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Faculty of Engineering
Department Of Architecture

Integrating Value Engineering and Facility Management as an Approach to Face Risks

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DEDICATION

I dedicate this thesis to...

My Grandmother's soul...

My loving, caring, supportive, and great "Mother" who has never left my side... with a very special feeling of gratitude for her... for her kind heart and beautiful smile...

My supportive and loving "Father" ...

My very special, cheerful and loving "Sister"...

And

All my loving Friends and Everyone who supported me and helped me through the way of this success...

Success is only by Allah...



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Abstract

This research is concerned with a main problem that is demonstrated in: "The absence of a comprehensive tool that is capable of facing risks and uncertainties problems through building life cycle"; where ignoring risks during any phase through building life cycle leads to the evolution of various problems such as, (increasing cost, low space performance, lack of design efficiency, demolition during construction phases or after operation ... etc.)

The research focuses on Public Service Building, which is considered a very important type of projects that serve hundreds of people every day whilst costing millions to be built. It also highlights the need for integrating value engineering and facility management to provide a tool to face risks through building life cycle. The main concern is to avoid increasing cost, low space performance, low design efficiency, demolition during construction phases or after operation ... etc.

The thesis aims at introducing an approach through a tool and coherent aspect to face risks and uncertainties that face the building throughout its life cycle by integrating Value Engineering and Facility Management. The research illustrates the importance of integrating Facility Management and Value Engineering and clarifies the problems and the risks which may face the building through its life cycle. It also aims at improving the ability of facing risks through pre schematic phase, construction phase, testing and commissioning and operation and maintenance phases in addition to achieving best quality and avoiding problems through building life cycle.

The objective of this thesis is fulfilled through the following:

- *The Theoretical Background* which discusses the evolution of risks throughout the building life cycle and how to face these risks by integrating Facility Management and Value Engineering. The Theoretical Background is covered in chapters one and two.

- *The Analytical Study* which analyses some projects, evaluates them, assess the role of correlating VE and FM, and points out the conclusions and the recommendations of the study. The Analytical study is covered in chapters three and four.

The thesis contains four chapters and the conclusion as follows:

Chapter One: Introducing the concepts of Both Value Engineering and Facility Management:

It deals with the definitions of Facility Management and Value Engineering and their role through building life cycle. Chapter one focuses on the most comprehensive definitions of both value engineering and facility management, it also stood on the main common points, the involved tasks and the best phases of applying and integrating both tools to achieve the required targets of facing risks and adding value to the building. The chapter ends with a simple comparison between VE and FM and points out and illustrates the main common points between the two approaches. The chapter concludes that VE and FM are two approaches with common targets and six integrated parameters, where the both approaches aim at saving time and effort, facing risks and problems and adding value to a project. In order to achieve the previously mentioned targets, both VE and FM shall be applied through the whole life cycle of a building starting from early design phases to provide better solutions and results in addition to avoiding the evolution of uncertainties problems or unplanned risks.

Chapter Two: Risks Incurred in the Design and Implementation of Service Buildings:

This chapter defines and highlights different types of risks that may face a building during its life cycle starting from the design phase till the operation and maintenance phase. It Examines and analyzes some public service buildings and highlights the different types of risks and problems that faces the buildings through different phases due to the lack of understanding to the FM and VE roles and responsibilities which can have a negative impact on projects,

especially in terms of both budget and value. Chapter two focused on illustrating the differences between in-house and outsourced services and the risks that may occur as a result of depending on in-house services instead of outsourcing. The chapter ends with highlighting the percentages of different types, phases and causes of risks that may face a building during different phases through its life cycle. It concludes that approximately all risks can be easily controlled in the same phase of evolution in case of applying the FM approach. The severity of risk and the ability of controlling it differ from one project to another according to the phase of evolution, the consequences and the degree of preparedness to face the problem.

Chapter Three: The Status of Applying Facility Management:

The chapter's target is to clarify and determine the application status of facility management both nationally and internationally. This is achieved through a comparative analysis between the services provided by FM companies in Egypt and the international FM companies in addition to a questionnaire that was distributed among general construction projects managers, FM practitioners and academicsetc. who are involved in the field of FM. The target of the questionnaire was to gather data and to conclude the current status and progress of FM in Egypt; where five main aspects to evaluate the performance of FM provided services were identified; vision, efficiency, flexibility, quality and scope of services. The chapter concludes two time lines that represent the progress of FM codes, status and provided services nationally and internationally. The chapter also presents a check list that clarifies the percentages of FM services that are provided by the national FM companies compared to that provided by the international companies and as determined by the “International Facility Management Association”.

Chapter Four: Case Study:

It analyzes a case study “Dar project” and evaluates it to assess the role of integrating Facility Management and Value Engineering on facing risks through

the building life cycle. Chapter four stood on all the details of applying facility management and value engineering on Dar project. It focused on the effect of applying both tools on solving the different risks that faced the project in addition to achieving the aim of the previously mentioned aspects (vision, efficiency, flexibility, quality and scope of services) by applying some agreed KPIs that were determined in a general contract which was signed with a FM supervision service provider to manage and supervise the service providers selected by Dar in order to fulfill the scope and performance of all FM services to the highest level and achieve maximum satisfaction to the users.

Conclusions and Recommendations:

The results of both theoretical and analytical studies are presented and compared to the research hypotheses to prove them and the recommendations are pointed out.

Author's Declaration

I the undersigned, hereby declare that this dissertation submitted to Ain Shams University, Faculty of Engineering, Department of Architecture; is my original work and no part of it was submitted to any other institution or university to achieve any degree and that all the references to the work of other authors have been duly acknowledged.

Samar El Motasem

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List of Acronyms

NFMA: National Facility Management Association

IFMA: International Facility Management Association

CEN: European Committee for Standardization

BIFM: British Institute of Facility Management

SAFMA: South African Facility Management Association

SAVE: Society of American Value Engineers

CRM: Customer Relationship Management

CAFM: Computer Aided Facility Management System

IMS: Information Management System

KPIs: Key Performance Indicators

O & M: Operation and Maintenance

FM: Facility Management

VE: Value Engineering

Introduction

For a long period of time, buildings have been depending on In-House services strategy to manage their non-core services and face any evolving risks and problems especially through operation and maintenance phase disregarding the main causes of risks or studying its relation to early project phases like design phase or testing and commissioning phase. Nowadays, most buildings depend on outsourcing in order to achieve greater budget flexibility and control and focus their concentration, time and resources to their core services⁽¹⁾.

Problem Definition

This research is concerned with a main problem that is demonstrated in: "The absence of a comprehensive tool that is capable of facing risks and uncertainties problems through building life cycle"; where ignoring risks during any phase through building life cycle leads to the evolution of various problems such as, (increasing cost, low space performance, lack of design efficiency, demolition during construction phases or after operation ... etc.)

Scope of Study and Limitations

The research focuses on Public Service Building, which is considered a very important type of projects that serve hundreds of people every day whilst costing millions to be built, it also highlights the need for integrating value engineering and facility management to provide a tool to face risks through building life cycle. The main concern is to avoid increasing cost, low space performance, low design efficiency, demolition during construction phases or after operation ... etc.

⁽¹⁾ Based on a survey and an open discussion that was conducted with some FM practitioners.

Main Objective

The research aims at introducing an approach through a comprehensive tool and coherent aspect to face risks and uncertainties that face the building throughout its life cycle by integrating Value Engineering and Facility Management.

Secondary Objectives

- Illustrating the importance of integrating Facility Management and Value Engineering during all building phases.
- Clarifying the problems and the risks which may face the building through its life cycle.
- Improve the ability of facing risks through pre schematic phase, construction phase testing and commissioning and operation and maintenance phases.
- Achieving best quality and avoiding problems through building life cycle.

