

# Quality Management Review

## *A Case Study of the Application of the Glykas Quality Implementation Compass*

Michail Glykas

Department of Financial and Management Engineering

University of the Aegean

Chios, Greece

mglikas@aegean.gr

**Abstract—** The purpose of this paper is to examine the application of quality management systems in the health care sector in the UAE. We introduce the Glykas Quality Compass (GQC) that maps all quality initiatives in an organization and provides a classification of implementation initiatives in four main categories: philosophies, standards, methodologies and excellence awards. We also examine and analyze the use of quality concepts and principles of GQC in the health care sector in the UAE via a case study in Mafraq Hospital and the wider Ambulatory Health Services (AHS) establishment of Abu Dhabi also known as SEHA.

**Keywords—** Glykas Quality Compass, Quality Management, Quality Standards, Healthcare Sector, Process Management, Quality Management Review, Six Sigma, EFQM, Baldrige Award.

2010b, 2005a, 2005b, 2004a, 2005b, 2005c, 2005d, 2005e, 1999, 1995, 1994a, 1994b, 1994c, 1994d, 1993a, 1993b, 1993c, 1993d, 1992a, 1992b) and Valiris et.al (2005, 2004, 2000, 1999a, 1999b, 1998). Performance measurement issues are also elaborated in GQC based on the work of Chytas et al. (2010, 2008, 2011), Wilhelmij et. al (1993a, 1993b) and Xirogiannis et. al. (2008, 2007, 2004a, 2004b, 2004c, 2004d).

The four categories of GQC are: philosophies, frameworks, standards and excellence awards.

Successful implementation of Quality Management is analyzed in GQC through the analysis of ten core quality concepts. The ten quality concepts in GQC are further subdivided into three categories: five core concepts, three intra-core concepts and two auxiliary concepts as described below:

The core concepts are:

1. **Customer focus:** Focusing on the way the product or services are delivered to the customers. Focusing on the customer segment and supporting processes. For example, Quality Function Deployment is a technique for analyzing customer focus.
2. **Human resource management:** It comprises of 4 elements namely performance measurement, training and education, rewards and incentives and career pathing.
3. **Leadership:** It is a soft skill which involves empowering of individuals in an organization. It is very important and deals with how authority and decision making is delegated to the human resources.
4. **Process focus:** Process flow is the sequence of activities. Process management deals with the activities and flow of activities.
5. **Strategic focus:** Deals with developing business objectives and the critical success factors.

The intra-core concepts are:

### *I. The Glykas Quality Compass for Quality Implementation*

There are several definitions of quality especially when business or management is involved; however its main purpose leads to fulfillment of customer needs and continuous improvement. Quality has become an important part of every organization and would remain essential since it supports to enhance customer satisfaction and company's performance in order to achieve better results compared to competitors. We cover the state of the art of quality management by describing its recent contributions through the four categories such as philosophies, frameworks, standards and excellence awards required by the Glykas Quality Compass (GQC) presented bellow. Additionally, we outline the background of quality management in health care that is supported by a case study that elaborate on the ambulatory health services in the UAE.

The Glykas Quality Compass (GQC) classification is based on the work of Glykas et. al. (2018, 2017, 2015a, 2015b, 2014, 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2013g, 2012, 2011a, 2011b, 2010a,

6. **Performance measurement:** Measurement of the efficiency and effectiveness of all organizational elements namely managerial system, job description, organizational structure and processes-procedures.
7. **Change management:** The management of the change in all organizational elements in a controlled manner.
8. **Continuous improvement:** Using PDCA cycle to continuously improve all elements of the organization.

The auxiliary concepts are:

9. **Information-Knowledge management:** Knowledge comprises of education, experience and training. Knowledge management is serving knowledge, using knowledge to achieve something. It deals with the way knowledge is documented in an organization.
10. **Partnership, Social Responsibility and Stake holders' value:** Partnership is the relation with the suppliers, subcontractors and outsourcing firms. Social responsibility is the responsibility with all other authorities in the wider community. Stake holder is anybody who has influence or interest in the company functioning.

The above ten concepts are used in all four quality categories (philosophies, methodologies, standards, excellence awards) and follow the PDCA cycle for constant continuous improvement. PDCA is a methodology composed of four phases: Plan, Do, Check, Act, with different techniques used in this type of cycle for the ten aforementioned concepts.

The first two phases (Plan and Do) are the most important during quality management implementation. The Plan phase is considered with the design of all organizational elements that will support and control the implementation during the Do phase by utilizing all organizational resources.

The organizational elements we are concerned with in the Plan Phase in GQC are: Processes, Organizational Structure, Job Descriptions, and Managerial Systems. The organizational resources we concentrate on at GQC in the Do Phase are: Land and Buildings, Equipment, Human Resources, Material and Inventories, Cash-Money, Information Systems. Both organizational elements and organizational resources can be utilized in all four quality categories apply to different quality concepts. A table depicting the GQC is presented below:

	Quality Categories																																							
	TQM										Frameworks and Methodologies										Standards										Excellence Awards									
	OE		OR		OE		OR		OE		OR		OE		OR		OE		OR		OE		OR		OE		OR		OE		OR		OE		OR					
Quality Concepts	OS	JS	P	MS	LS	E	HR	C	I	IT	OS	JS	P	MS	LS	E	HR	C	I	IT	OS	JS	P	MS	LS	E	HR	C	I	IT	OS	JS	P	MS	LS	E	HR	C	I	IT
Strategic Focus																																								
Customer Focus																																								
Process Focus																																								
HRM Focus																																								
Leadership																																								
Performance Measures																																								
Change Management																																								
Continuous Improvement																																								
Partnership & Corp. Resp.																																								
Know ledge Management																																								

Table 1: The Glykas Quality Compass Table

In the next sections we provide a literature survey of quality management based on the aforementioned GQC quality categories.

## II. Quality Categories of GQC

Quality Management is "a system which an organization aims to reduce and eventually eliminate nonconformance to specifications, standards, and customer expectations in the most cost effective and efficient manner." (Quality Management System – the definition of Quality Management System from BusinessDictionary.com. Available from <http://www.businessdictionary.com/definition/quality-management-system-QMS.html>. [24/09/ 2019].) Factors such as performance, durability and reliability could be used to measure quality. This leads to customer satisfaction and continuous improvement. Therefore is crucial for organizations to focus on process and output-product quality instead of maximizing output volumes in order to remain competitive. (Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13).

Quality and Quality Management Systems continuously play an important role in business for the last 25 years and many theories-philosophies, methodologies, standards and excellence awards have emerged. (Timeline of Changing Quality Systems. Available from <http://math.kennesaw.edu/~vkane/SixSigmaMaterials/QualityTimeline.pdf> [24/09/ 2019]).

### GQC Category: Quality Management Philosophies

Philosophy (Philosophy – the definition of philosophy from THE FREE Dictionary, Encyclopedia and Thesaurus. Available from <http://www.thefreedictionary.com/philosophy>. [24/09/ 2019].) is "the academic discipline concerned with making explicit the nature and significance of ordinary and scientific beliefs and investigating the intelligibility of concepts by means of rational argument concerning their presuppositions, implications, and interrelationships; in particular, the rational investigation of the nature and structure of reality (metaphysics), the resources and limits of knowledge (epistemology), the principles and import of moral judgment (ethics), and the relationship between language and reality (semantics)".

Leadership and its management has played an imperative role in most organizations for decades. By the end of Second World War (Quality Management

Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/Quality\\_management](http://en.wikipedia.org/wiki/Quality_management). [24/09/ 2019].), Japan made every effort and any possible investment to be best in quality management. In the country's early initiatives they required help of the earliest founders of quality such as: Walter Shewhart, W. Edwards Deming and Joseph Juran, amongst others. These are considered as quality "gurus" who researched the subject and provided its initial concepts, methodologies and standards. In the next sections we will present the three most prominent quality gurus who become known for their remarkable contribution to quality: Deming, Ishikawa and Shingo.

### W. Edwards Deming

He was an (W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].) American statistician, professor, author, lecturer and consultant who is best known for the "Plan-Do-Check-Act" cycle. He made a significant contribution to Japan's reputation for innovative high-quality products and economic power. In 1988 (W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].), he received the Distinguished Career in Science award from the National Academy Sciences.

Deming advocated that all managers must have implemented a quality system with widespread employee involvement, which is called 'System of Profound Knowledge'. This system is composed of four essential components, namely: appreciation of a system; knowledge of variation; theory of knowledge; and knowledge of Psychology. He further linked these four components to his 14 points of management in industry and advocated that: "One need not be eminent in any part nor in all four parts in order to understand and to apply it. The 14 points of management in industry, education, and government follow naturally as application of this outside knowledge, for transformation from the present style of Western management to one of optimization." (W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].)

Deming 14 points (Cohen, Phil, Deming's 14 points. Available from <http://www.hci.com.au/hcisite2/articles/deming.htm>. [24/09/ 2019]) can be considered as a set of guidelines for achieving organizational goals and objectives. These points highlight the importance and of continuously creating and assessing organizational goals in order to achieve continuous improvement.

These 14 points (as illustrated below Deming's 14 points. Available from <http://2.bp.blogspot.com/-oA88yzreYSo/TsTyZarUC4I/AAAAAAAAAYs/f-9DNYxHR6I/s1600/Deming%2527s+14+Points.jpg>

[24/09/ 2019]) also can be considered as a roadmap on how an organization can achieve and improve quality via standardized processes in each and every part of organization focused on the principles of quality control leadership etc.



Figure 1: Demings 14 points.

Deming later introduced the "Seven Deadly Diseases" of organizations that cause quality system failures. These are: (W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].) "lack of constancy of purpose"; "emphasis on short-term profits"; "evaluation by performance, merit rating, or annual review of performance"; "mobility of management"; "running a company on visible figures alone"; "excessive medical costs"; and "excessive costs of warranty, fueled by lawyers who work for contingency fees".

Deming's advocacies of the Plan-Do-Check-Act cycle, his 14 Points and Seven Deadly Diseases have had tremendous influence not only in manufacturing and have also been applied in other areas, such as business process management and in relatively new fields such as sales process engineering." (W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].)

### Kaoru Ishikawa

Kaoru Ishikawa is a Japanese professor who contributed extensively in the application of quality systems in Japan. He introduced the concept of **Quality circles** and the well known Ishikawa diagram also known as the '**cause and effect model**' and the **Fishbone model**. His model is included in the seven fundamental tools of quality. Below is an example of cause and effect diagram. (Easy Fishbone Diagrams. Available from [http://www.12manage.com/methods\\_ishikawa\\_cause\\_effect\\_diagram.html](http://www.12manage.com/methods_ishikawa_cause_effect_diagram.html) [24/09/ 2019])



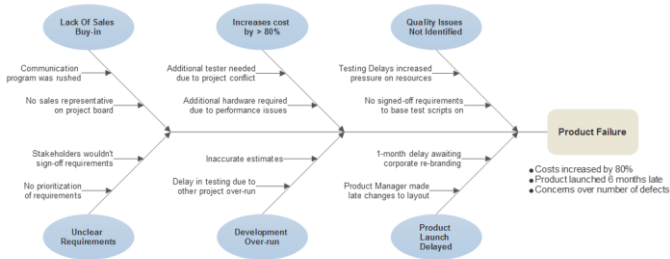


Figure 2: The Fishbone Model

Ishinawa advocated that all organizations should be simple and straightforward; hence a user-friendly system of quality control must be developed. He also introduced and focused the concept of **internal customer**, unknown and innovative in his era.

### Shingeo Shingo

Shingeo Shingo was an engineer who modernized the Toyota and the car production sector via the use of innovative control practices that later had a major impact on the western production industry.

He introduced the '**just in time**' concept which was later involved to the 'Single Minute Exchange of Die' (SMED) system. (SMED; Shigeo Shingo's Single Minute Exchange of Die. Available from <http://leanman.hubpages.com/hub/SMED> [24/09/2019])

SMED system principles focus on set-up time reduction and reduced response times to production plans, supply chain plans and customer needs. As an extension and supplement to the SMED system Shingo introduced the **POKA-YOKE** system, also known as the mistake proofing system. (Poka Yoke (Mistake Proofing). Available from <http://www.siliconfareast.com/pokayoke.htm> [24/09/2019].)

Utah University as a tribute to Shingo's contribution to quality management systems introduced "The Shingo Prize" (Poka Yoke (Mistake Proofing). Available from <http://www.siliconfareast.com/pokayoke.htm> [24/09/2019].) This excellence award aims to boost high class manufacturing techniques and is awarded to companies who achieve outstanding business results in customer satisfaction.

### GQC Category: Methodologies

A methodology is defined as a "real or conceptual structure intended to serve as a support or guide for the building or something that expands the structure into something useful." (Framework – the definition of framework from WhatIs.com. Available from <http://whatIs.techtarget.com/definition/framework> [24/09/2019].) In this section we introduce the GQC quality management methodologies or frameworks

used for quality management-improvement: the PDCA cycle, the EFQM model and Six Sigma.

### The PDCA for Continuous Improvement

The **Plan – Do – Check – Act (PDCA)** cycle is also known as Deming cycle and Shewhart cycle. It is the most well known methodology for continuous quality improvement and is used in quality management with its variations: DMAIC and DMADV used in Six Sigma and explained below (Continuous Quality Improvement through PDCA and DMAIC Cycles. Available from <http://leanman.hubpages.com/hub/Continuous-Quality-Improvement-through-PDCA-and-DMAIC#> [24/09/2019])

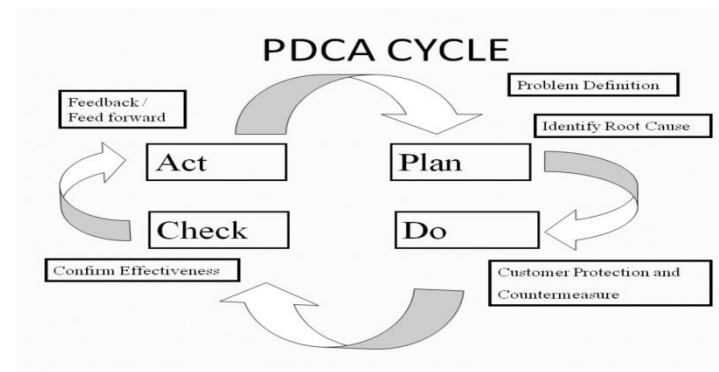


Figure 3: PDCA CYCLE

### European Foundation for Quality Management

EFQM (The EFQM Excellence Model. Available from: <http://www.efqm.org/en/tabid/132/default.aspx>. []) is identified as a framework, which also known as European Foundation for Quality Management that can be operated as a diagnostic tool in order to attain excellence in a business. EFQM is a non-profit association that was established in 1998.

The EFQM Excellence model has provided three major contributions to quality management: "the fundamental concepts"; "the nine criteria"; and "the RADAR logic". The fundamental concepts is a set of essential concepts that support the EFQM excellence model. They focus on the 'what' and not 'how' the organization quality management should be designed and implemented in an organization.

