

Industries are now elevating the Information Technology (IT) function from the operational to the strategic level. IT has become an essential function and tool used by modern management; from the development of new products to the support of sales

and service, from providing market intelligence to supplying tools for decision analysis. Multi-national companies have the ability to acquire information from multiple systems and make it broadly accessible to managers and employees; this has become a critical function. This coupled with the increased opportunities for using IT to achieve strategic competitiveness has made it essential for CEOs to reexamine their IT knowledge in order to manage it effectively.

Technology has become integrated with almost every aspect of the business of many companies. At one time, they had started using technology to run core applications, or to process key business information. Today, technology plays a role in almost everything businesses do, from every aspect of customer service to customizing their store formats or matching their merchandising strategies to

individual markets in order to meet varied customer preferences. Naturally as technology has become pervasive in the business, it has changed the way they work now. CEOs increasingly recognize the impact that technology decisions have on their business and their corporate culture. As a result, most of them are becoming less comfortable delegating technology decisions to others.

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تأثير الأقليات فى السياسة الدولية

د. ابوبكـر سليم عبده

MINORITIES IMPACT ON INTERNATIONAL POLITICS

إن الأقليات فى العالم يمثل إشكاليات كثيرة من الناحية السياسية والاقتصادية وما يتبعها من تغيرات اجتماعية , فالأقليات من الطرق الإستراتيجية التى تستخدمها دول مختلفة وتقوم بدراستها جيداً من اجل الوصول لأغراض سياسية او استراتيجية معينة و من الممكن ان تغير الخريطة السياسية لكثير من دول العالم , فاستخدام الأقليات كأسلوب ضغط فى بعض بلدان العالم أو لزعزعة الاستقرار فى مناطق اخرى, فعلى سبيل المثال لا الحصر دور الولايات المتحدة الأمريكية فى دعم القضية الكردية فى بعض مناطق من العالم (مثل العراق) وكانت من العوامل الرئيسية فى دخول العراق , وعلى طريق مّغاير تعتبر الاكراد فى تركيا من الارهابيين ,

وعلى صعيد اخر فإن التغيرات السياسية التى قد تحدث فى مناطق معينة قد تكون سبب فى تمكين الاقليات مثلما حدث فى مع انهيار الاتحاد السوفيتى وظهور دول اسيا الوسطى (طاجيكستان , قيرغيزستان , اوزبكستان , تركمانستان , كازاخستان)على الخريطة السياسية فى العالم , واصبح هناك تنافس ما بين القوى الاقليمية والقوى الدولية للسيطرة والهيمنة ومد النفوذ على تلك الدول وواقع الاقليات المسلمة فى العالم مختلف من بلد الى اخر طبقاً لطبيعة هذة البلاد او الظروف المحيطة بها والظروف السياسية والاقتصادية المتغيرة فعلى سبيل المثال لا الحصر حال المسلمين فى الدول الغربية مختلف عن حالهم فى الصين اوالدول الاخرى ولذا تتضمن الدراسة ثلاثة محاور اساسية :

توضيح مفهوم الاقليات –كيفية نشئت الاقليات–نبذة مختصرة عن الاقليات فى العالم

مفهوم الأقليات

هي مجموعات بشرية ذات سمات وخصائص تختلف عن مثيلاتها في مجتمع الأكثرية، ولكل أقلية منها سمات قومية أو MENORITIESالأقليات إثنية أو دينية مشتركة بين أفرادها.تختلف الأقليات فيما بينها نوعاً وهوية وانتماء، كما تأخذ تسميات مختلفة مثل: جالية أو فئة أو طائفة أو ملة أو فرقة أو مجموعة وغيرها من تسميات تدل في الغالب على جذور الأقلية وأصولها، وهويتها الاجتماعية والبشرية. وتنضوي تحت مفهوم الأقليات أنماط وأنواع مختلفة منها: الأقلية العرقية والأقلية الدينية والأقلية اللغوية والأقلية المذهبية والأقلية القبلية . العشائرية والأقلية الإقليمية والأقلية الثقافية والأقلية السياسية والأقلية الاقتصادية . الاجتماعية, والأقلية القومية المتعددة الجذور. وما عداها مشتق منها ومتفرع عنها أو جامع لها بصيغة أو بأخرى، مثل القول بأقلية إثنية أو عنصرية وغير ذلك. ومع ذلك فإن الأقليات العرقية والإثنية العنصرية، هي والأقليات الدينية . المذهبية، أكثر أنماط الأقليات ظهوراً في العالم، وتكمن وراء أغلب الصراعات التي تنشب من حين إلى حين بين الأقلية والأكثرية في بلد ما.