Research Hypotheses

- Risks during building life cycle can be faced by integrating Value Engineering and Facility Management.
- Integration between Facility Management and Value Engineering might produce a coherent aspect and an effective tool to face risks and solve problems throughout building life cycle.

Research Methodology

The objective of this thesis is fulfilled as follows:

- The Theoretical Background; it discusses the evolution of risks throughout building life cycle and how to face these risks by integrating Facility Management and Value Engineering.
- The Analytical Study; it analyses some projects, evaluates them, assess the role of correlating V.E. and FM, and points out the conclusions and the recommendations of the study.

Research Structure

Table (0-1): The Thesis Structure

Chapters	Secondary Objectives	Main Objective
Chapter One: Introducing the concepts of Both Value Engineering and Facility Management	Determines the role of Facility Management and Value Engineering and their role through building life cycle	Introducing an approach through a tool and coherent aspect to face risks and uncertainties that face the building throughout its life cycle by integrating Value Engineering and Facility Management
Chapter Two: Risks Incurred in the Design and Implementation of Service Buildings	Examines and analyzes some public service buildings and highlights the risks and problems facing them through different phases	
Chapter Three: The Status of Applying Facility Management	Discusses and judges the status of facility management and its effect on the life cycle of the buildings	
Chapter Four: Analysis of Case Study, Conclusion & Recommendations	Analyzes some projects and evaluates them to assess the role of the integrated tool (FM &VE) on facing risks through buildings life cycle. The chapter also reviews the conclusions and the recommendations of the study, where the results of both theoretical and analytical studies are presented and recommendations are pointed out	

Literature Review

The literature review summarizes the studies which are concerned with the relation between Facility Management, Value Engineering and Architectural Design highlighting the main issues in these researches and how the thesis would benefit from each study.

The literature review is divided into two parts **A & B**:

- **Part A:** Researches concerning the relation between Facility Management and Architectural Design.
- **Part B:** Researches concerning the relation between Value Engineering and Architectural Design.

Part A: Researches Concerning the Relation between Facility Management and Architectural Design

In a study titled "Facility Management as a tool for improving architectural design Efficiency, an approach to assess space performance in office buildings"⁽¹⁾; the author aimed at improving the architectural design efficiency of the work space environment through the integration of the facility management practice into design phases of office buildings. The study emphasized the need for supporting designers with facility management capabilities, especially through the architectural design phase, focusing on the workspace performance in office buildings, as the office space type is typically a flexible environment that integrates technology, comfort and safety, and energy efficiency to provide a productive, cost – effective and aesthetically pleasing working environment.

The study demonstrated the characteristics of designing space performance and illustrated the importance of the integrated relation between design process and

⁽¹⁾ Helal Doaa, Facility Management as a Tool for Improving Architectural Design Efficiency, thesis submitted at Helwan University, 2008.

facility management. It clarified the common problems that affect the performance of workspace environment and established method for designers considering facility management practice to assess the performance of the workspace environment.

The study didn't refer to the effects of applying facility management through other phases like construction phase; in addition, it didn't mention how applying facility management affects the value of the building and its life cycle cost.

In a study titled "Facility Management: A Paradigm for Expanding the Scope of Architectural Practice"⁽¹⁾; the authors discussed the challenging interrelations between the contemporary architectural practice and the expanding facility management (FM) sector to highlight the current development of FM concepts and strategies. This will help in the present study since its target is to support and clarify the concepts of facility management and to help in improving its role in projects. The systematization of local real-estate from the FM's point of view includes three different groups: the ones with integrated FM strategy in the early design stage, the ones with imported FM strategy from international firms, and the last incomparably largest group of objects that desperately need an appropriate FM concept. This may help in picking up and categorizing the case studies of the present study.

The paper clarified the two-way interrelation between architectural practice and the FM sector, while the consideration of the FM concepts becomes inevitable during the period of building design, the architectural expertise is needed during the exploitation of the designed buildings. The paper also highlighted the importance of information that comes as feedback from facility managers in the post-occupancy period which cannot be ignored by architects. The paper clarified the reason that architectural practice plays a leading role in establishing

⁽¹⁾ Mirjana Devetakovic and Milan Radojevic, Facility Management: A Paradigm for Expanding the Scope of Architectural Practice.

standards for operation, maintenance and protection of architectural objects, extending its scope of activities to the FM area.

Part B: Researches Concerning the Relation between Value Engineering and Architectural Design

"The Impact of the Value Engineering on Decision Making and the Development of the Construction Industry"⁽¹⁾ is a study that provided an organized evaluation tool in the architectural design hand, which is capable of evaluating the design alternatives, avoiding the individual intuition and achieve optional design decisions.

The study scope covered the design process, its standard phases and theories from the beginning to the end. It developed a design/value integrated system called "Value Based and Design System", with which the design alternatives are evaluated against value and cost in a parallel procedure to achieve design objectives and optimum solution was presented. The evaluation technique highlighted the benefits of implementing value engineering in early design stages and investigated the impact of integrating the value engineering approach with the architectural design process in early project life cycle in Egypt.

The study was beneficial in determining the scope of the present thesis where pre-schematic phase was chosen to be one of the three chosen studied phases for its impact and positive or negative effect on the building life cycle.

"Value Engineering As an Approach for Designing the Public Buildings in Egypt" Case Study: Office Buildings"⁽²⁾ is a study that established a comprehensive view of a strategy and an approach that doesn't consider the cost element alone, but deals with it as a component of an integrated system that

⁽¹⁾ Amr Hassan M. Hassan, The Impact of the Value Engineering on Decision Making and the Development of the Construction Industry.

⁽²⁾ Waseef, Ahmed Abd El Aziz Abd El Fatah, Value Engineering as an approach for designing the public buildings in Egypt, case study: Office Buildings.

produces a balanced working environment, spaces and buildings. It presented the design bases for office buildings to attain a working environment which is compatible with present needs in order to solve the office building problems and help decreasing the costs of construction.

The determination of the scope of the present thesis was generally affected by this study where pre-schematic phase was chosen to be one of the three chosen studied phases for its impact on building life cycle as the study concentrated on design phase and suggested a design approach to upgrade the performance in office buildings and to specify the design bases for the relationship between the functional, environmental and psychological needs. The study also concentrated on office building as a case study while there is a lack in the field of studying public service buildings.

A study titled "Value Engineering For the Sustainable Construction Industry"⁽¹⁾; aimed at defining the appropriate value engineering for the construction industry of the developing countries – the case of Egypt – by addressing the topics of the environmental economy instead of traditional economy; so one can consider the social and environmental costs during the estimation of the project life cycle and by generating a value engineering check list to be used for the evaluation and comparing alternatives for a construction project. The study analyzed the construction industry as an open system and defined its harmful environmental effects during the whole life cycle of the construction project, taking into consideration the construction waste as a main problem.

The present thesis benefited from this study as it concerned the construction industry in Egypt and its relation to the local circumstances, the environmental legislations and the socioeconomic of the country. It also illustrated that the life cycle cost of the project can be optimized by including the social and environmental costs. The study presented a Valued Engineering check list

⁽¹⁾ Safwat Sadek Abdel Hameed, Naglaa, Value Engineering for the sustainable construction industry

which will help in the present thesis while evaluating and comparing construction alternatives.

The paper titled "Challenges Facing Organizing and Practice of Value Engineering"⁽¹⁾; discussed the status of Value Engineering in the Kingdom of Saudi Arabia and the problems that may face it due to the circumstances, the conditions and the changes all over the country. The paper aimed at searching the challenges and obstacles that may face the regulations and practice of value engineering by viewing the real situation of Value Engineering including advantages and disadvantages, then declaring the new changes and the adequate regulations to solve them using a good system and a professional practice for value studies to solve and amend the problems which may happen.