The EFQM model is based on nine criteria that should be measured and analyzed by an organization in order to measure performance. The nine criteria are divided into five "enablers" that focus on resources used for the achievement of the four "results" criteria as presented in the picture below:

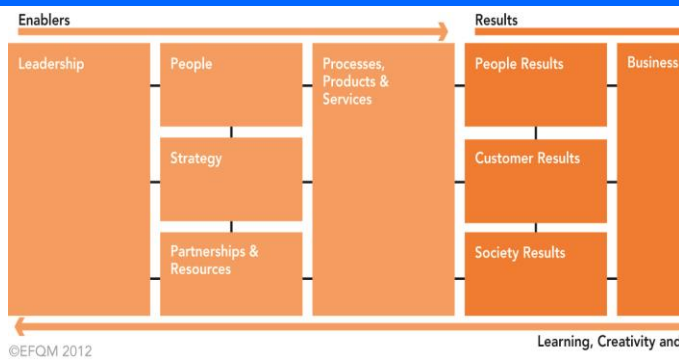


Figure 4: EFQM Model

For the implementation of the nine criteria presented in the picture above, EFQM has introduced an implementation methodology called RADAR logic. RADAR is defined as a “dynamic assessment framework and powerful management tool that provides a structured approach to questioning the performance of an organization.” RADAR stands for Results-Approach-Deploy-Assess-Refine, and is based on the PDCA methodology and is presented in the figure below:

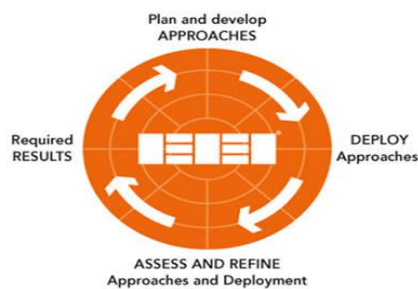


Figure 5: The RADAR Methodology

### Six Sigma

Six Sigma (Design for Six Sigma - Symbol Business Improvement. Available from <http://www.symbolbv.com/en/design-for-six-sigma.html> [24/09/ 2019]., Six Sigma Material. Available from <http://www.six-sigma-material.com/DMAIC.html> [24/09/ 2019].) was created with a focus to reduce or eliminate the causes of defects and deficiencies in manufacturing and service processes. Six Sigma has introduced two methodologies inspired by Deming's theory of Plan-Do-Check-Act Cycle called DMAIC and DMADV. Both methodologies consist of 5 phases.

**The DMAIC (Define, Measure, Analyze, Improve and Control) Improvement Cycle** (Six Sigma Material. Available from <http://www.six-sigma-material.com/DMAIC.html> [24/09/ 2019]., DMAIC Tools, Six Sigma Training Resources. Available from <http://www.dmaictools.com/> [24/09/ 2019]., Design for Six Sigma - Symbol Business Improvement. Available from <http://www.symbolbv.com/en/design-for-six-sigma.html> [24/09/ 2019].) is a data-driven

improvement cycle used for improving-optimizing business processes.

DMAIC is an abbreviation of five improvement steps: Define, Measure, Analyze, Improve and Control. (Six Sigma Material. Available from <http://www.six-sigma-material.com/DMAIC.html> [24/09/ 2019]., DMAIC Tools, Six Sigma Training Resources. Available from <http://www.dmaictools.com/> [24/09/ 2019]., Design for Six Sigma - Symbol Business Improvement. Available from <http://www.symbolbv.com/en/design-for-six-sigma.html> [24/09/ 2019].) These steps are illustrated below. (DMAIC Tools, Six Sigma Training Resources. Available from <http://www.dmaictools.com/> [24/09/ 2019].)



Figure 6: DMAIC Methodology

### Define

Refers to defining the goals of the project. The purpose of this step is to articulate the business problem, goal, potential resources, project scope and high-level project timeline. The objective is to ensure that the customer demand and the strategic goals of the organization are aligned. Normally, businesses are designing a roadmap to accomplish the targets and goals of the organization.

### Measure

The aim is to objectively launch improvement baselines and initiatives. Performance measurement and management techniques are utilized for assessing business performance.

### Analyze

The purpose of this step is to identify, validate and select root causes for elimination. This phase is extremely significant in order to establish any inconsistency that may occur between business goals and organizational performance. Analysis techniques are used for the identification bottlenecks, cycle time problems, process or output defects etc.

### Improve

The purpose is to identify, test and implement improvement initiatives. The use of brainstorming and techniques like 'Six Thinking Hats' and 'Random Word' could contribute in identifying creative solutions to get rid of the key root causes of process problems. Project planning and management of various implementation initiatives are designed.

### Control

Implementation of project plans designed in the previous phase takes place in a synchronous mode. Improvements are monitored and controlled to ensure sustainable success. During this phase we create a control plan via which we achieve proper versioning of update documents, business processes and training records.

## DMADV (DEFINE-MEASURE-ANALYZE-DESIGN-VERIFY) OR DFSS (DESIGN FOR SIX SIGMA)

It follows a similar approach to DMAIC as explained above. Its five improvement phases are illustrated below. (Design for Six Sigma - Symbol Business Improvement. Available from <http://www.symbolbv.com/en/design-for-six-sigma.html> [24/09/ 2019].)

Design for Six Sigma:  
DMADV roadmap

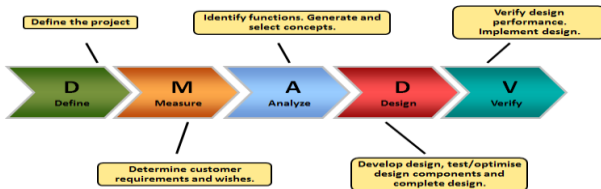


Figure 7: DMADV Methodology

## LEAN SIX SIGMA

An extension of DMAIC and DMADV is Lean six sigma (Lean Six Sigma – the definition from Wikipedia, the free encyclopedia. Available from [http://en.wikipedia.org/wiki/Lean\\_Six\\_Sigma](http://en.wikipedia.org/wiki/Lean_Six_Sigma) [24/09/ 2019]) a methodology-framework that aims in minimizing waste and idle time in the service provision, production and supply chain while providing flawless goods and services. The methodology has introduced the “seven wastes” that need to be eliminated in an organization in order to achieve Lean Six Sigma: transportation, inventory, motion, waiting, overproduction, over processing, and defects. The definition of these seven wastes are shown in the picture below:



Figure 8: The Seven Wastes of Lean Six Sigma

## GQC Category: Quality Standards

A standard is (ISO - International Organization for Standardization. Available from <http://www.iso.org/iso/home.html>. [24/09/ 2019].) “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.” The most well known quality standard is the International Organization for Standardization (ISO). It sets quality standards that a company should meet in order to be certified as compliant with international standards of

quality. A company acquires ISO certification after rigorous assessment by ISO assessors. There are a large set of ISO standards, each evaluating companies operating in sectors or markets. (ISO - International Organization for Standardization. Available from <http://www.iso.org/iso/home.html>. [24/09/ 2019].)

ISO 9000 outlines the standard that (Hoyle, 2003). ISO 9001 is concerned with processes and managerial systems that should be in place to ensure quality in daily company operations and is the most well known in industry. Quality control and quality conformance points and processes should be in place before certification as well as proper versioning and continuous improvement procedures.

ISO 14001 focuses on environmental management systems. Its aim is to enable an organization adhere to environmental legal requirements, processes and systems. This certification applies to organizations that are willing to implement, improve, as well as maintain environmental management systems. An organization has to be self-determined in order to assure conformity with the standards that are outlined in the environmental policy.

The ISO 18001 OHSAC focuses on management systems that ensure health and safety in an organization. It gives guidelines on how an organization should minimize health and safety hazards for its employees. It also follows legal requirements that ensure that workplaces are safe and free of any possible hazard risks.

## GQC Category: Excellence Awards

Excellence awards are prizes that are awarded to companies that have achieved outstanding performance in quality management as a recognition of achieving excellence in its internal processes and systems and in providing quality products and services. The award may also be awarded to a company for its outstanding role in upholding practices that promote environmental sustainability. Some of the renowned excellence awards across global economic regions are discussed below.

### MalcomBaldridge National Quality Award (Heaphy, M. & Gruska, G., 1993, ‘The Malcolm Baldridge National Quality Award’, Addison Wesley Publishing Company, London.)

The award was named after Malcolm Baldrige a “guru” of quality management who worked as the Secretary of the ‘U. S. Department of Commerce’ from 1981 to 1987. The prize was established in 1987 through the Malcolm Baldrige National Quality Improvement Act of 1987. The award is managed by the Baldrige Performance Excellence Program. This is a program that was formulated by the ‘U. S. Department of Commerce’ and is supervised by the ‘National Institute of Standards and Technology’.



Organizations that are considered for the award are expected to have excelled and improved significantly in seven major areas known as the 'Baldrige Criteria for Performance Excellence'. The areas are: strategic planning, human resource management, customer services, leadership, analysis management, as well as process focus and general business performance. (Heaphy, M. & Gruska, G., 1993, 'The Malcolm Baldrige National Quality Award', Addison Wesley Publishing Company, London)

This is an award that assesses both public and private organizations in the U.S.A for quality management excellence. The MalcomBaldrige National Quality Award is the only formal award in the United States and refers to both the private and the public sector. (Heaphy, M. & Gruska, G., 1993, 'The Malcolm Baldrige National Quality Award', Addison Wesley Publishing Company, London) It awards about 18 prizes per year classified by business sector such as: manufacturing, health care, service industry, small businesses, non- profit making organizations, education etc.

#### *The Deming prize*

It was established in 1950 as a tribute to the work of W. Edwards Deming and is awarded to both companies and individuals who have been influential and/or contributed to the advancement of quality management. (

#### References

Aquayo, R., 1991, Dr. Deming: The American who taught the Japanese about quality, 1st Ed, Fireside, New York, NY.

1. Berk, J. and Berk, S., 2000, 'Chapter 4 - Quality Measurement Systems: Where it all begins: Quality Management for the Technology Sector', Woburn: Butterworth-Heinemann.
2. Chirico-Post, J., Creech, D. and Stoelting, H., 1990, 'Generic screening as an integral part of quality management', Am College Physicians Utiliz Rev.
3. Chytas P. and Glykas M. (2011). A proactive balanced scorecard, *International Journal of Information Management*, Vol. 31, No.5, pp.460-468.
4. Chytas P., Glykas M. and Valiris G. (2008). A Proactive fuzzy cognitive balanced scorecard, *IEEE International Conference on Fuzzy Systems*, IEEE World Congress on Computational Intelligence, ISSN 1098-7584, 2008, ISBN 9781424418183, pp. 1331 – 1338.
5. Clancy CM, Farquhar MB, Sharp BA, 2005. 'Patient safety in nursing practice', J Nurs Care Qual Jul-Sep.
6. Davidson, E., 2001, 'Who's who in Canadian business', 21st Ed., University of Toronto Press, Canada.
7. De Mast, J. and Lokkerbol, J., 2006, 'An analysis of the Six Sigma DMAIC method from the perspective of problem solving', *International Journal of Production Economics*, Vol. 139, no 2, October, pp. 604-614.
8. Donabedian, A., 1966, 'Evaluating the quality of medical care', Milbank Mem Fund.
9. Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13.
10. Evans, J.R & Lindsay M.W, 'The Management and Control of Quality', South-Western Cengage Learning, 8th edition, pp. 3-12, 91-124.
11. Farner, S., 1996. 'Quality is still free: Making quality certain in uncertain times'. *Organizational Dynamics*, Vol. 25, no 2, Autumn 1996, pp. 89-90.
12. Friesen, M & Johnson, J., 1995, 'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT.
13. Glykas, M., Valiris, G., Kokkinaki, A., & Koutsoukou, Z. (2018). Banking Business Process Management Implementation. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 6(1), 50-69. doi:10.4018/IJPMAT.2018010104
14. Glykas, M., & Johnichen, G. (2017). Quality and Process Management Systems in the UAE Maritime Industry. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 5(1), 20-39. doi:10.4018/IJPMAT.2017010102
15. Glykas, M., Bailey, O. H., Al Maery, M. O., & Al Maery, N. O. (2015a). Process and Quality Management in Vocational Education & Training (VET). *International Journal of Management Sciences and Business Research*. Vol-4, Issue 1, ISSN (2226-8235)
16. Glykas, M. (2015b). Cluster Business Processes Management with 3D Immersive Environments. *International Journal of E-Entrepreneurship and Innovation (IJEEI)*, 5(2), 1-23. doi:10.4018/IJEEI.2015070101
17. Glykas, M. (2014). Fuzzy Cognitive Strategic Maps. In *Fuzzy Cognitive Maps for Applied Sciences and Engineering* (pp. 291-318). Springer Berlin Heidelberg.

18. Glykas M.(ed.), (2013a). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
19. Glykas M. (2013b). *State of the Art in Business Process Management*, in Glykas M.(ed.), (2013). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
20. Glykas M. (2013c). Fuzzy cognitive strategic maps in business process performance measurement, *Expert Systems with Applications*, pp1-14. (online: elsevier.com)
21. Glykas M., Pappa E., Giakoumis M., Voxaki V. (2013d). Managing Organizational Intellectual Capital, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp. 195-220, DOI: 10.1007/978-3-642-28409-0.
22. Glykas M, Plakoutsi A., Papadogianni G. (2013e). Performance Measurement in Business Process, Workflow and Human Resource Management, Glykas M. (ed.), in *Business Process Management*, Berlin : Springer, pp. 129-156, DOI: 10.1007/978-3-642-28409-0.
23. Glykas M., Sezenias E., Farmakis A., Karagiannis G., Diagkou E. (2013f). A Holistic Business Performance Measurement Framework, in *Business Process Management*, pp.75-98, DOI: 10.1007/978-3-642-28409-0.
24. Glykas M., Stakias G., Psoras M. (2013g). Fuzzy Cognitive Maps in Social and Business Network Analysis, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp.241-279, DOI: 10.1007/978-3-642-28409-0.
25. Glykas M. (2012). Performance measurement scenarios with fuzzy cognitive strategic maps, *International Journal of Information Management*, Vol.32, No.2, pp-182-195.
26. Glykas M. (2011a). Effort Based Performance Measurement in Business Process Management, *Knowledge and Process Management*, Vol. 18, No.1, pp 10-33. (online: wileyonlinelibrary.com)
27. Glykas M. (2011b). Performance Measurement in Business Process, Workflow and Human Resource Management, *Knowledge and Process Management*, Vol.18, No. 4, pp 241–265 (online: wileyonlinelibrary.com)
28. Glykas M. (ed.), (2010a). *Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications*, Berlin:Springer, pp. 1-427. DOI: 10.1007/978-3-642-03220-2
29. Chytas P., Glykas M. and Valiris G. (2010b). Software reliability modeling using fuzzy cognitive maps, *Fuzzy Cognitive Maps*, Springer, Berlin, pp.217-230.
30. Glykas M. and Chytas P.(2005a). Next generation of methods and tools for team work based care in speech and language therapy, *Telematics and Informatics*, Vol. 22, pp. 135–160. (online: sciencedirect.com)
31. Glykas M. and Xirogiannis G. (2005b). A soft knowledge modeling approach for geographically dispersed financial organizations, *Soft Computing*, Vol.9, No. 8, pp-579-593.
32. Glykas M. (2004a). Workflow and process management in printing and publishing firms, *International Journal of Information Management*, Vol.24, p.523-538. (online elsevier.com)
33. Glykas M. and Chytas P.(2004b). Team work based care in speech and language therapy through web-based tools and methods, *Studies in health technology and infomatics*, pp.343-354.
34. Glykas M. and Chytas P. (2004c). Technological innovations in asthma patient monitoring and care, *Expert Systems with Applications*, Vol. 27, pp.121–131.
35. Glykas M. and Chytas P.(2004d). Web-based Asthma Collaboration Management and Public Awareness, *Studies in health technology and infomatics*, pp. 19-27.
36. Glykas M. and Chytas P. (2004e). Technology assisted speech and language therapy, *International Journal of Medical Informatics*, Vol. 73, No.6, pp.529-541.
37. Glykas M. and Valiris G. (1999). Formal methods in object oriented business modelling, *The Journal of Systems and Software*, Vol. 48, pp. 27-41.
38. Glykas M. and Litinas N. (1995). From rapid growth to maturity : The need for holistic methodologies in business process redesign, *Proceedings of the 3rd European Conference on Information Systems, Athens/Greece*, June 1-3, p541.
39. Glykas M., Holden T. and Wilhelmij P.(1994a). Modelling safety-critical organizational processes using the Agent Relationship Morphism Methodology, *Proceedings of the Twenty-Seventh Annual Hawaii International Conference on System Sciences*, IEEE, pp.693-702.
40. Glykas, M. (1994b). *Agent Relationship Morphism Analysis* (Doctoral dissertation, PhD thesis, University of Cambridge).