نشئت الأقليات

وُجدت الأقليات والفوارق البشرية والاجتماعية والطبقات في مجتمعات بلدان الحضارات الأولى، واستمر وجودها حتى اليوم، نتيجة عدم استقرار الجماعات السكانية، ومن جراء تشابك العلاقات الاقتصادية والاجتماعية واندماج الحضارات، وتكوّن فوارق البنى الاجتماعية والبشرية في بيئات جغرافية متباينة، واختلاف في توزيع الثروات والموارد، وبالتالي ظهور مستغِل ومستغَل، فنشأت أقليات محكومة ومضطهدة من قبل أكثريات في ممالك التاريخ، جراء الغزو والاحتلال والهجرة والتهجير وسوق المغلوبين لخدمة الغالبين. وقد كانت مسألة الأغلبية والأقلية محور معظم الصراعات على السلطة والنفوذ والتملك والسيطرة على الثروات والموارد والأرض، منذ أقدم العصور حتى اليوم.

تنشأ الأقليات عادة نتيجة عمليتين أساسيتين هما:. الهجرة أو التهجير

الأقليات في العالم

تقدر الدراسات وجود 223 جماعة إثنية . أقلية كبيرة في العالم مجموع أفرادها يقرب من900 مليون نسمة، تخضع للتمييز في المعاملة والتصنيف الدولي بأسلوب أو بآخر. ولا تشمل هذه الدراسات الأقليات والجماعات الإثنية المتوسطة والصغيرة في عقد التسعينات، وهي كثيرة لانعدام الأقاليم والبلدان والدول ذات الانسجام والتجانس الإثني (المفهوم السياسي المعاصر لكلمة إثني يشمل الانتماءات المحددة باللغة أو العرق أو الدين أو الطائفة أو الطبقة أو القبيلة وغيرها)،

Midwives And Maternity Care In Ancient Egypt

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Abstract:

According to the International Confederation of Midwives (a definition that has been adopted by the World Health Organization and the International Federation of Gynecology and Obstetrics): A midwife is a person who, having been regularly admitted to a midwifery educational program that is duly recognized in the country in which it is located, has successfully completed the prescribed course of studies in midwifery and has acquired the requisite qualifications to be registered and/or legally licensed to practice midwifery.

In ancient Egypt there were no known words for midwife, obstetrician, or gynecologist. But because ancient Egyptians did not have words for these things does not mean that they did not exist. In Ancient Egypt, the "midwife" came in many forms. For peasants, the "midwife" was a friend, neighbor, and/or family member who helped deliver the baby. For noblewomen and wealthier classes, the "midwife" was usually a maidservant or nurse who already lived in the household. Midwives at this time did not have formal training to learn their trade. Instead they learned by apprenticeships where the knowledge was passed down from family member to another or from friend to friend. The work of the midwife included providing emotional support, encouragement, medical care, and religious help and protection to women during their lives. The areas that midwives focused on were pregnancy, labor, fertility, and contraception.

There are countless stories of early midwifery . In ancient Egyptian times , priestesses were trained in music , healing arts and high magic , using chant , sacred dance and healing herbs. These wise women carried great wisdom and knowledge , which was often viewed as threat .

Egyptian midwives seem to have used both medical and magical methods to speed up labor. Medical remedies included swallowing a mixture of honey and fenugreek , or a vaginal suppository whose ingredients included incense , beer and fly dung.
The work of the midwife included providing emotional support , encouragement, medical care ,and religious help and protection to women during their lives . The areas midwives focused on were pregnancy , labor , fertility , and contraception . Gynecological disorders such as uterine prolapsed were treated with medication rather than by manipulation. It

was thought that if the patient stood over a burning fire of medicinal ingredients, her uterus would be magically forced back into its normal position. Alternative methods included drinking specifically prepared remedies, and smearing oils and aromatic resins on the public region. Excessive bleeding or hemorrhage, was treated by remedies designed " to draw out blood of the woman " the rationale being that if you were to draw the blood out , the bleeding would stop. Other methodologies are discussed.