The present thesis benefited from both the local and international experiences in this scope and the way of defining the challenges and problems facing the regulation and the practice of value engineering. It also benefited from the introduced adequate solutions for these obstacles and difficulties and the recommendations and the suggestions which should be considered while establishing the regulations and standards concerning practicing and implementing value engineering on all types of projects.

⁽¹⁾El Khoayter, Ali Mohamed, Challenges facing organizing and practice of value engineering, 2005

Concluding Remarks

From the previous survey, the following points can be concluded:

- There is a lack of studies discussing the practice of facility management in general and its relationship with value engineering in particular.
- The phases affecting a building life cycle and value are: pre-schematic phase, construction phase, testing and commissioning phase and post occupation phase. Through the mentioned phases most risks and problems may take place due to lack of data or accumulation of mini problems, these problems become more costly to be fixed (in terms of both time and money) through post occupation phase than that during testing and commissioning phase, and more costly to be fixed during testing and commissioning phase than during construction phase and so on. And this means that discovering a problem or risk through early phases will for sure help in solving it in a better way without affecting negatively on the late project phases.
- Most of researches and studies concentrate on office buildings while there is a lack in the field of public service buildings.
- The lack of basic understanding of facility management concepts and role is common for the developing countries and that is why the architectural practice plays a leading role in establishing standards for maintenance and protection projects.

Chapter One	Structure of Chapter One
<p>Introducing the concepts of Both Value Engineering and Facility Management</p>	<p>1.1 The Concept of Facility Management</p> <p>1.1.1 Historical Background</p> <p>1.1.2 The Facility Management Equation</p> <p>1.1.3 Tasks Involved in Facility Management</p> <p>1.1.4 The Practice of Facility Management Worldwide</p> <p>1.2 The Concept of Value Engineering</p> <p>1.2.1 Historical Background</p> <p>1.2.2 The Value Equation</p> <p>1.2.3 Tasks Involved in Value Engineering</p> <p>1.2.4 The Practice of Value Engineering Worldwide</p> <p>1.3 Conclusion of Chapter One</p>

Chapter One

Introducing the Concepts of Both Facility Management and Value Engineering

The first step to introduce a comprehensive tool that integrates both value engineering and facility management is to know the concept, definition and the history of each of them. This chapter deals with the most important definitions, concepts, involved tasks and phases of application of both approaches. The chapter ends with a simple comparison between VE and FM and points out and illustrates the main common points between the two approaches.

1.1 The Concept of Facility Management

Facility Management is defined in many ways according to its scope and responsibilities from the point of view of different FM associations, institutes and organizations. The most comprehensive and integrated definition is that described by "The International Facility Management Association" (*IFMA*).

FM According to the Facility Management Association (IFMA)

FM is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process, and technology⁽¹⁾. According to IFMA, the scope of Facilities Management covers real estate, planning, budgeting, space management, interior planning, interior installation, architecture and engineering services and building maintenance and operation;

FM According to the European Committee for Standardization (CEN) and approved by BSI British Standards

⁽¹⁾ Mc Graw Hill, Facility Design and Management Handbook. Downloaded from Digital Engineering Library @ McGraw-Hill (www.digitalengineeringlibrary.com) Copyright © 2004 The McGraw-Hill Companies.

Facility management is the integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities⁽¹⁾.

FM According to the British Institute of Facility Management (BIFM)

BIFM has formally adopted the definition of FM provided by (CEN): Facilities management is the integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities⁽²⁾.

FM According to the South African Facility Management Association (SAFMA)

FM is an enabler of sustainable enterprise performance through the whole life management of productive workplaces and effective business support services⁽³⁾.

1.1.1 Historical Background

In the early 1970s, a move toward using systems furniture and the introduction of computer terminals into the workplace helped set the evolutionary course of facility management (FM). At that time, there was no organization that focused on providing information to manage the office environment. The first step toward the formation of a more specialized organization occurred in December 1978 when Herman Miller Research Corp. hosted a conference; “Facility Influence on Productivity,” in Ann Arbor, Mich. USA⁽⁴⁾. This conference brought together the three founders of IFMA. George Graves of Texas Eastern Transmission Corp., Charles Hitch of Manufacturer’s Bank in Detroit and David

⁽¹⁾ Facilities Management Introduction.BIFM. <http://www.BIFM.org.uk/bifm/about/facilities> Last Accessed: 24-8-2013

⁽²⁾ Facilities Management Introduction.BIFM. <http://www.BIFM.org.uk/bifm/about/facilities> Last Accessed: 24-8-2013

⁽³⁾ The South African Facility Management Association.SAFMA. <http://www.SAFMA.co.za/> Last Accessed: 24-8-2013

⁽⁴⁾ <http://www.IFMA.org/about/about-ifma/history> Last Accessed: 29-6-2013

Armstrong of Michigan State University voiced a need for an organization comprised of facility professionals from private industry⁽¹⁾.

In May 1980, Graves hosted a meeting in Houston to establish a formal organizational base for a facility management association. By the end of the meeting, the National Facility Management Association (NFMA) had a constitution, bylaws, temporary officers and plans to expand nationally. At the first NFMA meeting in October 1980, there were 47 participants — 25 were direct members of the association. The attendees from Houston helped establish the first chapter and committed to host the second annual national conference. Shortly after the 1981 conference, the name was changed to the International Facility Management Association to accommodate a growing Canadian membership⁽²⁾.

1.1.2 The Facility Management Equation:

The FM target is ensuring the functionality of the built environment by integrating certain responsibilities such as, people, places, processes and technologies, so, it should be applied through the whole building life cycle starting from early design phases in order to achieve the optimum results, avoid any problems and save time, effort and money.

Three basic elements provide a measure of successful FM to the user: people, place and process as shown in figure (1-1). These elements can be interpreted by the facility management equation as follows:

$$FM = (People + Place + Process)$$

Equation (1-1): The FM Equation

⁽¹⁾ <http://www.IFMA.org/about/about-ifma/history> Last accessed: 29-6-2013

⁽²⁾ <http://www.IFMA.org/about/about-ifma/history> Last Accessed: 29-6-2013

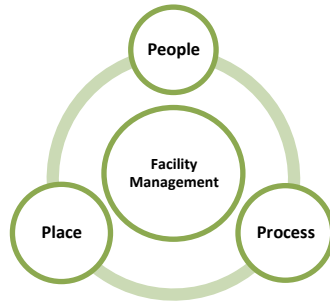


Figure (1-1): FM Components According to the Facility Management Association after 1970

Source: Mc Graw Hill, Facility Design and Management Handbook

Where:

- **The People:** The users of the building.
- **The Place:** The efficiency of the building spaces.
- **The Process:** Operating the building successfully based on the users' requirements.

The users' satisfaction (People) regarding a building is the most important indicator for how successfully the building is being processed (Process) and how efficiently the place is (Place). Achieving the required rates of satisfaction depends on knowing those users' requirements and considering them during early project phases. Ignoring the users' requirements during early phases will have a negative effect on the efficiency of the work place. It will also have negative sequences on processing the building especially in terms of operations budget.

1.1.3 Tasks Involved in Facility Management

Good applied FM depends on researches, organized collected data and a clear facility master plan to help the facility manager conducting the business

professionally⁽¹⁾. Table (1-1) highlights and clarifies the main 16 function of FM to facilitate studying and applying it successfully.