41. Glykas M., Holden T. (1994c). Enterprise Modelling And Process Design Techniques For Configuration Management, *Information Engineering Division*, Department Of Engineering, University Of Cambridge.
42. Glykas M., Holden T., Wilhelmij P. and Reynolds B. (1994d). LIFETRACK: organisational modelling for safety-critical decision support, in *Technology and Assessment of Safety-Critical Systems*, London:Springer, pp. 79-102.
43. Glykas M., Holden T. and Wilhelmij P. (1993a). Modelling the Collective Behaviour of Organisational Agents in the Petrochemical Industry Using the Agent Relationship Morphism Analysis (ARMA) Methodology, *Proceedings of the OOPSLA 93 Workshop on Modelling the Collective Behaviour of Organisational Agents*.
44. Glykas M., Wilhelmij P. and Holden T. (1993b). Verifiable object oriented designs. in *Proceedings of the eleventh international conference on Technology of object-oriented languages and systems*, N.J.: Prentice-Hall, Inc., pp. 391-406.
45. Glykas, M., Wilhelmij, P., & Holden, T. (1993c). Formal methods in object orientation. In *Proceedings of the European Conference on Object Oriented Programming (ECOOP)* (Vol. 93, pp. 26-30).
46. Glykas, M., Wilhelmij, P., & Holden, T. (1993d). Object orientation in enterprise modelling and information system design. In *COLLOQUIUM DIGEST-IEE* (Vol. 1, No. 7, pp. 8-8). IEEE.
47. Glykas M. and Valiris G. (1992a). ARMA: a multi-disciplinary approach to BPR, *Knowledge and process management*, Vol.6, No. 4, pp.213-226.
48. Glykas, M. M., Patel, U., Sutcliffe, A. G., Dodson, D. C., & Hackett, T. (1992b). Towards Interactive Explanation by 3D Visualisation. In *Proc. Workshop on Task Based Explanation. Research Laboratory of Samos, University of the Aegean*.
49. Heaphy, M. & Gruska, G., 1993, '*The Malcolm Baldrige National Quality Award*', Addison Wesley Publishing Company, London.
50. Hillmer, S. & Karney, D., 2001, '*In support of the assumptions at the foundation of Deming's management theory*', *Journal of Quality Management*, Vol. 6, No 2, pp. 371-400.
51. Hoyle, D., 2003, '*ISO 9000: 2000: An A – Z guide, Vol.1*', Butterworth–Heinemann, London.
52. Kanji, G & Asher, M., 1996, '*100 methods for quality management*', Sage Publications, London.
53. Lang N., '*Issues in quality assurance in nursing*'. Paper presented at issues in evaluation research: an invitational conference, December 10-12, 1975. Kansas City, KS: American Nurses Association; 1976.
54. Merry, M. & Crago, M., 2001 '*The Past ,Present And Future of Health care quality: Urgent need for innovative , external review process to protect patients*', *Patients and Understanding*, p. 32.
55. Mortimer, D. & Mortimer, S., 2004, '*Quality and risk management in the IVF laboratory*', Cambridge University Press, New York, NY.
56. National Quality Forum, 2006, '*Standardizing patient safety taxonomy: a consensus report*', Washington, DC.
57. Roberts, J. Coale, J. and Redman, R., 1987, '*A history of the Joint Commission on Accreditation of Hospitals*', JAMA.
58. Sanazaro, P. Mills, D., 1991, '*A critique of the use of generic screening in quality assessment*', JAMA.
59. Stevens, R., 1971, '*American Medicine and the Public Interest*', New Haven, Conn, Yale University Press.
60. Taghizadegan, S., 2006, '*Chapter 5 - Design for Six Sigma: Roadmap for Successful Corporate Goals: Essentials of Lean Six Sigma*', Burlington: Butterworth-Heinemann.
61. Taghizadegan, S., 2006, '*Deming's Consideration of the 14 Points for Management: Essentials of Lean Six Sigma*', Burlington: Butterworth-Heinemann.
62. Tourangeau AE, Cranley LA, Jeffs L, Feb 2006, '*Impact of nursing on hospital patient mortality: a focused review and related policy implications*', *Qual Saf Health Care*.
63. Valiris G. Chytas P. and Glykas M. (2005), Making decisions using the balanced scorecard and the simple multi-attribute rating technique, *Performance Measurement and Metrics*, Vol. 6, No.3, pp.159-171.
65. Valiris G. and Glykas M. (2004). Business analysis metrics for business process redesign, *Business Proces Management Journal*, Vol.10, No.4, p.445.
66. Valiris G. and Glykas M. (2000). A Case Study on Reengineering Manufacturing Processes and Structures, *Knowledge and Process Management*, Vol.7 No.1 pp.20-28.
67. Valiris G. and Glykas M. (1999a). Critical review of existing BPR methodologies the

- need for a holistic approach, *Business Process Management Journal*, Vol.5, No.1, pp 65-86.
68. Valiris G. and Glykas M. (1999b), Developing Solutions for Redesign: A Case Study in Tobacco Industry, *Evolution and Challenges in System Development*, US:Springer, p.607.
  69. Valiris G. and Glykas M. (1998) Management science semantics for object-oriented business modelling in BPR, *Information and Software Technology*, Vol. 40, No.8, pp. 417–433. (Online elsevier.com)
  70. Wilhelmij P., Glykas M. and Holden T. (1993a). Formal Methods in Object Orientation, *Proceedings of the European Conference on Object Oriented Programming (ECOOP)*, Vol. 93, pp.26-30.
  71. Wilhelmij P., Glykas M. and Holden T. (1993b). Object Oriented Information Systems Development, in *Proceedings of the 4th Hellenic Conference*.
  72. Xirogiannis G., Chytas P., Glykas M. and Valiris G. (2008), Intelligent impact assessment of HRM to the shareholder value, *Expert Systems with Applications*, Vol.35, No.4, pp. 2017-2031.
  73. Xirogiannis G. and Glykas M. (2007). Intelligent modeling of e-business maturity, *Expert Systems with Applications*, Vol.2, No.2, pp.687-702.
  74. Xirogiannis G., Glykas M. (2004a). Fuzzy casual maps in business modeling and performance-driven process re-engineering, in *Methods and Applications of Artificial Intelligence*, Berlin:Springer, pp.331-341, DOI: 10.1007/978-3-540-24674-9\_35
  75. Xirogiannis G. and Glykas M. (2004b). Fuzzy cognitive maps in business analysis and performance-driven change, *IEEE Transactions on Engineering Management*, Vo. 51, No.3, pp.334-351.
  76. Xirogiannis G., Glykas M. and Staikouras C. (2004c). Fuzzy cognitive maps as a back end to knowledge-based systems in geographically dispersed financial organizations, *Knowledge and Process Management*, Vol. 11, No.2, pp.137-154.
  77. Xirogiannis G., Stefanou J. and Glykas M. (2004d). A fuzzy cognitive map approach to support urban design, *Expert Systems with Applications*, Vol.26, No.2, pp. 257-268.

#### Internet References

1. Abu Dhabi Health Services Company - SEHA. Available from: <http://www.seha.ae/SEHA/EN/Pages/Home.aspx>. [24/09/ 2019]
2. Accreditation & Certification Programs/ Available from <http://www.jointcommissioninternational.org/accreditation-programs/> [24/09/ 2019]



Figure 9: Deming Prize

The award encourages innovation and novel approaches to quality (

#### References

- Aquayo, R., 1991, Dr. Deming: The American who taught the Japanese about quality, 1st Ed, Fireside, New York, NY.
64. Berk, J. and Berk, S., 2000, 'Chapter 4 - Quality Measurement Systems: Where it all begins: Quality Management for the Technology Sector', Woburn: Butterworth-Heinemann.
  65. Chirico-Post, J., Creech, D. and Stoelting, H.,1990, 'Generic screening as an integral part of quality management', *Am College Physicians Utiliz Rev*.
  66. Chytas P. and Glykas M. (2011). A proactive balanced scorecard, *International Journal of Information Management*, Vol. 31, No.5, pp.460-468.
  67. Chytas P., Glykas M. and Valiris G. (2008). A Proactive fuzzy cognitive balanced scorecard, *IEEE International Conference on Fuzzy Systems, IEEE World Congress on Computational Intelligence*, ISSN 1098-7584, 2008, ISBN 9781424418183, pp. 1331 – 1338.
  68. Clancy CM, Farquhar MB, Sharp BA, 2005. 'Patient safety in nursing practice', *J Nurs Care Qual* Jul-Sep.
  69. Davidson, E., 2001, 'Who's who in Canadian business', 21st Ed., University of Toronto Press, Canada.
  70. De Mast, J. and Lokkerbol, J., 2006, 'An analysis of the Six Sigma DMAIC method from the perspective of problem solving', *International Journal of Production Economics*, Vol. 139, no 2, October, pp. 604-614.

71. Donabedian, A., 1966, '*Evaluating the quality of medical care*', Milbank Mem Fund.
72. Evans, J. & Lindsay, W., 2008, '*The management and control of quality*', Mason: Thomson South-Western, p. 13.
73. Evans, J.R & Lindsay M.W, '*The Management and Control of Quality*', South-Western Cengage Learning, 8th edition, pp. 3-12,91-124.
74. Farner, S., 1996. '*Quality is still free: Making quality certain in uncertain times*'. *Organizational Dynamics*, Vol. 25, no 2, Autumn 1996, pp. 89-90.
75. Friesen, M & Johnson, J., 1995, '*The success paradigm: Creating organizational effectiveness through quality and strategy*', Quorum Publishers, Westport, CT.
76. Glykas, M., Valiris, G., Kokkinaki, A., & Koutsoukou, Z. (2018). Banking Business Process Management Implementation. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 6(1), 50-69. doi:10.4018/IJPMAT.2018010104
77. Glykas, M., & Johnichen, G. (2017). Quality and Process Management Systems in the UAE Maritime Industry. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 5(1), 20-39. doi:10.4018/IJPMAT.2017010102
78. Glykas, M., Bailey, O. H., Al Maery, M. O., & Al Maery, N. O. (2015a). Process and Quality Management in Vocational Education & Training (VET). *International Journal of Management Sciences and Business Research*. Vol-4, Issue 1, ISSN (2226-8235
79. Glykas, M. (2015b). Cluster Business Processes Management with 3D Immersive Environments. *International Journal of E-Entrepreneurship and Innovation (IJEEI)*, 5(2), 1-23. doi:10.4018/IJEEI.2015070101
80. Glykas, M. (2014). Fuzzy Cognitive Strategic Maps. In *Fuzzy Cognitive Maps for Applied Sciences and Engineering* (pp. 291-318). Springer Berlin Heidelberg.
81. Glykas M.(ed.), (2013a). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
82. Glykas M. (2013b). *State of the Art in Business Process Management*, in Glykas M.(ed.), (2013). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
83. Glykas M. (2013c). Fuzzy cognitive strategic maps in business process performance measurement, *Expert Systems with Applications*, pp1-14. (online: elsevier.com)
84. Glykas M., Pappa E., Giakoumis M., Voxaki V. (2013d). Managing Organizational Intellectual Capital, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp. 195-220, DOI: 10.1007/978-3-642-28409-0.
85. Glykas M, Plakoutsi A., Papadogianni G. (2013e). Performance Measurement in Business Process, Workflow and Human Resource Management, Glykas M. (ed.), in *Business Process Management*, Berlin : Springer, pp. 129-156, DOI: 10.1007/978-3-642-28409-0.
86. Glykas M., Sezenias E., Farmakis A., Karagiannis G., Diagkou E. (2013f). A Holistic Business Performance Measurement Framework, in *Business Process Management*, pp.75-98, DOI: 10.1007/978-3-642-28409-0.
87. Glykas M., Stakias G., Psoras M. (2013g). Fuzzy Cognitive Maps in Social and Business Network Analysis, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp.241-279, DOI: 10.1007/978-3-642-28409-0.
88. Glykas M. (2012). Performance measurement scenarios with fuzzy cognitive strategic maps, *International Journal of Information Management*, Vol.32, No.2, pp-182-195.
89. Glykas M. (2011a). Effort Based Performance Measurement in Business Process Management, *Knowledge and Process Management*, Vol. 18, No.1, pp 10-33. (online: wileyonlinelibrary.com)
90. Glykas M. (2011b). Performance Measurement in Business Process, Workflow and Human Resource Management, *Knowledge and Process Management*, Vol.18, No. 4, pp 241–265 (online: wileyonlinelibrary.com)
91. Glykas M. (ed.), (2010a). *Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications*, Berlin:Springer, pp. 1-427. DOI: 10.1007/978-3-642-03220-2
92. Chytas P., Glykas M. and Valiris G. (2010b). Software reliability modeling using fuzzy cognitive maps, *Fuzzy Cognitive Maps*, Springer, Berlin, pp.217-230.
93. Glykas M. and Chytas P.(2005a). Next generation of methods and tools for team work based care in speech and language therapy, *Telematics and Informatics*, Vol. 22, pp. 135–160. (online: sciencedirect.com)