Conference Resolutions

توصيات المؤتمر

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تم عقد المؤتمر السنوي رقم ٤٠ لرابطة العلماء المصريين بأمريكا و كندا بالاكاديمية العربية للعلوم و التكنولوجيا و النقل البحري و ذلك في الفتره من ٢٨ الي ديسمبر ٢٠١٣ تحت رعاية معالي الدكتور/ نبيل العربي الامين العام لجامعة الدول العربية و الاستاذ الدكتور/ جورج استينو وزير البحث العلمي و الاستاذ الدكتور/ اسماعيل عبد الغفار اسماعيل فرج رئيس الاكاديمية و رئاسة الاستاذ الدكتور/ توفيق أيوب رئيس المؤتمر و رئيس الرابطة و الاستاذ الدكتور/ ناصر الشيمي سكرتير عام الرابطة و مسئول البرنامج الاستاذ الدكتور/ أحمد الصاوي نائب رئيس الرابطة و التنسيق العلمي الأستاذ الدكتور/ عادل طلعت نائب رئيس الرابطة و الاستاذ الدكتور/ محمد عطا الله الرئيس السابق للرابطة و اللجنة المنظمة المحلية للمؤتمر من الاكاديمية و يمثلها الاستاذ الدكتور/ اسماعيل طه و الدكتورة/ حنان جودة.

و قد تم رفع توصيات المؤتمر في الجلسة الختامية في المجالات المختلفة كالأتي:

اولا: مجالات الصحة العامة و الطب

- تفعيل تنفيذ قانون تطوير التعليم الطبي في مصر و المقدم من المجلس الاعلي للجامعات و وزير التعليم العالي و البحث العلمي في عام ٢٠١٠ و وضع خطة زمنية لتنفيذ هذا القانون.
- دعم دراسة تفصيلية لتطوير آليات الطب الوقائي لمواكبة التغيرات المرضية في المجتمع المصري
- تطوير آليات و مبادئ الصحة العامة في مصر و تعميم موادها في مراحل التعليم المختلفة ابتداءاً من التعليم الابتدائي
- تطوير الابحاث الطبية بما يخدم المجتمع المصري و تفعيل دور المجلس القومي للبحوث الطبية الذي تم اقتراحه في صيف ٢٠١٢
- الاهتمام بانشاء خطة قومية استراتيجية لعلاج الامراض المزمنة في المجتمع المصري مثل مرض البول السكري و فيروس (C) و التعاون مع خبرات رابطة العلماء المصريين في امريكا و كندا في هذا المجال
- دراسة مخرجات مشروعات الجوده و الاعتماد في الجامعات و مؤسسات التعليم العالي بحيث يكون الهدف هو اضافة جوده حقيقية للتعليم و ليس فقط للحصول علي شهاده الجوده
- تنفيذ مشروعات تطوير الصناعات الدوائية و الحصول علي التراخيص العالمية التي تسمح بتسويق صناعات الدواء المصرية في الاسواق العالمية بما يتيح عائد مثمر لمصر
- انشاء آلية للتعاون بين معامل ابتكار و اختراع الدواء في مصر بين بعضها البعض و كذلك بين العلماء المصريين في الخارج
- الاهتمام بتطبيق قانون عدم صرف الدواء في الصيدليات المصرية بدون وصفة طبية (روشته) معتمده من طبيب مصرح له بمزاولة المهنة
- دعم التعاون العلمي بين مدينة برج العرب للبحث العلمي و رابطة العلماء المصريين بأمريكا و كندا في المجالات المختلفة
- تطوير برامج التعليم و التدريب لخريجي كليات التمريض بما يتواكب مع التقدم و التطور المستمر في الخدمات الطبية
- انشاء برامج خاصة بالصيدلة الاكلينيكية كبرنامج دراسات عليا متقدمة لدعم الخدمات الطبية بالمستشفيات