The first three rows in table (1-1) clarify the three target study phases and prove the direct relation between facility management and value engineering as follows:

- Architectural Engineering Planning and Design: this function proves that FM should be applied through *pre-schematic phase*.
- Construction Project Management: this function proves that FM should be applied through *construction phase*.
- Operations, Maintenance and Repair: this function proves that FM should be applied through *post occupation phase*.
- Budgeting, Accounting, and Economic Justification: this function proves and highlights the direct relation between facility management and value engineering.

Table (1-1): Tasks involved in facility management

Tasks involved in Facility Management as mentioned in "The Facility Management Handbook"	Equivalent Chosen Study Phases and proof of the direct relation between Facility Management and Value Engineering
Architectural Engineering Planning and Design	FM should be applied through <i>Pre-Schematic Phase</i>
Construction Project Management	FM should be applied through <i>Construction Phase</i>
Operations, Maintenance and Repair	FM should be applied through <i>Post Occupation Phase</i>
Budgeting, Accounting and Economic Justification	There is a direct relation between <i>FM & VE</i>
Sustainability	_____
Real Estate Acquisition and Disposal	_____
Workplace Planning, Allocation and Management	_____
Facility Planning and Forecasting	_____
Management of the Organization	_____

⁽¹⁾ Based on open discussion with some FM managers and practitioners

Tasks involved in Facility Management as mentioned in "The Facility Management Handbook"	Equivalent Chosen Study Phases and proof of the direct relation between Facility Management and Value Engineering
Lease Administration	_____
Technology Management	_____
Facility Emergency Management	_____
Security and Life Safety Management	_____
General Administrative Services	_____
Space Planning Allocation and Management	_____
Move, Add, Change (MAC) Management	_____

Source: *The Facility Management Handbook, 3rd edition*

IFMA described forty one responsibilities of FM under eight headings; Maintenance Operations, Administrative Services, Space Management, Architectural/Engineering Services, Real Estate, Facility Planning, Financial Planning, and Health and Safety as shown in table (1-2). In 1985, after studying how companies manage their facilities; Wilson decreased these responsibilities to five; *real estate, long-range planning, building projects, building administration, and office support*, in the second half of the 1970s; Herman Miller studied the main components of FM and determined three integrated responsibilities; *people, process, and place* ⁽¹⁾.

⁽¹⁾Mc Graw Hill, Facility Design and Management Handbook. Downloaded from Digital Engineering Library @ McGraw-Hill (www.digitalengineeringlibrary.com) Copyright © 2004 The McGraw-Hill Companies.

Table (1-2): 41 Responsibilities of Facility Management Described Under the Eight Headings Identified by IFMA before 1970

The Eight Headings of FM Responsibilities	The Forty One Responsibilities of Facility Management
Maintenance Operations	<ul style="list-style-type: none"> - Furniture maintenance - Finishes maintenance - Preventive maintenance - Breakdown maintenance - Exterior maintenance - Custodial/housekeeping - Landscape maintenance
Administrative Services	<ul style="list-style-type: none"> - Corporate artwork - Mail services - Shipping/receiving - Records retention - Security - Telecommunications - Copy services
Space Management	<ul style="list-style-type: none"> - Space inventory Space policies - Space allocation - Forecasting needs - Furniture purchase - Furniture specifications - Furniture inventory - Interior plans - Furniture moves - Major redesign - Trash/solid waste - Hazardous materials
Architectural and Engineering Services	<ul style="list-style-type: none"> - Code compliance - Construction management - Building systems - Architectural design
Real Estate	<ul style="list-style-type: none"> - Building leases - Site selection - Acquisition/disposal - Building purchases - Property appraisals - Subleasing
Facility Planning	<ul style="list-style-type: none"> - Operational plans - Emergency plans - Strategic plans - Energy planning
Financial Planning	<ul style="list-style-type: none"> - Operational budgets - Capital budgets - Major financing
Health and Safety	<ul style="list-style-type: none"> - Ergonomics - Energy management - Indoor air quality - Recycling program - Emissions

Source: Mc Graw Hill, Facility Design and Management Handbook

FM Standard job plan "Service Delivery Model" consists of five phases as described by some FM Companies⁽¹⁾ in table (1-3):

Table (1-3): Phases and Tasks involved in Facility Management according some Facility Management Companies

Phase	Task
1- Sustain	<ul style="list-style-type: none"> - Assets life cycle management - Energy and utilities management - Assets technical improvement
2- Transformation	<ul style="list-style-type: none"> - Innovation in service delivery - Assure service continuity - Customer Relationship Management (CRM) support
3- Transition	<ul style="list-style-type: none"> - Stabilize service delivery levels - Ensure quality assurance and business continuity - Implement and monitor the Key Performance Indicator (KPI)
4- Mobilize	<ul style="list-style-type: none"> - Recruitment , staff, Induction & training - Condition audits, data collation, validation & asset integration - Prepare project processes, operating plan & staff subcontractor site orientation
5- Envision	<ul style="list-style-type: none"> - Envision client needs & identify challenges - Validate client needs with the client - Obtain client endorsement of service level requirements & - Finalize service structure (Organization, People, Information Management System (IMS),and, Computer Aided Facility Management System (CAFM) - Establish Service Delivery Standards - Agree on Implementation Plan

Source: http://www.efsme.com/services_facilities, Last Accessed: 18-4-2014

⁽¹⁾ EFS Company Profile.pdf http://www.efsme.com/services_facilities Last accessed: 18-4-2014

1.1.4 The Practice of Facility Management Worldwide

In 1990s the International Facility Management Association (IFMA) has grown exponentially with more than 22,500 members in 78 countries and 128 chapters, the association advances the facility management profession by providing exceptional services, products, resources and opportunities. In 1994 the British Institute of Facilities Management (BIFM) was officially born out of merging the Institute of Facility Managers and the Association of Facilities Managers. In 1988 the International Facility Management Association of Australia was established and changed its name to Facility Management Association of Australia (FMAA) in 1990. In 1997 the South African Facilities Management Association (SAFM) was founded due to the need of large South African institutions to improve and enhance their facilities management operations⁽¹⁾.

1.2 The Concept of Value Engineering

Value Engineering is defined by different parties and in different ways, but they all agreed that VE can simply be defined as *"Achieving the best quality and performance using the least costs"*. The most comprehensive definition which will be adopted though this thesis is that defined by SAVE or the "Society of American Value Engineers"

VE According to SAVE International Value Society

The value engineering (VE) or methodology (VM) is a systematic and structured approach that improves projects, products, and processes. VM is used to analyze manufacturing products and processes, design and construction projects, and business and administrative processes. VM helps achieve balance between required functions, performance, quality, safety, and scope with the

⁽¹⁾ Doaa Helal, Facility Management as a Tool for Improving Architectural Design Efficiency, thesis submitted at Helwan University, 2008

cost and other resources necessary to accomplish those requirements. The proper balance results in the maximum value for the project⁽¹⁾.

According to Alphonse Dell'Isola in his book "Value Engineering: Practical Applications"

The value engineering is a methodology that is known and accepted in the industrial sector. It is an organized process with an impressive history of improving value and quality. The VE process identifies opportunities to remove unnecessary costs while assuring that quality, reliability, performance and other critical factors will meet or exceed the customer's expectations. The improvements are the result of recommendations made by multidisciplinary teams representing all parties involved. VE is a rigorous, systematic effort to improve the value and optimize the life cycle cost of a facility. VE generates these cost improvements without sacrificing needed performance levels. A wide range of companies and establishments have used VE effectively to achieve their continuous goal of improving decision making⁽²⁾.