94. Glykas M. and Xirogiannis G. (2005b). A soft knowledge modeling approach for geographically dispersed financial organizations, *Soft Computing*, Vol.9, No. 8, pp-579-593.
95. Glykas M. (2004a). Workflow and process management in printing and publishing firms, *International Journal of Information Management*, Vol.24, p.523-538. (online elsevier.com)
96. Glykas M. and Chytas P.(2004b). Team work based care in speech and language therapy through web-based tools and methods, *Studies in health technology and informatics*, pp.343-354.
97. Glykas M. and Chytas P. (2004c). Technological innovations in asthma patient monitoring and care, *Expert Systems with Applications*, Vol. 27, pp.121–131.
98. Glykas M. and Chytas P.(2004d). Web-based Asthma Collaboration Management and Public Awareness, *Studies in health technology and informatics*, pp. 19-27.
99. Glykas M. and Chytas P. (2004e). Technology assisted speech and language therapy, *International Journal of Medical Informatics*, Vol. 73, No.6, pp.529-541.
100. Glykas M. and Valiris G. (1999). Formal methods in object oriented business modelling, *The Journal of Systems and Software*, Vol. 48, pp. 27-41.
101. Glykas M. and Litinas N. (1995). From rapid growth to maturity : The need for holistic methodologies in business process redesign, *Proceedings of the 3rd European Conference on Information Systems, Athens/Greece*, June 1-3, p541.
102. Glykas M., Holden T. and Wilhelmij P.(1994a). Modelling safety-critical organizational processes using the Agent Relationship Morphism Methodology, *Proceedings of the Twenty-Seventh Annual Hawaii International Conference on System Sciences*, IEEE, pp.693-702.
103. Glykas, M. (1994b). *Agent Relationship Morphism Analysis* (Doctoral dissertation, PhD thesis, University of Cambridge).
104. Glykas M., Holden T. (1994c). Enterprise Modelling And Process Design Techniques For Configuration Management, *Information Engineering Division*, Department Of Engineering, University Of Cambridge.
105. Glykas M., Holden T., Wilhelmij P. and Reynolds B. (1994d). LIFETRACK: organisational modelling for safety-critical decision support, in *Technology and Assessment of Safety-Critical Systems*, London:Springer, pp. 79-102.
106. Glykas M., Holden T. and Wilhelmij P. (1993a). Modelling the Collective Behaviour of Organisational Agents in the Petrochemical Industry Using the Agent Relationship Morphism Analysis (ARMA) Methodology, *Proceedings of the OOPSLA 93 Workshop on Modelling the Collective Behaviour of Organisational Agents*.
107. Glykas M., Wilhelmij P. and Holden T. (1993b). Verifiable object oriented designs. in *Proceedings of the eleventh international conference on Technology of object-oriented languages and systems*, N.J.: Prentice-Hall, Inc., pp. 391-406.
108. Glykas, M., Wilhelmij, P., & Holden, T. (1993c). Formal methods in object orientation. In *Proceedings of the European Conference on Object Oriented Programming (ECOOP)* (Vol. 93, pp. 26-30).
109. Glykas, M., Wilhelmij, P., & Holden, T. (1993d). Object orientation in enterprise modelling and information system design. In *COLLOQUIUM DIGEST-IEE* (Vol. 1, No. 7, pp. 8-8). IEEE.
110. Glykas M. and Valiris G. (1992a). ARMA: a multi-disciplinary approach to BPR, *Knowledge and process management*, Vol.6, No. 4, pp.213-226.
111. Glykas, M. M., Patel, U., Sutcliffe, A. G., Dodson, D. C., & Hackett, T. (1992b). Towards Interactive Explanation by 3D Visualisation. In *Proc. Workshop on Task Based Explanation. Research Laboratory of Samos, University of the Aegean*.
112. Heaphy, M. & Gruska, G., 1993, 'The Malcolm Baldrige National Quality Award', Addison Wesley Publishing Company, London.
113. Hillmer, S. & Karney, D., 2001, 'In support of the assumptions at the foundation of Deming's management theory', *Journal of Quality Management*, Vol. 6, No 2, pp. 371-400.
114. Hoyle, D., 2003, 'ISO 9000: 2000: An A – Z guide, Vol.1', Butterworth-Heinemann, London.
115. Kanji, G & Asher, M., 1996, '100 methods for quality management', Sage Publications, London.
116. Lang N., 'Issues in quality assurance in nursing'. Paper presented at issues in evaluation research: an invitational

- conference, December 10-12, 1975. Kansas City, KS: American Nurses Association; 1976.
117. Merry, M. & Crago, M., 2001 'The Past ,Present And Future of Health care quality: Urgent need for innovative , external review process to protect patients', Patients and Understanding, p. 32.
  118. Mortimer, D. & Mortimer, S., 2004, 'Quality and risk management in the IVF laboratory', Cambridge University Press, New York, NY.
  119. National Quality Forum, 2006, 'Standardizing patient safety taxonomy: a consensus report', Washington, DC.
  120. Roberts, J. Coale, J. and Redman, R., 1987, 'A history of the Joint Commission on Accreditation of Hospitals', JAMA.
  121. Sanazaro, P. Mills, D., 1991, 'A critique of the use of generic screening in quality assessment', JAMA.
  122. Stevens, R., 1971, 'American Medicine and the Public Interest,' New Haven, Conn, Yale University Press.
  123. Taghizadegan, S., 2006, 'Chapter 5 - Design for Six Sigma: Roadmap for Successful Corporate Goals: Essentials of Lean Six Sigma', Burlington: Butterworth-Heinemann.
  124. Taghizadegan, S., 2006, 'Deming's Consideration of the 14 Points for Management: Essentials of Lean Six Sigma', Burlington: Butterworth-Heinemann.
  125. Tourangeau AE, Cranley LA, Jeffs L, Feb 2006, 'Impact of nursing on hospital patient mortality: a focused review and related policy implications', Qual Saf Health Care.
  126. Valiris G. Chytas P. and Glykas M. (2005), Making decisions using the balanced scorecard and the simple multi-attribute rating technique, *Performance Measurement and Metrics*, Vol. 6, No.3, pp.159-171.
  109. Valiris G. and Glykas M. (2004). Business analysis metrics for business process redesign, *Business Process Management Journal*, Vol.10, No.4, p.445.
  110. Valiris G. and Glykas M. (2000). A Case Study on Reengineering Manufacturing Processes and Structures, *Knowledge and Process Management*, Vol.7 No.1 pp.20-28.
  111. Valiris G. and Glykas M. (1999a). Critical review of existing BPR methodologies the need for a holistic approach, *Business Process Management Journal*, Vol.5, No.1, pp 65-86.
  112. Valiris G. and Glykas M. (1999b), Developing Solutions for Redesign: A Case Study in Tobacco Industry, *Evolution and Challenges in System Development*, US:Springer, p.607.
  113. Valiris G. and Glykas M. (1998) Management science semantics for object-oriented business modelling in BPR, *Information and Software Technology*, Vol. 40, No.8, pp. 417–433. (Online elsevier.com)
  114. Wilhelmij P., Glykas M. and Holden T. (1993a). Formal Methods in Object Orientation, *Proceedings of the European Conference on Object Oriented Programming (ECOOP)*, Vol. 93, pp.26-30.
  115. Wilhelmij P., Glykas M. and Holden T. (1993b). Object Oriented Information Systems Development, in *Proceedings of the 4th Hellenic Conference*.
  116. Xirogiannis G., Chytas P., Glykas M. and Valiris G. (2008), Intelligent impact assessment of HRM to the shareholder value, *Expert Systems with Applications*, Vol.35, No.4, pp. 2017-2031.
  117. Xirogiannis G. and Glykas M. (2007). Intelligent modeling of e-business maturity, *Expert Systems with Applications*, Vol.2, No.2, pp.687-702.
  118. Xirogiannis G., Glykas M. (2004a). Fuzzy casual maps in business modeling and performance-driven process re-engineering, in *Methods and Applications of Artificial Intelligence*, Berlin:Springer, pp.331-341, DOI: 10.1007/978-3-540-24674-9\_35
  119. Xirogiannis G. and Glykas M. (2004b). Fuzzy cognitive maps in business analysis and performance-driven change, *IEEE Transactions on Engineering Management*, Vo. 51, No.3, pp.334-351.
  120. Xirogiannis G., Glykas M. and Staikouras C. (2004c). Fuzzy cognitive maps as a back end to knowledge-based systems in geographically dispersed financial organizations, *Knowledge and Process Management*, Vol. 11, No.2, pp.137-154.
  121. Xirogiannis G., Stefanou J. and Glykas M. (2004d). A fuzzy cognitive map approach to support urban design, *Expert Systems with Applications*, Vol.26, No.2, pp. 257-268.

#### Internet References

3. Abu Dhabi Health Services Company - SEHA. Available from: <http://www.seha.ae/SEHA/EN/Pages/Home.aspx>. [24/09/ 2019]

4. Accreditation & Certification Programs/ Available from <http://www.jointcommissioninternational.org/accreditation-programs/> [24/09/ 2019]

) and encourages organizations and individuals to undertake any efforts necessary in achieving exceptional performance.

#### *European Quality Award (EFQM)*

This is an award that was established in 1992 in Europe at the 'European Foundation for Quality Management'. There was a change of its name from 'European Quality Award' to 'EFQM Excellence Award' in 2010.

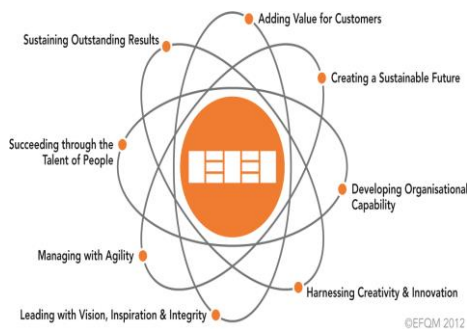


Figure 10: The EFQM Excellence Award

Organizations are required to establish managerial systems that measure, analyze and continuously improve employees, processes and quality systems in a continuous manner regardless of the size of the organization, its structure or even the industry in which it operates. (Kanji, G & Asher, M., 1996, '100 methods for quality management', Sage Publications, London) The award has been very influential to European organizations.

#### *Canadian Award for Business Excellence*

The award was established in 1992 by the Canadian government. This award was formed as a partnership between organizations in the private sector and government. Canada was in the streak of losing its competitiveness in the international market at the time the award was created. There had to be measures in place to energize the private sector and the nation to regain its competitiveness and the potential for economic improvement. As a consequence, the 'Canadian Award for Business Excellence' focused on the major objective of re-instituting quality management and quality performance in both the private and the public sector. The award is awarded to any organization, regardless of the size or the industry in which the organization operates in. (Davidson, E., 2001, 'Who's who in Canadian business', 21st Ed.,

University of Toronto Press, Canada) The organization achieving the award is reassessed on an annual basis. According to Davidson (Davidson, E., 2001, 'Who's who in Canadian business', 21st Ed., University of Toronto Press, Canada), the criterion for evaluating the companies to be awarded is based on the performance assessment categories that are outlined by the National Quality Institute (NQI). (Canadian Framework for Business Excellence. Available from <http://www.nqi.ca/en/knowledge-centre/products-and-tools/canadian-framework-for-business-excellence2> [24/09/ 2019])



Figure 11: Canadian Excellence Award

The award has been very effective in reviving the economy of Canada with the introduction of the 'Progressive Excellence Programs (PEP)' initiative. It has also created, the "Healthy Workplace Program" aiming at improving working conditions in companies as better working conditions in an organization increase employee motivation and their productivity. Canadian organizations have been able to access benchmarking case studies as well as excellence programs and has a positive implication and has led to the revival of the Canadian economy.

#### *Australian Business Excellence Award*

This is an award for Australian companies (Australian Business Excellence Awards. Available from [http://www.saiglobal.com/Improve/Awards/BEA\\_Overview.htm](http://www.saiglobal.com/Improve/Awards/BEA_Overview.htm) [24/09/ 2019]) was established twenty years ago.



Figure 12: Australian Excellence Award

Innovation facilitates customer satisfaction and increases the competitiveness of an organization. For a company to qualify for the award, has to demonstrate quality in both products and services offered to customers. The firm must be a leading company and usually could be considered as a best practice to others. (Friesen, M & Johnson, J., 1995,



'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT) The company should also be result-oriented and show proof of the results it has achieved in the financial year in question. This award has helped in improving the quality of Australian companies and making them competitive in the global market.

#### *The Quality Award of China*

The China Quality Award (Friesen, M & Johnson, J., 1995, 'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT) was established in 2001. The award aimed at stimulating business in China and setting criteria for assessment of their international expansion (Friesen, M & Johnson, J., 1995, 'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT).

Awarded organizations are amongst today's top companies in China that have a significant effect on the country's economy and in some cases on the international markets.



Figure 13: Chinese Excellence Award

Chinese organizations can only survive if they adopt quality management in an economic environment that has become very competitive. The award helps Chinese organizations improve in quality management. In addition, the award serves the social interests of the Chinese people in a collective manner.

#### *The Dubai Quality Award*

This award is related to companies in Dubai (Mortimer, D. & Mortimer, S., 2004, 'Quality and risk management in the IVF laboratory', Cambridge University Press, New York, NY). The award was established in 1994 by 'Dubai's Department of Economic Development'. Recipients of the award are organization whose performance is influential to other companies within the Dubai. The Dubai Quality Award is an award that gives directions to organizations on how to excel by adopting good practices and embracing approaches that have the ability to improve their performance. The desired direction organizations are expected to follow is that of being competitive within the country and internationally (Mortimer, D. & Mortimer, S., 2004, 'Quality and risk management in

the IVF laboratory', Cambridge University Press, New York, NY).



Figure 14: Dubai Excellence Award

The Dubai Quality Award uses a model that was adapted from the 'Excellence Model of the European Foundation for Quality Management (EFQM)' known as the 'Dubai Quality Award Model'. It has also helped in the improvement of external as well as internal trade in Dubai, a factor that has boosted the competitiveness of Dubai companies.

#### *Sheikh Khalifa Quality Award*

This is an award that was formed to assess and award exceptional performance of companies in the Abu Dhabi region by the government of the United Arab Emirates (UAE) (Sheikha Khalifa Excellence Award. Available from

<http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019]). Organizations in the UAE have recognized the need for quality management in order to become competitive. Any organization that demonstrates a high level of performance in Abu Dhabi and shows consistency in improvement is rewarded with this award. The award is known for providing a roadmap through which an organization can achieve success. It also offers a benchmark on which organizations can assess their performance against companies that have excelled in Europe and the rest of the world. Organizations in Abu Dhabi have improved in terms of domestic and international competition since the award was established.



Figure 15: The Sheikh Khalifa Excellence Award (SKEA)

The Sheikh Khalifa Excellence Award (SKEA) (Sheikha Khalifa Excellence Award. Available from <http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019]) is the excellence award for the UAE region. SKEA was launched by the Abu Dhabi Chamber of Commerce & Industry in 1999 as a blue print, a roadmap and a methodology for continuous improvement aimed at enhancing the competitiveness of the Business Sector in Abu Dhabi and the UAE.

SKEA is based on the EFQM Excellence model, a move that was followed by all other local awards in Dubai, Sharjah Ajman as well as RAK. SKEA also led the way to prepare the first and foremost Arabic version of the EFQM 2013 Model which was approved by all other Arabic speaking countries with local distributors and representatives as well as experts in the field of Organisational Excellence.