ثانيا: بيوتكنولوجي

- فلسفة البيوتكنولوجي تشمل وضع خريطة واضحة لخروج مصر من ازمات مرتبطة بتوافر الامصال و اللقاحات اللازمة لصحة الانسان و الحيوان و لهذا يجب تنمية مهارات البيوتكنولوجي في مصر بحيث يشمل تفعيل هذه الابحاث لكي تتحول الي منتجات تخدم الصناعة المصرية
- التركيز علي صناعة اللقاحات في مصر بحيث تزداد كمية الناتج المحلي و تقلل من الاستيراد

- الاهتمام بتعليم البيوتكنولوجي في جميع الكليات العلمية للمساعدة في نشر الوعي بأهمية هذه التكنولوجيا في النمو الاقتصادي و العلمي لمصر

ثالثا: الهندسة و البنية التحتية

- خلق قنوات اتصال دائمة بين رابطة العلماء المصريين بأمريكا و كندا مع الاكاديمية العربية للعلوم و التكنولوجيا و النقل البحري و في هذا الصدد توقيع مذكرة تفاهم بين الرابطة و الاكاديمية و جامعة الزقازيق (للدرجات المشتركة و المشروعات المشتركة و تبادل الخبرات و الطلاب و الاشراف المشترك)
- تتبني وزارة النقل و المواصلات بجمهورية مصر العربية تنفيذ مشروع رفع كفاءة و سلامة الطرق السريعة باستخدام العربات المعلوماتية المتحركة و التي تقوم بتحليل الحالة الوظيفية للطرق و تساعد في اتخاذ القرار الملائم بتحديد اوليات مشروعات الاحلال و التجديد للطرق
- حيث ان توفير الطاقة في مصر من اكبر المشاكل الحيوية و المستقبلية للاقتصاد المصري و انه من الهام ان تقوم الحكومة بدور فعال في دعم مشروعات الطاقة الجديدة المتجددة و بناءاً عليه يجب ان تقوم وزارة الطاقة بدراسة مشروع للدعم المالي لمشروعات توفير الطاقة بالمشأت الصناعية و التجارية و الحكومية و السكنية القائمة بالإضافة الي الدعم المالي للمشروعات توليد الطاقة من مصادر متجددة و هذا من أجل تحفيز الاستثمار في هذه المجالات
- أن تقوم وزارة البيئة بإستخدام تقنيات الاستشعار عن بعد لدراسة التغيرات المناخية و تأثيرها علي العوالق الهوائية بخاصة ما يسمي بالسحابة السوداء، أيضا تقوم وزارة البيئة بدعم دراسة متخصصة لديناميكية الهواء فوق سماء القاهرة و ذلك لإكتشاف أماكن إختناق و ركود الهواء و يترتب علي ذلك امكانية عمل بعض الفتحات في المرتفعات الشرقية الغربية لخلخلة هواء القاهرة و من ثم القضاء علي ظاهرة السحابة السوداء
- تقوم وزارة البحث العلمي بانشاء آليات جديدة لتقوية منظومة توظيف الابحاث العلمية و تسويق التنفيذ و الانتاج و علي سبيل المثال تمويل برامج تدريبية للباحثين علي خطوات تحويل نتائج الابحاث العلمية الي منتجات تخدم المجتمع و ايضا زيادة عدد الحضانات للابتكارات العلمية و زيادة التوزيع الجغرافي للشركات المستحدثة (start up)
- زيادة التمويل للمشروعات الخاصة و المشتركة بين علماء الداخل و الخارج و التنسيق مع رابطة العلماء المصريين بأمريكا و كندا لتكون قناة فاعلة لتقوية الاتصال و الاستفادة من هذا التمويل
- تقوم وزارة الطاقة بأبحاث متقدمة لكيفية تطبيق التقنيات الجديدة و الامنة لانشاء محطات توليد الكهرباء من الطاقة النووية تنمية مصادر الطاقة في سيناء (الفحم، الرمال السوداء، الكواتز) لانتاج اللوحات الشمسية و الغاز الطبيعي (Bio Gas) بالتعاون بين الاكاديمية و الجامعات الامريكية Oklahoma state University او Tennessee Techonological University