According to Rashad M. AbdelRahaman in his Value Engineering Program, 2005

VE is a Systematic team effort aimed at improving the quality as well as optimizing the life cycle cost (LCC), analyzing functions and quality of projects (goods, services and processes) in order to generate practical cost-effective alternatives that meet customer requirements⁽³⁾.

⁽¹⁾What's Value Engineering. (n.d.). Retrieved August 30, 2013, from Save International@Official Web Site: http://www.value-eng.org/value_engineering.php, last access date, August 13, 2014

⁽²⁾What's Value Engineering. (n.d.). Retrieved August 30, 2013, from Save International@Official Web Site: http://www.value-eng.org/value_engineering.php, last access date, August 13, 2014

⁽³⁾Value Engineering Program, a course by: Arch. / AbdelRahaman M. Rashad, Introduction session. Web Site:<https://docs.google.com/file/d/0BxbHliEXFe2oOG1nMmpjLUMwS1RFcFZENmV5ZTJWVHpbokFn/ed> it last access date, May 18, 2015

1.2.1 Historical Background

Value engineering began at General Electric Co. during the World War II. Because of the war, there were shortages of skilled labor, raw materials, and component parts. In 1947, Lawrence Miles, Harry Erlicher and their team at General Electric Co. looked for acceptable substitutes; they noticed that these substitutions often reduced costs, improved the product, or both. What started out as an accident of necessity was turned into a systematic process; they developed a step – by – step system called “*Value Analysis*”⁽¹⁾.

In 1954, the U.S. Navy applied the "Value Analysis" process to cost improvement during design and they called it "*Value Engineering*", in 1959, the “Society of American Value Engineers” SAVE was incorporated in Washington. In 1960 - 1970 V.E. became mandatory in many fields in U.S. In 1970 the "Society of Japanese Value Engineering" SJVE was incorporated in Japan, and after 1970 V.E. became one of the most important worldwide methodologies⁽²⁾.

1.2.2 The Value Equation

The main objectives of value engineering are, saving money and time, improving quality, getting rid of unnecessary costs without sacrificing performance and enhancing team - work and decision making. The decision should achieve optimum solutions and avoid confusing cost and value; otherwise, it is unacceptable. If the added costs don't improve quality or ability to achieve functions then, the value is decreased. Three basic elements provide a

⁽¹⁾ The origins of value engineering/McGill University/<http://www.mcgill.ca/ve/history> : 30-8-2013

⁽²⁾Value Engineering Program, a course by: Arch./ AbdelRahaman M. Rashad. Web

Site:<https://docs.google.com/file/d/0BxbHliEXFe2oOG1nMmpjLUMwS1RFcFZENmV5ZTJWVHpbokFn/edit>
last access date, May 18, 2015

measure of value to the user: function, quality and *cost* as shown in figure (1-2). These elements can be interpreted by the following equation (1-2)⁽¹⁾:

$$\text{Value} = (\text{Function} + \text{Quality}) / \text{Cost}$$

Equation (1-2): The Value Equation

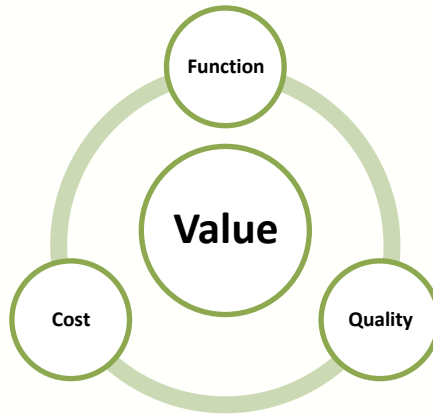


Figure (1-2): The Value Engineering Equation

Where:

- **The Function:** The specific work that a design per item must perform.
- **The Quality:** The owner's or user's needs desires and expectations.
- **The Cost:** The life cycle cost of the project.

Therefore:

The Value: The most cost effective way to reliably accomplish a function that will meet the users' needs desires and expectations.

⁽³⁾ Value Engineering Program, a course by: Arch. / AbdelRahaman M. Rashad, Introduction session. Web Site: <https://docs.google.com/file/d/0BxbHliEXFe2oOG1nMmpjLUMwS1RFcFZENmV5ZTJWVHpbkFn/edit> last access date, May 18, 2015

1.2.3 Tasks Involved in Value Engineering

The VE Job Plan is the organized problem solving approach that separates VE from other cost – cutting exercises⁽¹⁾. The VE Job Plan is also an organized plan of action for accomplishment of VE studies⁽²⁾. Although the VE “Job Plan” was described by different parties as mentioned below, the most comprehensive Job Plan was that described by "The Society of American Value Engineers".

According to "The Society of American Value Engineers", the standard job plan consists of six phases as shown in table (1-4).

Table (1-4): 6 Phases and Tasks involved in Value Engineering

Phase	Task
Information Phase	Gather information to better understand the project.
Function Analysis Phase	Analyze the project to understand and clarify the required functions
Creative Phase	Generate ideas on all the possible ways to accomplish the required functions
Evaluation Phase	Synthesize ideas and concepts to select feasible ideas for development into specific value improvement
Development Phase	Select and prepare the “best” alternative(s) for improving value
Presentation Phase	Present the value recommendation to the project stakeholders

Source: Alphonse Dell'Isola, PE. Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations Book

⁽¹⁾Alphonse Dell'Isola, PE. Value Engineering: Practical Applications for Design, Construction, Maintenance & Operation Book.

⁽²⁾Value Engineering Program, a course by: Arch./ AbdelRahaman M. Rashad, Introduction to value engineering,CEM512.WebSite:<https://docs.google.com/file/d/0BxbHliEXFe2oOG1nMmpjLUMwS1RFcFZE NmV5ZTJWVHpobkFn/edit> last access date, May 18, 2015

A simple five – step approach job plan was proposed by Alphonse Dell'Isola as follows:⁽¹⁾

1- Gathering Step:

- The provided functions
- The cost of functions
- The worth of functions
- Expected accomplished functions

2- Creativity & Idea Generation:

- Different tools to perform the function
- Different ways to perform the function

3- Analysis of Ideas / Evaluation & Selection:

- Evaluating the ability of each idea to perform the function
- Analyzing the ideas and choosing the most suitable ones

4- Development of Proposal:

- Studying the best way of applying the idea
- The achieved requirements due to applying the idea
- Costs of applying the idea
- The impact of the idea on the LCC

5- Presentation / Implementation & Follow - up:

- The reasons for choosing the idea
- The most suitable party to apply the idea
- Clarifying the advantages / disadvantages and specific benefits
- The requirements of implementing the proposal

⁽¹⁾Alphonse Dell'Isola, PE. Value Engineering: Practical Applications for Design, Construction, Maintenance & Operation Book.