More than 10,000 organisations in the UAE used its model of Excellence and hundreds of them annually participated in its assessment cycles and tens every year are recognized as recipients of the SKEA Awards (Sheikha Khalifa Excellence Award. Available from <http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019]). SKEA should not only be considered as an award, but rather as a complete Quality & Excellence program as it includes services like: Licensed Assessors' training, Journey to Excellence programs (J2E) as well as Leaders for Excellence (L4E) courses designed for the senior executives and other members of the management team in all organizations working in the UAE. It also provides international EFQM products like the well known Committed to Excellence (C2E) and Recognized for Excellence (R4E) that aim in encouraging organizations in the UAE to sustain their efforts towards achieving the Excellence Transformation (Sheikha Khalifa Excellence Award. Available from <http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019]).

### III. GQC in Health Care

Health care services are vital for any society that aims to deliver proper patient care. Proper care is achieved by minimizing the occurrence of malpractice via continuous monitoring, assessment and improvement. Legislative frameworks and standards concerning all aspects of health care services are in place that cater for the safety and the well being of the patient, and put in place a comprehensive system that covers all aspects related to medical care and professional ethics. The standards require a complete assessment to health institutions and assess which ones are following the best quality care methods. Furthermore, medical practice codes have been implemented in various countries such as Denmark, United States, Australia and other countries such as the Gulf States. Moreover, the overgrowing medical service concerns led to the creation of several institutions dedicated to medical standards, a very good example is the joint commission international also known as the JCI to assure the implementation of medical standards in the institutions that are being assessed.

Via JCI standards medical institutions are assessed in indicators in which the patients determine whether they are satisfied or dissatisfied about the medical services offered, in which areas the medical institution did the best and in which areas the medical institution failed to deliver the best possible care.

Patient satisfaction levels provide measures of a medical institution's success to meet customer needs and expectations and a good feedback about its ability to fulfill the role as a proper medical care provider in the community. There are many reasons that make medical institutions to access their services. The most important reason is that care is related to tax payers money and governments are concerned in providing decent medical services. In a similar way care is related to private insurance companies as they pay the medical care provided to their customers. In addition the high cost of compensation in cases of malpractice / mistreatment of a patient led in JCI focusing on improving health care outcomes and procedures.

Patient satisfaction is related to patient expectations and patient conditions in about health care services; age, which implies that adult patients give a better feedback of the level of medical care; nature of the disease, where patients with complicated diseases often give dissatisfied feedbacks because they require much attention; past experience of the patient, where the patient will compare the level of the service in the medical institution with other medical institutions or compare the level of the service in the past vs. the present; and sex or race where patients from different genders or races give mixed views about the medical care given to them.

#### *Quality Management in Health care: A review of Health Care standards*

Health care services affect directly human lives and thus health care providers need standardization of their processes in order to achieve quality service provision to their patients in a consistent manner

The American College of Surgeons (ACS) was the first hospital that established standards (Roberts, J. Coale, J. and Redman, R., 1987, 'A history of the Joint Commission on Accreditation of Hospitals', JAMA.). These standards were later called as Minimum standards and concentrated on management of medical staff, and was mainly limited to licensed physicians and surgeons. Later the ACS standards evolved (Ambulatory health services-<http://www.AHS/homepage> [24/09/ 2019].) and concentrated on continuously recording and evaluating clinic processes, patient records, laboratory results physical examination data etc. (Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13., Roberts, J. Coale, J. and Redman, R., 1987, 'A history of the Joint Commission on Accreditation of Hospitals', JAMA.).

ACS standards later became the cornerstone of three sets of standards: The Joint Commission on Accreditation of Hospitals (JCAHO), The American Medical Association (AMA) and The Canadian Medical Association.

The international arm for JCAHO was established in 1988. (Chirico-Post, J., Creech, D. and Stoelting, H., 1990, 'Generic screening as an integral part of quality management', *Am College Physicians Utiliz Rev.*, Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13., Sanazaro, P. Mills, D., 1991, 'A critique of the use of generic screening in quality assessment', *JAMA.*) and introduced audit and quality assurance processes (Roberts, J. Coale, J. and Redman, R., 1987, 'A history of the Joint Commission on Accreditation of Hospitals', *JAMA.*) They focused on the wider health care staff community; Physicians, nurses, administrators, paramedics, housekeepers and clerks and advocated that all these professionals should work properly and synchronously with the aim of providing the best possible care (Donabedian, A., 1966, 'Evaluating the quality of medical care', *Milbank Mem Fund.*).

#### Health care in Abu Dhabi and Quality Excellence

The UAE General Authority of Health Services (GAHS) has been supervising the administration of social insurance conglomerations since 2001. GAHS has divided UAE health services into four regional regions: Abu Dhabi City, Middle Region, Al Ain and Western Region. The Abu Dhabi Health Authority, known by the name SEHA, promotes health awareness and aims at the best possible health care provision for the city's population. In order to achieve its goal SEHA signs agreements and monitors and assesses the work of leading international health care providers located in Abu Dhabi.

SEHA has developed more than 15 health awareness offices, 2600 authorized bunks, and over 55 Ambulatory & Prime Health care Clinics. SEHA is said to be one of the biggest head honchos in the Middle Eastern region with more than 15 000 employees (

#### References

Aquayo, R., 1991, Dr. Deming: The American who taught the Japanese about quality, 1st Ed, Fireside, New York, NY.

127. Berk, J. and Berk, S., 2000, 'Chapter 4 - Quality Measurement Systems: Where it all begins: Quality Management for the Technology Sector', Woburn: Butterworth-Heinemann.
128. Chirico-Post, J., Creech, D. and Stoelting, H., 1990, 'Generic screening as an

integral part of quality management', *Am College Physicians Utiliz Rev.*

129. Chytas P. and Glykas M. (2011). A proactive balanced scorecard, *International Journal of Information Management*, Vol. 31, No.5, pp.460-468.
130. Chytas P., Glykas M. and Valiris G. (2008). A Proactive fuzzy cognitive balanced scorecard, *IEEE International Conference on Fuzzy Systems*, IEEE World Congress on Computational Intelligence, ISSN 1098-7584, 2008, ISBN 9781424418183, pp. 1331 – 1338.
131. Clancy CM, Farquhar MB, Sharp BA, 2005. 'Patient safety in nursing practice', *J Nurs Care Qual* Jul-Sep.
132. Davidson, E., 2001, 'Who's who in Canadian business', 21st Ed., University of Toronto Press, Canada.
133. De Mast, J. and Lokkerbol, J., 2006, 'An analysis of the Six Sigma DMAIC method from the perspective of problem solving', *International Journal of Production Economics*, Vol. 139, no 2, October, pp. 604-614.
134. Donabedian, A., 1966, 'Evaluating the quality of medical care', *Milbank Mem Fund.*
135. Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13.
136. Evans, J.R & Lindsay M.W., 'The Management and Control of Quality', South-Western Cengage Learning, 8th edition, pp. 3-12,91-124.
137. Farner, S., 1996. 'Quality is still free: Making quality certain in uncertain times'. *Organizational Dynamics*, Vol. 25, no 2, Autumn 1996, pp. 89-90.
138. Friesen, M & Johnson, J., 1995, 'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT.
139. Glykas, M., Valiris, G., Kokkinaki, A., & Koutsoukou, Z. (2018). Banking Business Process Management Implementation. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 6(1), 50-69. doi:10.4018/IJPMAT.2018010104
140. Glykas, M., & Johnichen, G. (2017). Quality and Process Management Systems in the UAE Maritime Industry. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 5(1), 20-39. doi:10.4018/IJPMAT.2017010102



141. Glykas, M., Bailey, O. H., Al Maery, M. O., & Al Maery, N. O. (2015a). Process and Quality Management in Vocational Education & Training (VET). *International Journal of Management Sciences and Business Research*. Vol-4, Issue 1, ISSN (2226-8235)
142. Glykas, M. (2015b). Cluster Business Processes Management with 3D Immersive Environments. *International Journal of E-Entrepreneurship and Innovation (IJEEI)*, 5(2), 1-23. doi:10.4018/IJEEI.2015070101
143. Glykas, M. (2014). Fuzzy Cognitive Strategic Maps. In *Fuzzy Cognitive Maps for Applied Sciences and Engineering* (pp. 291-318). Springer Berlin Heidelberg.
144. Glykas M.(ed.), (2013a). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
145. Glykas M. (2013b). *State of the Art in Business Process Management*, in Glykas M.(ed.), (2013). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
146. Glykas M. (2013c). Fuzzy cognitive strategic maps in business process performance measurement, *Expert Systems with Applications*, pp1-14. (online: elsevier.com)
147. Glykas M., Pappa E., Giakoumis M., Voxaki V. (2013d). Managing Organizational Intellectual Capital, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp. 195-220, DOI: 10.1007/978-3-642-28409-0.
148. Glykas M, Plakoutsi A., Papadogianni G. (2013e). Performance Measurement in Business Process, Workflow and Human Resource Management, Glykas M. (ed.), in *Business Process Management*, Berlin : Springer, pp. 129-156, DOI: 10.1007/978-3-642-28409-0.
149. Glykas M., Sezenias E., Farmakis A., Karagiannis G., Diagkou E. (2013f). A Holistic Business Performance Measurement Framework, in *Business Process Management*, pp.75-98, DOI: 10.1007/978-3-642-28409-0.
150. Glykas M., Stakias G., Psoras M. (2013g). Fuzzy Cognitive Maps in Social and Business Network Analysis, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp.241-279, DOI: 10.1007/978-3-642-28409-0.
151. Glykas M. (2012). Performance measurement scenarios with fuzzy cognitive strategic maps, *International Journal of Information Management*, Vol.32, No.2, pp-182-195.
152. Glykas M. (2011a). Effort Based Performance Measurement in Business Process Management, *Knowledge and Process Management*, Vol. 18, No.1, pp 10-33. (online: wileyonlinelibrary.com)
153. Glykas M. (2011b). Performance Measurement in Business Process, Workflow and Human Resource Management, *Knowledge and Process Management*, Vol.18, No. 4, pp 241–265 (online: wileyonlinelibrary.com)
154. Glykas M. (ed.), (2010a). *Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications*, Berlin:Springer, pp. 1-427. DOI: 10.1007/978-3-642-03220-2
155. Chytas P., Glykas M. and Valiris G. (2010b). Software reliability modeling using fuzzy cognitive maps, *Fuzzy Cognitive Maps*, Springer, Berlin, pp.217-230.
156. Glykas M. and Chytas P.(2005a). Next generation of methods and tools for team work based care in speech and language therapy, *Telematics and Informatics*, Vol. 22, pp. 135–160. (online: sciencedirect.com)
157. Glykas M. and Xirogiannis G. (2005b). A soft knowledge modeling approach for geographically dispersed financial organizations, *Soft Computing*, Vol.9, No. 8, pp-579-593.
158. Glykas M. (2004a). Workflow and process management in printing and publishing firms, *International Journal of Information Management*, Vol.24, p.523-538. (online elsevier.com)
159. Glykas M. and Chytas P.(2004b). Team work based care in speech and language therapy through web-based tools and methods, *Studies in health technology and informatics*, pp.343-354.
160. Glykas M. and Chytas P. (2004c). Technological innovations in asthma patient monitoring and care, *Expert Systems with Applications*, Vol. 27, pp.121–131.
161. Glykas M. and Chytas P.(2004d). Web-based Asthma Collaboration Management and Public Awareness, *Studies in health technology and informatics*, pp. 19-27.
162. Glykas M. and Chytas P. (2004e). Technology assisted speech and language therapy, *International Journal of Medical Informatics*, Vol. 73, No.6, pp.529-541.

163. Glykas M. and Valiris G. (1999). Formal methods in object oriented business modelling, *The Journal of Systems and Software*, Vol. 48, pp. 27-41.
164. Glykas M. and Litinas N. (1995). From rapid growth to maturity : The need for holistic methodologies in business process redesign, *Proceedings of the 3rd European Conference on Information Systems, Athens/Greece*, June 1-3, p541.
165. Glykas M., Holden T. and Wilhelmij P.(1994a). Modelling safety-critical organizational processes using the Agent Relationship Morphism Methodology, *Proceedings of the Twenty-Seventh Annual Hawaii International Conference on System Sciences*, IEEE, pp.693-702.
166. Glykas, M. (1994b). Agent Relationship Morphism Analysis (Doctoral dissertation, PhD thesis, University of Cambridge).
167. Glykas M., Holden T. (1994c). Enterprise Modelling And Process Design Techniques For Configuration Management, *Information Engineering Division, Department Of Engineering, University Of Cambridge*.
168. Glykas M., Holden T., Wilhelmij P. and Reynolds B. (1994d). LIFETRACK: organisational modelling for safety-critical decision support, in *Technology and Assessment of Safety-Critical Systems*, London:Springer, pp. 79-102.
169. Glykas M., Holden T. and Wilhelmij P. (1993a). Modelling the Collective Behaviour of Organisational Agents in the Petrochemical Industry Using the Agent Relationship Morphism Analysis (ARMA) Methodology, *Proceedings of the OOPSLA 93 Workshop on Modelling the Collective Behaviour of Organisational Agents*.
170. Glykas M., Wilhelmij P. and Holden T. (1993b). Verifiable object oriented designs. in *Proceedings of the eleventh international conference on Technology of object-oriented languages and systems*, N.J.: Prentice-Hall, Inc., pp. 391-406.
171. Glykas, M., Wilhelmij, P., & Holden, T. (1993c). Formal methods in object orientation. In *Proceedings of the European Conference on Object Oriented Programming (ECOOP)* (Vol. 93, pp. 26-30).
172. Glykas, M., Wilhelmij, P., & Holden, T. (1993d). Object orientation in enterprise modelling and information system design. In *COLLOQUIUM DIGEST-IEE* (Vol. 1, No. 7, pp. 8-8). IEEE.
173. Glykas M. and Valiris G. (1992a). ARMA: a multi-disciplinary approach to BPR, *Knowledge and process management*, Vol.6, No. 4, pp.213-226.
174. Glykas, M. M., Patel, U., Sutcliffe, A. G., Dodson, D. C., & Hackett, T. (1992b). Towards Interactive Explanation by 3D Visualisation. In *Proc. Workshop on Task Based Explanation. Research Laboratory of Samos, University of the Aegean*.
175. Heaphy, M. & Gruska, G., 1993, '*The Malcolm Baldrige National Quality Award*', Addison Wesley Publishing Company, London.
176. Hillmer, S. & Karney, D., 2001, '*In support of the assumptions at the foundation of Deming's management theory*', *Journal of Quality Management*, Vol. 6, No 2, pp. 371-400.
177. Hoyle, D., 2003, '*ISO 9000: 2000: An A – Z guide, Vol.1*', Butterworth-Heinemann, London.
178. Kanji, G & Asher, M., 1996, '*100 methods for quality management*', Sage Publications, London.
179. Lang N., '*Issues in quality assurance in nursing*'. Paper presented at issues in evaluation research: an invitational conference, December 10-12, 1975. Kansas City, KS: American Nurses Association; 1976.
180. Merry, M. & Crago, M., 2001 '*The Past ,Present And Future of Health care quality: Urgent need for innovative , external review process to protect patients*', *Patients and Understanding*, p. 32.
181. Mortimer, D. & Mortimer, S., 2004, '*Quality and risk management in the IVF laboratory*', Cambridge University Press, New York, NY.
182. National Quality Forum, 2006, '*Standardizing patient safety taxonomy: a consensus report*', Washington, DC.
183. Roberts, J. Coale, J. and Redman, R., 1987, '*A history of the Joint Commission on Accreditation of Hospitals*', JAMA.
184. Sanazaro, P. Mills, D., 1991, '*A critique of the use of generic screening in quality assessment*', JAMA.
185. Stevens, R., 1971, '*American Medicine and the Public Interest*', New Haven, Conn, Yale University Press.
186. Taghizadegan, S., 2006, '*Chapter 5 - Design for Six Sigma: Roadmap for Successful Corporate Goals: Essentials of*