In addition to the previously mentioned job plans, another job plan that comprises eight phases was described by Abdel Rahman M. Rashad Al Youssefy⁽¹⁾. He clarified the techniques and the tasks involved in each phase as shown in table (1-5):

Table (1-5): 8 Phases of VE job plan

Phase	Task
Selection	<ul style="list-style-type: none"> - Speculate on sources of projects - Develop plan to identify project - Analyze projects for applying VE - Evaluate projects for potential - Present project to management - Select projects for VE study - Implement study plan
Investigation	<ul style="list-style-type: none"> - Speculate on sources of project data - Develop a plan to gather project data - Implement data search plan - Investigate the project and audit data - Speculate on functions performed - Analyze cost - Analyze functions - Evaluate function cost/worth - Evaluate project potential - Select specific study areas
Speculation (Creative)	<ul style="list-style-type: none"> - Select techniques to be used - Speculate alternatives - Select the best Alternatives
Evaluation (Judgment)	<ul style="list-style-type: none"> - Speculate on evaluation criteria - Evaluate alternatives - Select the best Alternatives
Development	<ul style="list-style-type: none"> - Speculate on information needed - Speculate on information sources - Develop a plan of investigation - Develop selected alternatives - Select preferred alternative - Develop implementation plan - Audit Data
Presentation	<ul style="list-style-type: none"> - Develop a written proposal - Speculate on possible roadblocks to acceptance - Present recommended alternative
Implementation	<ul style="list-style-type: none"> - Develop change documents - Implement approved alternative - Evaluate process
Audit	<ul style="list-style-type: none"> - Audit results of Implementation - Evaluate project results - Present project results - Present awards

Source: Value Engineering Program, a course by: AbdelRahaman M. Rashad, Introduction to value engineering

⁽¹⁾Value Engineering Program, a course by: AbdelRahaman M. Rashad, Introduction to value engineering, CEM512. WebSite: <https://docs.google.com/file/d/0BxbHliEXFe2oOG1nMmpjLUMwS1RFcFZENmV5ZTJWVHpobkFn/edit> last access date, May 18, 2015

1.2.4 The Practice of Value Engineering Worldwide

Value Engineering should be applied through all project phases, but, earlier is always better. Figure (1-3) illustrates the potential savings that can be achieved by performing and applying VE through early phases and before commitment of funds and approval of systems and designs. Maximum results are always achieved when applying VE during planning and analysis phase, this is automatically reflected on increasing the potential savings in addition to saving time, money, efforts and avoiding future risks. Those results decrease gradually when applying VE during design phase and drawings and documentation phase, till they reach construction phase. After construction phase and during operation and maintenance phase, the savings become loss, where the required investments to implement any changes and the resistance to change increase till they reach the maximum feasible value.

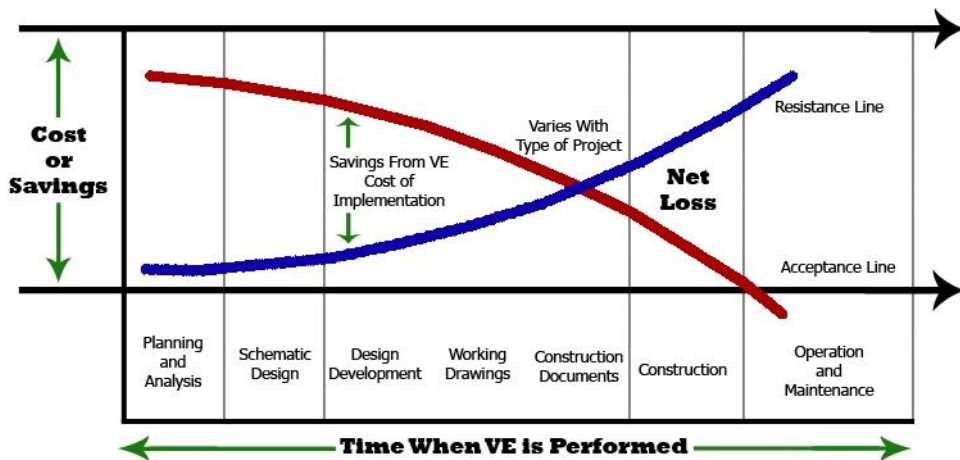


Figure (1-3): Potential Savings from VE Applications

Source: Alphonse Dell'Isola, PE. *Value Engineering: Practical Applications for Design, Construction Maintenance and Operations*

During the life cycle of a facility, the owner and the consultants are the major decision makers, the consultants' decisions can influence about 50% of the facility's total cost, so; the owner and the consultants should be involved in the VE process during the early design phases in order to get the optimum results.

Figure (1-4) represents the influence of decision makers on facilities costs. Maximum influence is achieved during early project phases like pre-schematic and design phases; it decreases gradually till it reaches its minimum during operation and maintenance phase.

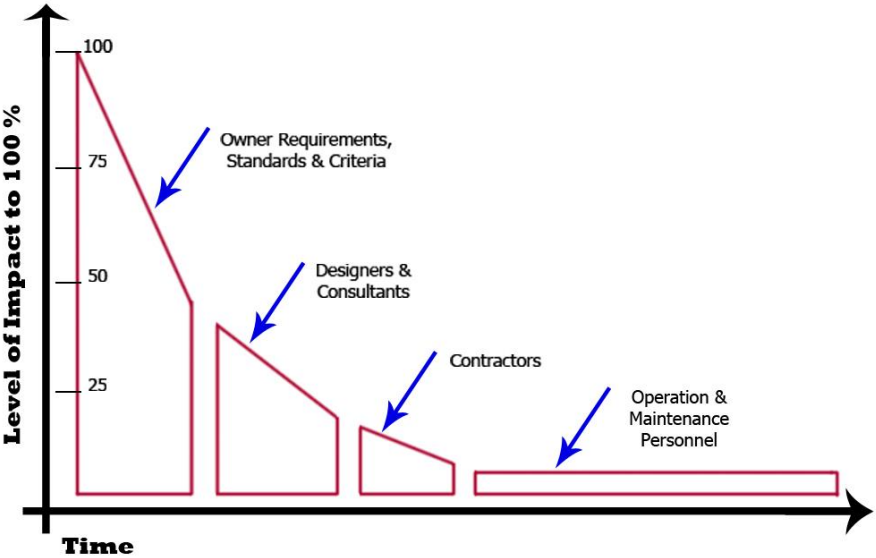


Figure (1-4): Major Decision Makers' Influence on Facility Costs

Source: Alphonse Dell'Isola, PE. Value Engineering: Practical Applications for Design, Construction Maintenance and Operations

1.3 Conclusion of Chapter One

Table (1-6): Conclusion of Chapter One

	Facility Management	Value Engineering
Definitions which will be considered through the present study	<p>FM According to the Facility Management Association (IFMA)</p> <p>FM is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process, and technology. According to IFMA, the scope of Facilities Management covers real estate, planning, budgeting, space management, interior planning, interior installation, architecture and engineering services and building maintenance and operation.</p>	<p>V.E. According to SAVE International® Value Society</p> <p>The value engineering (VE) or the value methodology (VM) is a systematic and structured approach, improves projects, products, and processes. VM is used to analyze manufacturing products and processes, design and construction projects, and business and administrative processes. VM helps achieve balance between required functions, performance, quality, safety, and scope with the cost and other resources necessary to accomplish those requirements. The proper balance results in the maximum value for the project.</p>
Equation	FM = People + Places + Process	VE = (Function + Quality) / Cost
Involved Tasks and Phases	<ul style="list-style-type: none"> - Sustain - Transformation - Transition - Mobilization - Envision 	<ul style="list-style-type: none"> - Information Phase - Function Analysis Phase - Creation Phase - Evaluation Phase - Development Phase - Presentation Phase
When to Apply	<p>FM target is ensuring the functionality of the built environment by integrating certain responsibilities such as, people, places, processes and technologies, so, it should be applied through the whole building life cycle starting from early design phases in order to achieve the optimum results, avoid any problems and save time, effort and money.</p>	<p>VE should be applied through all project phases, but, earlier is always better in order to decrease the required investments to implement any changes in addition to saving efforts and money and achieving the best quality and the optimum solutions for problems.</p>

Studying and comparing the tasks involved in both FM and VE is a proof that integrating VE and FM can help in introducing an approach through a comprehensive tool and coherent aspect to face risks and uncertainties that face the building throughout its life cycle. The common points between FM and VE are clarified and summerized in figure (1-5).