- Lean Six Sigma*, Burlington: Butterworth-Heinemann.
187. Taghizadegan, S., 2006, '*Deming's Consideration of the 14 Points for Management: Essentials of Lean Six Sigma*', Burlington: Butterworth-Heinemann.
  188. Tourangeau AE, Cranley LA, Jeffs L, Feb 2006, '*Impact of nursing on hospital patient mortality: a focused review and related policy implications*', Qual Saf Health Care.
  189. Valiris G. Chytas P. and Glykas M. (2005), Making decisions using the balanced scorecard and the simple multi-attribute rating technique, *Performance Measurement and Metrics*, Vol. 6, No.3, pp.159-171.
  153. Valiris G. and Glykas M. (2004). Business analysis metrics for business process redesign, *Business Process Management Journal*, Vol.10, No.4, p.445.
  154. Valiris G. and Glykas M. (2000). A Case Study on Reengineering Manufacturing Processes and Structures, *Knowledge and Process Management*, Vol.7 No.1 pp.20-28.
  155. Valiris G. and Glykas M. (1999a). Critical review of existing BPR methodologies the need for a holistic approach, *Business Process Management Journal*, Vol.5, No.1, pp 65-86.
  156. Valiris G. and Glykas M. (1999b), Developing Solutions for Redesign: A Case Study in Tobacco Industry, *Evolution and Challenges in System Development*, US:Springer, p.607.
  157. Valiris G. and Glykas M. (1998) Management science semantics for object-oriented business modelling in BPR, *Information and Software Technology*, Vol. 40, No.8, pp. 417–433. (Online elsevier.com)
  158. Wilhelmi P., Glykas M. and Holden T. (1993a). Formal Methods in Object Orientation, *Proceedings of the European Conference on Object Oriented Programming (ECOOP)*, Vol. 93, pp.26-30.
  159. Wilhelmi P., Glykas M. and Holden T. (1993b). Object Oriented Information Systems Development, in *Proceedings of the 4th Hellenic Conference*.
  160. Xirogiannis G., Chytas P., Glykas M. and Valiris G. (2008), Intelligent impact assessment of HRM to the shareholder value, *Expert Systems with Applications*, Vol.35, No.4, pp. 2017-2031.
  161. Xirogiannis G. and Glykas M. (2007). Intelligent modeling of e-business maturity, *Expert Systems with Applications*, Vol.2, No.2, pp.687-702.
  162. Xirogiannis G., Glykas M. (2004a). Fuzzy casual maps in business modeling and performance-driven process re-engineering, in *Methods and Applications of Artificial Intelligence*, Berlin:Springer, pp.331-341, DOI: 10.1007/978-3-540-24674-9\_35
  163. Xirogiannis G. and Glykas M. (2004b). Fuzzy cognitive maps in business analysis and performance-driven change, *IEEE Transactions on Engineering Management*, Vol. 51, No.3, pp.334-351.
  164. Xirogiannis G., Glykas M. and Staikouras C. (2004c). Fuzzy cognitive maps as a back end to knowledge-based systems in geographically dispersed financial organizations, *Knowledge and Process Management*, Vol. 11, No.2, pp.137-154.
  165. Xirogiannis G., Stefanou J. and Glykas M. (2004d). A fuzzy cognitive map approach to support urban design, *Expert Systems with Applications*, Vol.26, No.2, pp. 257-268.

#### Internet References

Abu Dhabi Health Services Company - SEHA. Available from: <http://www.seha.ae/SEHA/EN/Pages/Home.aspx>. [24/09/ 2019].

#### *Development of the health sector in the emirate of Abu Dhabi*

The overall expenditure on health care in the UAE has exceeded 45 billion dirham's in 2018. The numbers of hospitals in the country dramatically increased from only 7 hospitals back in 1971 to 92 public hospitals and more than 246 health care centers.

The UAE applies a compulsory health insurance to provide comprehensive health care to the citizens and residents of the state with the cost generally imposed on their employers. Regardless of their employer being in the government or the private sector, employers are responsible for ensuring the provision of health insurance cards for expatriate employees as a mandatory condition to provide them with residence visas in the country.

#### *Health strategies in the UAE*

The Abu Dhabi Ambulatory Health Services (AHS) aims at developing comprehensive national programs to combat infectious diseases and other emerging



diseases (Ambulatory health services-  
<http://www.AHS/homepage> [24/09/ 2019].)  
The AHS has set four main objectives in its 2013 to 2025 strategy: achieving prevention and awareness, providing comprehensive service, efficiency and investment in competitiveness, and assuring maximum quality standards applied throughout in the emirate of Abu Dhabi. AHS identified 17 operational goals and 43 initiatives to implement these objectives backed by a plan to monitor the performance indicators.

#### Health care related standards - JCI

The most well known International Health Care Standards were developed by the Joint Commission International (JCI) (Joint Commission – A definition from Wikipedia, the free dictionary. Available from [http://en.wikipedia.org/wiki/Joint\\_Commission](http://en.wikipedia.org/wiki/Joint_Commission) [24/09/ 2019]). They were formerly known as Joint Commission on Accreditation of Health care Organizations (JCAHO) standards. JCI has developed a network of Regional Advisory Councils that are based in various parts of the world including the Middle East, most regions in Asia Pacific, Africa, Europe and the Americas. Accreditation is defined as a (Joint Commission International. Available from <http://www.jointcommissioninternational.org> [24/09/ 2019]) “process in which an entity, separate and distinct from the health care organization, usually non-governmental, assesses the health care organization to determine if it meets a set of requirements (standards) designed to improve the safety and quality of care”. The aim of JC standards is to continuously enhance the safety and quality of patient care, to consistently guarantee a safe care environment, and to continually eliminate the level of risks to all patients and personnel (JCI Accreditation. Available from <http://www.wooridul.com/About/jci.jsp> [24/09/ 2019]).

Improving the Quality and Safety of Health Care for Every Patient Across the Globe



Seoul Wooidul Hospital,  
The First Specialized Hospital in Korea with JCI Accreditation

Figure 16: Joint Commission International (JCI) Standards

JCI has created a series of standards and accreditation programs specifically for health care services such as: “Hospitals” Ambulatory health institutions”, “Clinical Laboratory”, “Primary Care Centers” and “Medical Transport”. It has also created programs for clinical care certification like stroke treatment and care, cardiac care, joint replacement care etc. (JCI Accreditation. Available from <http://www.wooridul.com/About/jci.jsp> [24/09/ 2019]).

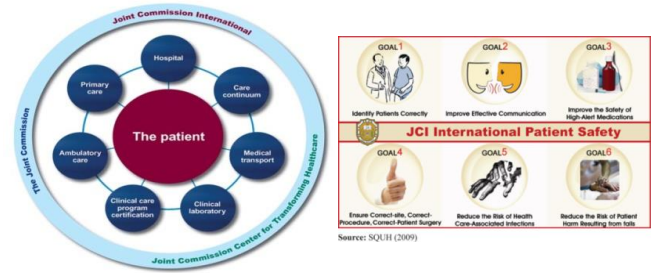


Figure 17: JCI Standards Components

The standard is decomposed in two categories: (1) patient care and (2) health care organizations. The Patient-Centered Standards is a notable example of the first category (JCI Accreditation. Available from <http://www.wooridul.com/About/jci.jsp> [24/09/ 2019], The Joint Commission Organization. Available from <http://www.jointcommissioninternational.org/The-Joint-Commission-Organization/> [24/09/ 2019]).



Figure 18: JCI Patient Safety and Care

Indicative example of the second JCI category are the Health care Organization Management Standards (JCI Accreditation. Available from <http://www.wooridul.com/About/jci.jsp> [24/09/ 2019], Joint Commission Resources. Available from <http://www.jcrlinc.com/> [24/09/ 2019]).



Figure 19: JCI Infection Control and Patient Safety

The Gold Standard of Approval® (New to Accreditation. Available from <http://www.jointcommissioninternational.org/New-to-Accreditation/> [24/09/ 2019]) provides universal respect to health care organizations from their patients, contributors, businesses and insurance companies for accomplishing highest level services for patient care of standard. During the last decade international standards committees improved and modernized the JCI standards for the assessment of patient safety and quality improvement. The survey process (New to Accreditation. Available from <http://www.jointcommissioninternational.org/New-to-Accreditation/> [24/09/ 2019]).

Accreditation/ [24/09/ 2019]) collects information required by the JCI standards throughout the whole organization. Based on this information there is a score calculation process of each JCI quantifiable component. The diagram below illustrates the JCI accreditation process timeline.



Figure 20: JCI Accreditation Process

The tracer methodology (New to Accreditation. Available from <http://www.jointcommissioninternational.org/New-to-Accreditation/> [24/09/ 2019]) is used in order to monitor and assess organizational performance improvement. JCI accreditation provides numerous benefits to organizations (JCI Ambulatory Survey Process Guide. Available from [http://webcache.googleusercontent.com/search?q=cache:2to5qnsFsRUJ:www.jointcommissioninternational.org/common/documents/ambulatory/ambulatory\\_survey\\_process\\_guide\\_2nded.pdf+&cd=2&hl=en&ct=clnk](http://webcache.googleusercontent.com/search?q=cache:2to5qnsFsRUJ:www.jointcommissioninternational.org/common/documents/ambulatory/ambulatory_survey_process_guide_2nded.pdf+&cd=2&hl=en&ct=clnk) [24/09/ 2019]). User experience for JCI benefits include: “providing competitive advantage”; “strengthening community confidence”; “assisting recognition from insurers”; “validating quality care to individuals”; “helping the organization to organize and strengthen their improvement efforts”; “enhancing staff education”; “improving risk management”; “facilitating staff recruitment”; and “promoting team building skills for staff”.

#### *Ambulatory Health Services Awards and Accreditation.*

Ambulatory health services (Ambulatory health services- <http://www.AHS/homepage> [24/09/ 2019].) is considered by the Abu Dhabi health Services Company (SEHA) to be the most important establishment in preventing, diagnosing and curing the society. It started operating in 2008 providing facilities and care centers in Abu Dhabi with clinics incorporating family medicine, obstetrics, pediatrics, and health screening services.

Staffed with the best health specialists and physicians, Ambulatory Health Services have launched a series of programs. A notable example is the ambulatory health service Kafu program called as – “We Care” that has appointed a large number of employees as “Customer Service Ambassadors” showing the program dedication to client

service excellence -a devotion that has been compensated with widespread industry recognition.

In 2012, the Ambulatory Health Service (AHS) became the first medicinal services establishment in the UAE to be awarded with the Diamond Sheikh Khalifa Excellence Award (SKEA). The same year it was also distinguished by SEHA as the best organization in organizational transformation in the implementation of the EFQM Excellence model. AHS hospitals also earned JCI accreditation in the medicinal services industry (Sheikha Khalifa Excellence Award. Available from <http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019])

#### *Ambulatory Health Services path into accreditation*

Two years prior to JCI accreditation AHS started preparing their organization for their assessment. The JCI Survey Process Guide and the JCI accreditation manual for Hospitals were studied and their directions and recommendations were followed. Selected employees were designated to go to the Annual JCI Practicum where they got trained in program management, benchmarking and the JCI “tracer” approach. All health professional staff were trained and assessed in JCI standards via the use of tests, lead training days with instructive stalls and incorporating informative content about JCI arrangements, gauges and necessities. For each JCI accreditation category a lead employee was assigned as well as a manager. In top management a board of JCI guiding trustees was created with support from executives, managers and key employees.

After the first year a team of three JCI surveyors comprising of a doctor, nursing officer and overseer performed an initial JCI assessment of the alignment of the work performed to JCI principles and requirements. They questioned key work force and examined JCI required reports and investigated the health facility premises and offices. The surveyors met top management and presented their findings and recommendations for improvement in the effort of achieving JCI accreditation.

Following these recommendations AHS achieved JCI accreditation in April 2012.

#### *IV. Application of GQC in AHS at Mafraq Hospital*

The major part of the AHS case study was carried out in Mafraq Hospital is located in Abu Dhabi. It is mainly responsible for the curative activities of the public hospitals and clinics of the Emirate of Abu Dhabi. It is a SKEA award-winning Hospital which is dedicated to high quality medical care services. In the following sections we will present the analysis of each GQC concept in AHS in Mafraq Hospital.

#### *GQC Concept: Leadership and Strategic Focus in SEHA*

SEHA requires documentation of vision, goals, objectives, mission and values. AHS vision was documented as: "Ambulatory health services will be distinguished as the social insurance supplier for patients, representatives, and medical practitioners". The vision is implemented by processes. The AHS quality proclamation is: "AHS furnish Quality health awareness with Integrity and Service Excellence in nature's turf".

#### *GQC Elements: Structure and Job Descriptions*

The AHS organization chart was reviewed and modified, job descriptions were also amended to be aligned with SEHA, JCI and SKEA requirements based on the best practices of health care quality initiatives. (Merry, M. & Crago, M., 2001 'The Past, Present And Future of Health care quality: Urgent need for innovative, external review process to protect patients', Patients and Understanding, p. 32.), (Donabedian, A., 1966, 'Evaluating the quality of medical care', Milbank Mem Fund.)

#### *GQC Concept: Leadership*

*For AHS leadership is engaged in program and project management and in a continuous interaction with representatives of stakeholders, society, customers and, partners. The JCI and SKEA committees continuously interact with*

- health management entities: reviewing key performance indicators
- Health regulatory entities.
- patients, families and visitors
- JCI and SKEA assigned staff: CEO, Chief medical Officer, Chief nursing staff, patient affairs manager and other executives who participate in taking care of patients' complaints and concerns.
- JCI and SKEA assigned staff involved in local, regional or international seminars and awareness campaigns.

#### *GQC Concept: Change Management*

AHS is an organization that has been through change management initiatives in SEHA, JCI and SKEA. These initiatives are required to be performed in a controlled and holistic manner otherwise outcomes and efforts might prove conflicting and contradictory. A Program Management office was set up to control all change management initiatives based on the GQC concepts. All changes were documented and a solid versioning information system was installed that keeps track of all updates of: processes, organizational structures, job descriptions, managerial systems, performance measurement systems, quality and standards etc. Without this type of system there would be a serious problem in change management. The

The Executive council Team meets on periodic basis with SEHA to understand the strategic objectives and changes that they need to implement on and then redirect the message it to the Senior Management and Leadership Council in order to reflect it on the annual Ambulatory health services business and action plan. Examples of internal changes include change in management (new CEO), new programs, structures, and JCI implementation.

#### *GQC Concept: Strategic Focus*

The AHS vision is created by a common team composed of members of the AHS Executive Team and SEHA senior executives. AHS strategy is focusing on its stakeholders and the fulfillment of their needs and demands. In the strategic plan stakeholders are divided into two categories:

- Primary: Patients, Employees, Visitors, Governmental entities
- Secondary: Media, Competitors, Commercial entities, alluding Doctors

The AHS JCI and SKEA executive team in cooperation with the strategic management department creates and monitors the strategic plan. AHS business objectives should be in alignment with SEHA set external priorities and critical success factors are directly linked to implemented-ongoing projects.

SEHA external priorities are analyzed based on the PEST methodology and are classified to:

- P – concentrating on **political** initiatives like: the Abu Dhabi 2030 and SEHA Strategic Plan) or **economic** factors like well known UAE Insurance private projects.
- S – concentrating on **social** factors related to community awareness that make people more knowledgeable on preventative health projects such as obesity, diabetes, breast cancer screening programs etc.
- T – for **technological** factors concentrating on UAE wide health related technological projects

The strategic plan has a five year duration with six monthly assessments and revisions based on five Service Level Agreements (SLA) agreed upon between AHS and: 1-SEHA SLA, 2-Steering Committee SLA, 3-Joint Service Review (JSR) SLA, 4-Hospital Management SLA and 5- Contract Management Unit (CMU) SLA.

#### *GQC Concept: People Focus – GQC Organizational Resources: People*

SEHA and AHS follow the requirements of the Abu Dhabi Health Authority (HAAD) which sets the



principles and regulations of health care related personnel. The Human Resources Management (HRM) department creates and monitors the HRM plan which includes clear directives with respect to recruitment, employee performance measurement, employee improvements in the forms of education-training, employee incentives, career paths etc. The recruitment process is based on the Personal Qualification Requirement (PQR) set by HAAD for health care services experts in 2006. HADD requirements are included in JCI and SKEA documents, processes, job descriptions etc.

The HRM plan describes all HRM processes for:

- Encouraging and supporting staff and group cooperation during change management: "Enthusiastic colleagues" is one of the center components of change management initiatives in AHS. Aggregation is essential for JCI successful implementation and in many cases requires multidisciplinary collaboration (Roberts, J. Coale, J. and Redman, R., 1987, 'A history of the Joint Commission on Accreditation of Hospitals', JAMA.)
- Improvement Recommendation Process: Recommendations could be submitted from employees, clients, departments or groups. The recommendation process describes the way a recommendation could be approved and materialized in a change management program or be rejected.
- Employee Motivation Process: In this process there is a clear step by step description of how benefits, bonuses and salary increases could be attributed to employees by their supervisors in their individual performance measurement plans.
- The Knowledge Management and Education process: Based on individual performance measurement plans AHS, via this process, invests on employee performance improvement. Investing in people means having a budget in place for employee participation in education and training both internal and external. Special budget is in place for ambulatory health practices benchmarking and practices education in cooperation with international institutions.
- Career Paths process: This process describes the way individual career paths are developed and linked to the improvement and education processes above. Based on the individual performance measurement plan if the employee achieves his/her targets then he/she will advance in the job description

ladder and the departmental hierarchy and will receive a salary increase.

Strategy, the aforementioned processes, project plans and HRM policies are communicated via internal intranet, notice boards, inner conveyance frameworks etc. An emiratization program has been launched to ensure development of local employees both internally and externally. AHS has built relations with Fatima Health Sciences College where all the local nurses get their education in the means of scholarship provision and setting up milk-grounds to attract nurses in AHS.

#### *GQC Concept: Partnerships and Societal Results*

AHS hospitals are constantly providing health care services that directly depend upon their suppliers-providers and direct outsourcing of even their core health care services. They sign contracts and agreements with a wide spectrum of conglomerations ranging from large-international health care providers to the National Corporation for Tourism & Hotels which that provides services for food and catering, the Tanzifco Emirates LLC., Abu Dhabi that provides services for cleaning and housekeeping, the Abu Dhabi National Hotels that provides laundry services, and New Cleaning EST that specializes on medical waste disposal services to guarantee the wellbeing of the wider community.

These service providers have to be quality certified and the quality of their services have to be assessed continuously by AHS with the use of monthly key performance indicators.

Recent research performed by the PA consulting group in 2012 showed that 48% of UAE nationals travel to Thailand for their health treatment. Another 13% is travelling to Germany and 11% to the UK. This research proved the very low appreciation of patients of 28% towards AHS in the UAE. Recent studies after the accreditation AHS in JCI standards and the achievement of SKEA award showed a drastic increase of this percentage reaching more than 70%. This was achieved via a public educational campaign about AHS and their direct effect over the society. The "Ask the pharmacist" campaign motivated people in being more aggressive towards illnesses and their cure. The "Hand Hygiene" campaign focused on flue reduction especially on epidemic cases. The "Dietician campaign" make the public aware of the benefits of healthy food and dietary routines.

#### *GQC Concept: Process Focus*

JCI accreditation standards are considered by the Ambulatory health services hospital as the framework to document, manage, improve and monitor processes in a systematic way. Core AHS processes

are categorized as "Patient-Centered" and "Health care organization management" (Classification in JCI standards chapters).

JCI processes incorporate HAAD and SEHA requirements. They also incorporate quality control checkpoints and some of them are dedicated to the JC accreditation quality management system like the quality assurance and continuous improvement processes.

Performance measurement is based primarily on patient assessment. Process cycle time reduction and activities simplification and elimination are always performance measurement and continuous improvement targets.

#### *GQC Concept: Customer Focus*

Customer Surveys on patient satisfaction are usually managed by SEHA and distributed at SEHA corporate level. These are assessed on a monthly basis with patient complaints being of first priority in case of mistreatment. The yearly expected patient JCI satisfaction target is more than 92%.

Apart from health care services facilities play a very important role in patient satisfaction and as consequence there is a constant need for improvement mainly focusing on the renovation of inpatient and outpatient areas, lab and operation rooms, accommodation etc. (Kanji, G & Asher, M., 1996, '100 methods for quality management', Sage Publications, London.).

#### *GQC Concept: Performance Measurement*

SKEA and JCI standards require organizational performance measurement in a holistic manner. AHS has developed a performance measurement system that complies with both SKEA and JCI requirements. SKEA completed its first performance measurement assessment in September 2011 with an overall score of 577.295 out of 1000. Based on this report several areas of improvement were identified and continuous improvement efforts were performed. Several reviews based on self-assessment and SKEA reassessments have dramatically improved the SKEA score in recent years.

### *V. Conclusions, Recommendations and Future Work*

We presented the application of the Glykas Quality Compass (GQC) in health care via a case study in Mafrq Hospital and the wider Ambulatory Health Services (AHS) establishment of Abu Dhabi also known as SEHA. We presented a literature survey of the four GQC categories, namely: Quality Philosophies, Methodologies, Standards, Excellence Awards. We then presented the use of these four categories in the health care sector with focus on the JCI standards and the SKEA excellence award. We then proceeded with the presentation of the

application of GQC in AHS by presenting an analysis of each GQC concept in AHS application of JCI standards and SKEA.

AHS has been JCI certified and was awarded the SKEA quality excellence award. Many useful findings have emerged via the application of GQC in AHS. The AHS executives and the employees involved in the JCI certification process and SKEA assessment became aware of the whole picture of quality management systems of GQC. They realized that although they are quite advanced in the two GQC categories of Quality Standards and Excellence Awards they have not progressed in the other two GQC categories of Total Quality Management and Quality Methodologies.

The slow progress in GQC Quality Management Philosophies Category and Total Quality Management in particular was also identified in both people enablers and people results of the SKEA EFQM assessment. The GQC analysis has concluded that an extensive effort has to be undertaken for quality management training to all employees. This need has resulted from the fact that JCI standards are concentrating on health care services standardization and they have some serious incompatibilities to standard quality management standards like ISO. The major problems stemming from these incompatibilities that need action are:

- immediate need for TQM training with special focus on quality management and quality control at the level of each individual employee
- non existent quality assurance process as there exists only JCI standards assurance

A recommendation to the above two points could be a decision of the AHS executives committee to commence a project on ISO certification as quite a lot of substantial work for process modeling and real time monitoring has already been in place in the AHS JCI standards system.

Many AHS continuous improvement projects have failed. This was clearly recorded in both JCI improvement recommendations by AHS employees as well as during SKEA analysis and assessment. GQC analysis also revealed the reason of these failures. The lack of continuous improvement success is mainly due to the lack of any initiatives in the second GQC category of quality methodologies. The main focus of these methodologies like six sigma and the EFQM radar methodologies is that of continuous improvement. So there is a need for further initiatives in AHS on the implementation of one of these methodologies with special focus on continuous improvement. GQC analysis recommended the use of Radar EFQM methodology as there is a clear link with the SKEA award principles that are also based on EFQM.

The application of GQC proved to be very successful and for one more case study as its results have been verified and validated and proved similar to previous SKEA assessment performed in AHS. GQC usefulness has been appreciated by the organization it was applied to (AHS) for both its accuracy and ease of implementation.

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#### References

190. Aquayo, R., 1991, *Dr. Deming: The American who taught the Japanese about quality*, 1<sup>st</sup> Ed, Fireside, New York, NY.
191. Berk, J. and Berk, S., 2000, 'Chapter 4 - Quality Measurement Systems: Where it all begins: Quality Management for the Technology Sector', Woburn: Butterworth-Heinemann.
192. Chirico-Post, J., Creech, D. and Stoelting, H., 1990, 'Generic screening as an integral part of quality management', *Am College Physicians Utiliz Rev*.
193. Chytas P. and Glykas M. (2011). A proactive balanced scorecard, *International Journal of Information Management*, Vol. 31, No.5, pp.460-468.
194. Chytas P., Glykas M. and Valiris G. (2008). A Proactive fuzzy cognitive balanced scorecard, *IEEE International Conference on Fuzzy Systems*, IEEE World Congress on Computational Intelligence, ISSN 1098-7584, 2008, ISBN 9781424418183, pp. 1331 – 1338.
195. Clancy CM, Farquhar MB, Sharp BA, 2005. 'Patient safety in nursing practice', *J Nurs Care Qual* Jul-Sep.
196. Davidson, E., 2001, 'Who's who in Canadian business', 21<sup>st</sup> Ed., University of Toronto Press, Canada.
197. De Mast, J. and Lokkerbol, J., 2006, 'An analysis of the Six Sigma DMAIC method from the perspective of problem solving', *International Journal of Production Economics*, Vol. 139, no 2, October, pp. 604-614.
198. Donabedian, A., 1966, 'Evaluating the quality of medical care', *Milbank Mem Fund*.
199. Evans, J. & Lindsay, W., 2008, 'The management and control of quality', Mason: Thomson South-Western, p. 13.
200. Evans, J.R & Lindsay M.W, 'The Management and Control of Quality', South-Western Cengage Learning, 8<sup>th</sup> edition, pp. 3-12,91-124.
201. Farner, S., 1996. 'Quality is still free: Making quality certain in uncertain times'. *Organizational Dynamics*, Vol. 25, no 2, Autumn 1996, pp. 89-90.
202. Friesen, M & Johnson, J., 1995, 'The success paradigm: Creating organizational effectiveness through quality and strategy', Quorum Publishers, Westport, CT.
203. Glykas, M., Valiris, G., Kokkinaki, A., & Koutsoukou, Z. (2018). Banking Business Process Management Implementation. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 6(1), 50-69. doi:10.4018/IJPMAT.2018010104
204. Glykas, M., & Johnichen, G. (2017). Quality and Process Management Systems in the UAE Maritime Industry. *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, 5(1), 20-39. doi:10.4018/IJPMAT.2017010102
205. Glykas, M., Bailey, O. H., Al Maery, M. O., & Al Maery, N. O. (2015a). Process and Quality Management in Vocational Education & Training (VET). *International Journal of Management Sciences and Business Research*. Vol-4, Issue 1, ISSN (2226-8235
206. Glykas, M. (2015b). Cluster Business Processes Management with 3D Immersive Environments. *International Journal of E-Entrepreneurship and Innovation (IJEEI)*, 5(2), 1-23. doi:10.4018/IJEEI.2015070101
207. Glykas, M. (2014). Fuzzy Cognitive Strategic Maps. In *Fuzzy Cognitive Maps for Applied Sciences and Engineering* (pp. 291-318). Springer Berlin Heidelberg.
208. Glykas M.(ed.), (2013a). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
209. Glykas M. (2013b). *State of the Art in Business Process Management*, in Glykas M.(ed.), (2013). *Business Process Management*, Berlin:Springer, pp.1-456. DOI: 10.1007/978-3-642-28409-0
210. Glykas M. (2013c). Fuzzy cognitive strategic maps in business process performance measurement, *Expert Systems with Applications*, pp1-14. (online: elsevier.com)
211. Glykas M., Pappa E., Giakoumis M., Voxaki V. (2013d). Managing Organizational