Also through comparing the equations of the two approaches:

$$VE = (\text{Function} + \text{Quality}) / \text{Cost}$$

And,

$$FM = \text{People} + \text{Place} + \text{Process}$$

The 6 parameters of the two equations (function, quality, cost, people, places and process) can be illustrated as follows; where, ensuring the functionality (*function*) and the quality (*quality*) of the built environment (*places*) totally depends on the users' satisfaction (*People*). Achieving the users' satisfaction during the building's post occupation phase within the determined operation and maintenance budget (*cost*) means successful built environment and successfully operated building (*Process*).

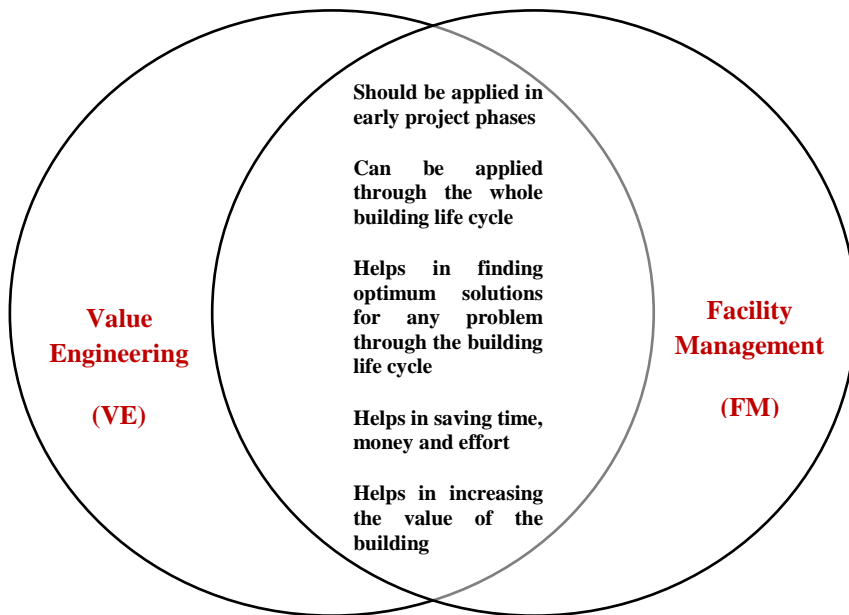


Figure (1-5): The Common Points between FM & VE

The users' satisfaction and the successful process and operation can only be achieved by considering all the project aspects and all the users' needs during early design phases and also through studying the impact of the design phase and the early decisions phases on processing the built environment in terms of operation, budget and satisfaction.

VE and FM are two approaches with common targets and six integrated parameters, where the both approaches aim at saving time and effort, facing risks and problems and adding value to a project. In order to achieve the previously mentioned targets, both VE and FM shall be applied through the whole life cycle of a building starting from early design phases to provide better solutions and results in addition to avoiding the evolution of uncertainties problems or unplanned risks.

Chapter Two	Structure of Chapter Two
<p>Risks Incurred in the Design and Implementation of Service Buildings</p>	<p>2.1 Defining Risks</p> <p>2.1.1 Types and Characteristics of Risks</p> <p>2.1.2 Steps of Managing Risks</p> <p>2.1.2.1 Establishing the Context</p> <p>2.1.2.2 Identification of Risks</p> <p>2.2 Relevance of Risk in Facility Management and Value Engineering</p> <p>2.2.1 Scope of Applying Risk Management in Facility Management</p> <p>2.2.2 Scope of Applying Risk Management in Value Engineering</p> <p>2.3 Risk in In-House and Outsourced Services</p> <p>2.3.1 In-House Services</p> <p>2.3.2 Outsourcing Services</p> <p>2.3.3 Questionnaire Survey</p> <p>2.3.3.1 Findings</p> <p>2.1 Illustrative Examples</p> <p>2.1.1 Project 1: Haram Expansion Building</p> <p>2.1.2 Project 2: The Mataf Project</p> <p>2.1.3 Project 3: Etisalat Building</p> <p>2.1.4 Project 4: Key Bank Building - USA</p> <p>2.2 Conclusion of Chapter Two</p>

Chapter Two

Risks Incurred in the Design and Implementation of Service Buildings

As previously mentioned, defining the risks and facing them during early project phases will for sure have a good impact on the project. The sudden evolution of risks and problems during late phases will impact the project negatively specially in terms of cost and time. This chapter defines and highlights different types of risks that may face a building during its life cycle starting from the design phase till the operation and maintenance phase. It also presents some illustrative examples that faced different types of risks through different phases and how those risks affected the projects negatively.

2.1 Defining Risks

Risk was defined in many ways as follows:

The most comprehensive definition was that defined by the *Facility Management Association of Australia Limited*:

“Risk is an inherent part of life. It is the chance of something happening that will impact upon objectives. It is measured by combining the magnitude of the potential consequence with the likelihood of the occurrence”⁽¹⁾.

Operating any organization successfully totally depends on controlling risks effectively by considering and managing all the costs and opportunities and never letting risks get out of hand.

According to the Risk Management Standard © AIRMIC, ALARM, IRM, 2002:

“Risk can be defined as the combination of the probability of an event and its consequences”⁽¹⁾.

⁽¹⁾FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

2.1.1 Types and Characteristics of Risks

Risks have three main types as described in table (2-1); each has distinct characteristics with different analysis techniques and managing approach⁽²⁾:

Table (2-1): Types and Characteristics of Risks

Type of Risk	Definition	Characteristics of Risk	Examples
Uncertainty Based Risk	This risk may or may not happen, those instead are called constraints. They are associated with unknown and unexpected events. These events are usually catastrophic in nature and include accidents and acts of God	<ul style="list-style-type: none"> - They are unknown or extremely difficult to quantify - They are catastrophic or disastrous in nature - They can be very costly - They are associated with a negative outcome - They are outside the manager's sphere of control or influence 	<ul style="list-style-type: none"> - building damage by flash flooding - Arson - Acts of sabotage or terrorism to a major facility
Opportunity Based Risk	Opportunity risk is the potential gain or the positive impact to objectives	<ul style="list-style-type: none"> - Can be tangible and or intangible - It is often quantified in cost terms - Can have a positive or negative outcome. 	<ul style="list-style-type: none"> - Business expansion - Change in business location - Outsourcing
Hazard Based Risk	<p>Hazard-based risk is the risk associated with a source of potential harm or a situation with the potential to cause harm. Hazards are generally grouped into the following categories:</p> <ul style="list-style-type: none"> - Physical hazards: Noise, radiation, heat, cold, vibration and pressure - Chemical hazards: Explosions, flammability, corrosion, poisoning and 	<ul style="list-style-type: none"> - They are usually known - They are readily quantifiable - They are tangible - They impact predominantly on safety 	<ul style="list-style-type: none"> - Outbreaks from air conditioning - Management and usage of hazardous chemicals - Confined space entries - Manual handling

⁽¹⁾The Risk Management Standard © AIRMIC, ALARM, IRM, 2002

⁽²⁾FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

Type of Risk	Definition	Characteristics of Risk	Examples
	toxicity - Biological hazards: Viruses, bacteria, fungi and other organisms - Ergonomic hazards: Hazards associated with poor workspace design, layout or activity and equipment usage - Psychological hazards: Sources of psychological stress that can result in physical or psychological harm.		

Source: The Risk Management Standard © AIRMIC, ALARM, IRM, 2002

When risks are not studied or considered through early phases or in case of the lack of a risk managing plan, any type of the three previously mentioned risks may become reality and unwanted consequences or losses occur, project schedule will slip, costs will increase, quality will be affected and implementation may become difficult or impossible.

Understanding the three types of risks enables the facility managers through all project phases to select the most appropriate solutions and effective management approach for the type of risk at the right time. This helps in identifying, preventing, containing and reducing negative impacts and maximizing opportunities and positive outcomes⁽¹⁾.