- Intellectual Capital, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp. 195-220, DOI: 10.1007/978-3-642-28409-0.
212. Glykas M., Plakoutsi A., Papadogianni G. (2013e). Performance Measurement in Business Process, Workflow and Human Resource Management, Glykas M. (ed.), in *Business Process Management*, Berlin : Springer, pp. 129-156, DOI: 10.1007/978-3-642-28409-0.
  213. Glykas M., Sezenias E., Farmakis A., Karagiannis G., Diagkou E. (2013f). A Holistic Business Performance Measurement Framework, in *Business Process Management*, pp.75-98, DOI: 10.1007/978-3-642-28409-0.
  214. Glykas M., Stakias G., Psoras M. (2013g). Fuzzy Cognitive Maps in Social and Business Network Analysis, Glykas M. (ed.), in *Business Process Management*, Berlin:Springer, pp.241-279, DOI: 10.1007/978-3-642-28409-0.
  215. Glykas M. (2012). Performance measurement scenarios with fuzzy cognitive strategic maps, *International Journal of Information Management*, Vol.32, No.2, pp-182-195.
  216. Glykas M. (2011a). Effort Based Performance Measurement in Business Process Management, *Knowledge and Process Management*, Vol. 18, No.1, pp 10-33. (online: wileyonlinelibrary.com)
  217. Glykas M. (2011b). Performance Measurement in Business Process, Workflow and Human Resource Management, *Knowledge and Process Management*, Vol.18, No. 4, pp 241–265 (online: wileyonlinelibrary.com)
  218. Glykas M. (ed.), (2010a). *Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications*, Berlin:Springer, pp. 1-427. DOI: 10.1007/978-3-642-03220-2
  219. Chytas P., Glykas M. and Valiris G. (2010b). Software reliability modeling using fuzzy cognitive maps, *Fuzzy Cognitive Maps*, Springer, Berlin, pp.217-230.
  220. Glykas M. and Chytas P.(2005a). Next generation of methods and tools for team work based care in speech and language therapy, *Telematics and Informatics*, Vol. 22, pp. 135–160. (online: sciencedirect.com)
  221. Glykas M. and Xirogiannis G. (2005b). A soft knowledge modeling approach for geographically dispersed financial organizations, *Soft Computing*, Vol.9, No. 8, pp-579-593.
  222. Glykas M. (2004a). Workflow and process management in printing and publishing firms, *International Journal of Information Management*, Vol.24, p.523-538. (online elsevier.com)
  223. Glykas M. and Chytas P.(2004b). Team work based care in speech and language therapy through web-based tools and methods, *Studies in health technology and informatics*, pp.343-354.
  224. Glykas M. and Chytas P. (2004c). Technological innovations in asthma patient monitoring and care, *Expert Systems with Applications*, Vol. 27, pp.121–131.
  225. Glykas M. and Chytas P.(2004d). Web-based Asthma Collaboration Management and Public Awareness, *Studies in health technology and informatics*, pp. 19-27.
  226. Glykas M. and Chytas P. (2004e). Technology assisted speech and language therapy, *International Journal of Medical Informatics*, Vol. 73, No.6, pp.529-541.
  227. Glykas M. and Valiris G. (1999). Formal methods in object oriented business modelling, *The Journal of Systems and Software*, Vol. 48, pp. 27-41.
  228. Glykas M. and Litinas N. (1995). From rapid growth to maturity : The need for holistic methodologies in business process redesign, *Proceedings of the 3<sup>rd</sup> European Conference on Information Systems, Athens/Greece*, June 1-3, p541.
  229. Glykas M., Holden T. and Wilhelmij P.(1994a). Modelling safety-critical organizational processes using the Agent Relationship Morphism Methodology, *Proceedings of the Twenty-Seventh Annual Hawaii International Conference on System Sciences*, IEEE, pp.693-702.
  230. Glykas, M. (1994b). *Agent Relationship Morphism Analysis* (Doctoral dissertation, PhD thesis, University of Cambridge).
  231. Glykas M., Holden T. (1994c). Enterprise Modelling And Process Design Techniques For Configuration Management, *Information Engineering Division*, Department Of Engineering, University Of Cambridge.
  232. Glykas M., Holden T., Wilhelmij P. and Reynolds B. (1994d). LIFETRACK: organisational modelling for safety-critical decision support, in *Technology and*

- Assessment of Safety-Critical Systems*, London:Springer, pp. 79-102.
233. Glykas M., Holden T. and Wilhelmij P. (1993a). Modelling the Collective Behaviour of Organisational Agents in the Petrochemical Industry Using the Agent Relationship Morphism Analysis (ARMA) Methodology, *Proceedings of the OOPSLA 93 Workshop on Modelling the Collective Behaviour of Organisational Agents*.
  234. Glykas M., Wilhelmij P. and Holden T. (1993b). Verifiable object oriented designs. in *Proceedings of the eleventh international conference on Technology of object-oriented languages and systems*, N.J.: Prentice-Hall, Inc., pp. 391-406.
  235. Glykas, M., Wilhelmij, P., & Holden, T. (1993c). Formal methods in object orientation. In *u Proceedings of the European Conference on Object Oriented Programming (ECOOP)* (Vol. 93, pp. 26-30).
  236. Glykas, M., Wilhelmij, P., & Holden, T. (1993d). Object orientation in enterprise modelling and information system design. In *COLLOQUIUM DIGEST-IEE* (Vol. 1, No. 7, pp. 8-8). IEEE.
  237. Glykas M. and Valiris G. (1992a). ARMA: a multi-disciplinary approach to BPR, *Knowledge and process management*, Vol.6, No. 4, pp.213-226.
  238. Glykas, M. M., Patel, U., Sutcliffe, A. G., Dodson, D. C., & Hackett, T. (1992b). Towards Interactive Explanation by 3D Visualisation. In *Proc. Workshop on Task Based Explanation. Research Laboratory of Samos, University of the Aegean*.
  239. Heaphy, M. & Gruska, G., 1993, '*The Malcolm Baldrige National Quality Award*', Addison Wesley Publishing Company, London.
  240. Hillmer, S. & Karney, D., 2001, '*In support of the assumptions at the foundation of Deming's management theory*', *Journal of Quality Management*, Vol. 6, No 2, pp. 371-400.
  241. Hoyle, D., 2003, '*ISO 9000: 2000: An A – Z guide, Vol.1*', Butterworth–Heinemann, London.
  242. Kanji, G & Asher, M., 1996, '*100 methods for quality management*', Sage Publications, London.
  243. Lang N., '*Issues in quality assurance in nursing*'. Paper presented at issues in evaluation research: an invitational conference, December 10-12, 1975. Kansas City, KS: American Nurses Association; 1976.
  244. Merry, M. & Crago, M., 2001 '*The Past ,Present And Future of Health care quality: Urgent need for innovative , external review process to protect patients*', *Patients and Understanding*, p. 32.
  245. Mortimer, D. & Mortimer, S., 2004, '*Quality and risk management in the IVF laboratory*', Cambridge University Press, New York, NY.
  246. National Quality Forum, 2006, '*Standardizing patient safety taxonomy: a consensus report*', Washington, DC.
  247. Roberts, J. Coale, J. and Redman, R., 1987, '*A history of the Joint Commission on Accreditation of Hospitals*', JAMA.
  248. Sanazaro, P. Mills, D., 1991, '*A critique of the use of generic screening in quality assessment*', JAMA.
  249. Stevens, R., 1971, '*American Medicine and the Public Interest*', New Haven, Conn, Yale University Press.
  250. Taghizadegan, S., 2006, '*Chapter 5 - Design for Six Sigma: Roadmap for Successful Corporate Goals: Essentials of Lean Six Sigma*', Burlington: Butterworth-Heinemann.
  251. Taghizadegan, S., 2006, '*Deming's Consideration of the 14 Points for Management: Essentials of Lean Six Sigma*', Burlington: Butterworth-Heinemann.
  252. Tourangeau AE, Cranley LA, Jeffs L, Feb 2006, '*Impact of nursing on hospital patient mortality: a focused review and related policy implications*', *Qual Saf Health Care*.
  253. Valiris G. Chytas P. and Glykas M. (2005), Making decisions using the balanced scorecard and the simple multi-attribute rating technique, *Performance Measurement and Metrics*, Vol. 6, No.3, pp.159-171.
  197. Valiris G. and Glykas M. (2004). Business analysis metrics for business process redesign, *Business Process Management Journal*, Vol.10, No.4, p.445.
  198. Valiris G. and Glykas M. (2000). A Case Study on Reengineering Manufacturing Processes and Structures, *Knowledge and Process Management*, Vol.7 No.1 pp.20-28.
  199. Valiris G. and Glykas M. (1999a). Critical review of existing BPR methodologies the need for a holistic approach, *Business Process Management Journal*, Vol.5, No.1, pp 65-86.
  200. Valiris G. and Glykas M. (1999b), Developing Solutions for Redesign: A Case Study in Tobacco Industry, *Evolution and*

*Challenges in System Development*,  
US:Springer, p.607.

201. Valiris G. and Glykas M. (1998) Management science semantics for object-oriented business modelling in BPR, *Information and Software Technology*, Vol. 40, No.8, pp. 417–433. (Online elsevier.com)
202. Wilhelmij P., Glykas M. and Holden T. (1993a). Formal Methods in Object Orientation, *Proceedings of the European Conference on Object Oriented Programming (ECOOP)*, Vol. 93, pp.26-30.
203. Wilhelmij P., Glykas M. and Holden T. (1993b). Object Oriented Information Systems Development, in *Proceedings of the 4th Hellenic Conference*.
204. Xirogiannis G., Chytas P., Glykas M. and Valiris G. (2008), Intelligent impact assessment of HRM to the shareholder value, *Expert Systems with Applications*, Vol.35, No.4, pp. 2017-2031.
205. Xirogiannis G. and Glykas M. (2007). Intelligent modeling of e-business maturity, *Expert Systems with Applications*, Vol.2, No.2, pp.687-702.
206. Xirogiannis G., Glykas M. (2004a). Fuzzy casual maps in business modeling and performance-driven process re-engineering, in *Methods and Applications of Artificial Intelligence*, Berlin:Springer, pp.331-341, DOI: 10.1007/978-3-540-24674-9\_35
207. Xirogiannis G. and Glykas M. (2004b). Fuzzy cognitive maps in business analysis and performance-driven change, *IEEE Transactions on Engineering Management*, Vo. 51, No.3, pp.334-351.
208. Xirogiannis G., Glykas M. and Staikouras C. (2004c). Fuzzy cognitive maps as a back end to knowledge-based systems in geographically dispersed financial organizations, *Knowledge and Process Management*, Vol. 11, No.2, pp.137-154.
209. Xirogiannis G., Stefanou J. and Glykas M. (2004d). A fuzzy cognitive map approach to support urban design, *Expert Systems with Applications*, Vol.26, No.2, pp. 257-268.

#### Internet References

5. Abu Dhabi Health Services Company - SEHA. Available from:

<http://www.seha.ae/SEHA/EN/Pages/Home.aspx>. [24/09/ 2019]

6. Accreditation & Certification Programs/ Available from <http://www.jointcommissioninternational.org/accreditation-programs/> [24/09/ 2019]
7. Ambulatory health services- <http://www.AHS/homepage> [24/09/ 2019].
8. Australian Business Excellence Awards. Available from [http://www.saiglobal.com/Improve/Awards/BEA\\_Overview.htm](http://www.saiglobal.com/Improve/Awards/BEA_Overview.htm) [24/09/ 2019]
9. Canadian Framework for Business Excellence. Available from <http://www.nqi.ca/en/knowledge-centre/products-and-tools/canadian-framework-for-business-excellence2> [24/09/ 2019]
10. Cohen, Phil, *Deming's 14 points*. Available from <http://www.hci.com.au/hcisite2/articles/deming.htm>. [24/09/ 2019].
11. Continuous Quality Improvement through PDCA and DMAIC Cycles. Available from <http://leanman.hubpages.com/hub/Continuous-Quality-Improvement-through-PDCA-and-DMAIC#> [24/09/ 2019].
12. Deming's 14 points. Available from <http://2.bp.blogspot.com/-oA88yzreYSo/TsTyZarUC4I/AAAAAAAAAYs/f-9DNYxHR6I/s1600/Deming%2527s+14+Points.jpg> [24/09/ 2019]
13. Design for Six Sigma - Symbol Business Improvement. Available from <http://www.symbolbv.com/en/design-for-six-sigma.html> [24/09/ 2019].
14. DMAIC – the definition of DMAIC from Wikipedia, The Free Encyclopedia. Available from <http://en.wikipedia.org/wiki/DMAIC>. [24/09/ 2019].
15. DMAIC Tools, Six Sigma Training Resources. Available from <http://www.dmaictools.com/>. [24/09/ 2019].
16. Dr. Deming's Management Training. Available from <http://www.dharma-haven.org/five-havens/deming.htm>. [24/09/ 2019].
17. Easy Fishbone Diagrams. Available from [http://www.12manage.com/methods\\_ishikawa\\_a\\_cause\\_effect\\_diagram.html](http://www.12manage.com/methods_ishikawa_a_cause_effect_diagram.html) [24/09/ 2019].
18. Framework – the definition of framework from WhatIs.com. Available from



- <http://whatis.techtarget.com/definition/frame-work> [24/09/ 2019].
19. ISO - International Organization for Standardization. Available from <http://www.iso.org/iso/home.html>. [24/09/ 2019].
  20. JCI Accreditation. Available from <http://www.wooridul.com/About/jci.jsp> [24/09/ 2019]
  21. JCI Ambulatory Survey Process Guide. Available from [http://webcache.googleusercontent.com/search?q=cache:2to5qnsFsRUJ:www.jointcommissioninternational.org/common/documents/ambulatory/ambulatory\\_survey\\_process\\_guide\\_2nded.pdf+&cd=2&hl=en&ct=clnk](http://webcache.googleusercontent.com/search?q=cache:2to5qnsFsRUJ:www.jointcommissioninternational.org/common/documents/ambulatory/ambulatory_survey_process_guide_2nded.pdf+&cd=2&hl=en&ct=clnk) [24/09/ 2019]
  22. Joint Commission – A definition from Wikipedia, the free dictionary. Available from [http://en.wikipedia.org/wiki/Joint\\_Commission](http://en.wikipedia.org/wiki/Joint_Commission) [24/09/ 2019]
  23. Joint Commission International. Available from <http://www.jointcommissioninternational.org> [24/09/ 2019]
  24. Joint Commission Resources. Available from <http://www.jcrinc.com/> [24/09/ 2019]
  25. Juran's Trilogy. Management Science & Innovation. Available from <http://msi6.com/MSI6/QualityZone/QzoneJuranTrilogy.aspx> [24/09/ 2019].
  26. Lean Six Sigma – the definition from Wikipedia, the free encyclopedia. Available from [http://en.wikipedia.org/wiki/Lean\\_Six\\_Sigma](http://en.wikipedia.org/wiki/Lean_Six_Sigma) [24/09/ 2019]
  27. New to Accreditation. Available from <http://www.jointcommissioninternational.org/New-to-Accreditation/> [24/09/ 2019]
  28. Philosophy – the definition of philosophy from THE FREE Dictionary, Encyclopedia and Thesaurus. Available from: <http://www.thefreedictionary.com/philosophy>. [24/09/ 2019].
  29. Poka Yoke (Mistake Proofing). Available from <http://www.siliconfareast.com/pokayoke.htm> [24/09/ 2019].
  30. Quality in Practice. Available from <http://qualitypractice.blogspot.ae/2010/02/tug-of-war-customer-satisfaction-vs.html> [24/09/ 2019].
  31. Quality Management Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/Quality\\_management](http://en.wikipedia.org/wiki/Quality_management). [24/09/ 2019].
  32. Quality Management System – the definition of Quality Management System from BusinessDictionary.com. Available from <http://www.businessdictionary.com/definition/quality-management-system-QMS.html>. [24/09/ 2019].
  33. Ron Kurtus, 'Basic Principles of Total Quality Management (TQM)'. Available <http://www.school-for-champions.com/tqm/principles.htm>. [24/09/ 2019].
  34. Sheikh Khalifa Excellence Award. Available from <http://www.teraquality.com/awards/regional/903-sheikh-khalifa-excellence-award.html> [24/09/ 2019]
  35. Six Sigma Material. Available from <http://www.six-sigma-material.com/DMAIC.html>. [24/09/ 2019].
  36. SMED; Shigeo Shingo's Single Minute Exchange of Die. Available from <http://leanman.hubpages.com/hub/SMED> [24/09/ 2019].
  37. The EFQM Excellence Model. Available from: <http://www.efqm.org/en/tabid/132/default.aspx>. [24/09/ 2019].
  38. The Joint Commission Organization. Available from <http://www.jointcommissioninternational.org/The-Joint-Commission-Organization/> [24/09/ 2019]
  39. Timeline of Changing Quality Systems. Available from <http://math.kennesaw.edu/~vkane/SixSigmaMaterials/QualityTimeline.pdf> [24/09/ 2019].
  40. W. Edwards Deming Article from Wikipedia, The Free Encyclopedia. Available from [http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming). [24/09/ 2019].