2.1.2 Steps of Managing Risks

Successful risk management process consists of five main steps as shown in figure (2-1). These steps shall be applied through all project phases in order to achieve the best practice of facility management in facing risks.

⁽¹⁾ ILG – Supplementary Guidance - #2 - Project Risk Management Guideline v1 – February 2009

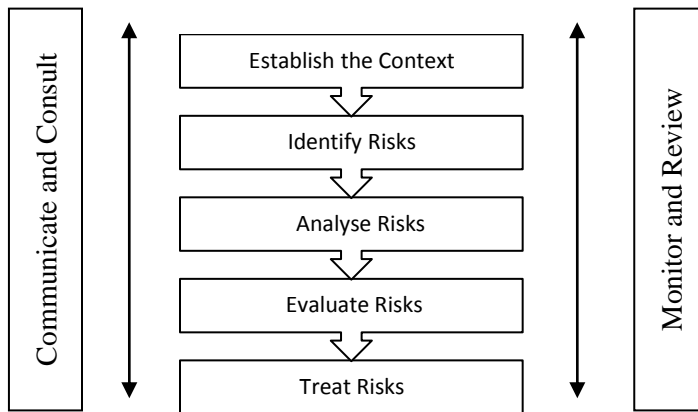


Figure (2-1): Steps of Managing Risks

Source: FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

2.1.2.1 Establishing the Context

Establishing the context is an important step that determines the main parameters and sets the scope of managing risks process before commencing any risk management procedures. Establishing the context can be defined as determining the main internal goals, objectives and functions of an organization and examining how this organization is affected by external factors and influences⁽¹⁾.

This facilitates to the facility manager making the best decisions in risk management activity and being sure that those decisions are not isolated from the organization's goals and objectives. Establishing the context helps determining the organization's strengths, weaknesses, opportunities and threats to help in achieving the best practice of facility management.

2.1.2.2 Identification of Risks

Establishing a good context facilitates the step of identifying risks as it totally depends on the quantity of available data and information. To identify risks all

⁽¹⁾FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

the aspects shall be considered and all the sources shall be determined and examined in order to develop a comprehensive list of risks that may face a project through any phase.

Risks can be identified by applying the following steps:

- Putting some probabilities for the type of risks that may happen.
- Expecting the cause of each type of risks.
- Expecting some reasons for the risks to happen.
- Putting some probabilities for the place where the risks may happen.
- Putting some probabilities for the time when the risks may happen.

2.1.2.3 Analysis of Risks

After identifying the risks they are analyzed to determine how each type of risks may affect a project and accordingly a "Risk Scoring Matrix" or a "Likelihood of Risks", table (2-2), is developed. The "Likelihood of Risks" reflects the severity of the impact of a risk on the project where, the rate of high severity risks ranges from 20 to 25 and it takes the red color in the "Risk Scoring Matrix", the rate of significant severity risks ranges from 12 to 16 and takes the orange color, the rate of medium severity risks ranges from 5 to 10 and takes the yellow color, and the rate of low severity risks ranges from 1 to 4 and it takes the green color. This then helps through evaluating the risk and choosing the optimum solution and correct action to face it.

Table (2-2): "The Risk Scoring Matrix" or "The Likelihood of Risks"

Consequence Likelihood	Overall Rating					
		Insignificant	Minor	Moderate	Major	Catastrophic
		1	2	3	4	5
Almost Certain	5	Medium (5)	Medium (10)	Significant (15)	High (20)	High (25)
Likely	4	Low (4)	Medium (8)	Significant (12)	Significant (16)	High (20)
Neutral	3	Low (3)	Medium (6)	Medium (9)	Significant (12)	Significant (15)
Unlikely	2	Low (1)	Low (4)	Medium (6)	Medium (8)	Medium (10)
Rare	1	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)

Source: ILG – Supplementary Guidance - #2 - Project Risk Management Guideline v1 – February 2009

2.1.2.4 Evaluation of Risks

Evaluating the risks involves comparing the impacts and severity of each risk as previously mentioned in the "Risk Scoring Matrix" to determine the best action to be taken as shown in table (2-3). The risk may be accepted in case of low severity and impacts or treated in case of high severity and impacts.

Table (2-3): Actions in Risk Evaluation

Key Actions	Accept	Refer	Amend	Cancel
I have the resources to implement recommended treatments.	✓			
I do not have the resources or authority to implement recommended treatments.		✓	✓	✓
The risk level is above my level of delegated authority.		✓	✓	✓
The risk level is within my level of delegated authority.	✓			
The risk level is within my level of delegated authority; however, the task or activity is significant, new, unusual or infrequent.	✓	✓		

Source: FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

2.1.2.5 Treatment of Risks

Through this step the facility manager is always seeking for a solution for the unacceptable risks and problems that face the project as described by the key actions table through the evaluation step. The risk treatment step involves identifying the range of options for treating risk, assessing those options, preparing risk treatment plans and implementing them in order to remove negative outcomes of risks and enhance the positive outcomes if possible⁽¹⁾.

To facilitate the treatment of risks, Ian Hord developed a "Risk Treatment Diagram" where he categorized the types of risks and the responsible parties for treating those risks into three categories as shown in figure (2-2)⁽²⁾:

- *The Strategic Level:* Strategic level risks are those risks that may impact the strategic or high level outcomes of the project. Their treatment actions may become part of the scope of work of the project in case they have an effect on the time schedule or the total budget of the project. These risks are generally monitored at the highest levels of direction by the owner, the senior executives, the strategic planners or the key stakeholders who can identify the key sources of uncertainties which may impact the desired project outcomes and who are responsible for the strategic objectives of a project and what may prevent achieving them.
- *The Operational Level:* These are the types of risks that may impact the delivery of the project and will be the focus of the Project Director or the Project Manager who are responsible for what objectives shall be delivered, the exact time of delivery, the quality and cost of the deliverables and what may prevent achieving the required objectives.

⁽¹⁾ FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

⁽²⁾ ILG – Supplementary Guidance - #2 - Project Risk Management Guideline v1 – February 2009

- *The Compliance Level:* These risks relate more to the administration and the operational standards. The administration's main task is to make sure that there is no conflict between the design standards, the financial standards and the operating procedures.



Figure (2-2): Risk Treatment Diagram

Source: ILG – Supplementary Guidance - #2 - Project Risk Management Guideline v1 – February 2009

2.1.2.6 Monitor and Review

Monitor and Review is a very important step in the risk management process, it facilitates to the facility manager the determination and monitoring of risks to make sure that the treatment plan has a positive effect on facing risks. That is the main reason why the facility manager shall repeat the "Monitor and Review" process on regular basis to prevent any changes in the context or the evolution of any types of new risks that may affect the work progress. Below are some examples for the areas that shall be monitored and the methods of reviewing:

Areas to monitor include:

- Risks, to ensure that plans remain up to date
- Residual risk levels
- Analysis (verify against real data if possible)
- Understanding of risk
- Quality of decisions
- Treatment implementation
- Effectiveness of treatment

Possible methods of review are:

- Appeal tribunals, courts, commissions of inquiry
- Ombudsman, parliamentary committee
- Formal investigation: board of inquiry, accident investigation
- Internal check programs
- Evaluation of risk documentation
- Physical inspection
- Program evaluation
- Review of organizational policies, strategies and processes: corporate plans

2.2 Relevance of Risk in Facility Management and Value Engineering

Determining the risks and uncertainties and being prepared to face them through the building life cycle will help in achieving the target of facility management and ensuring the functionality of the built environment. Being ready to face the worst case scenario where the cause of risks is unpredictable and beyond control can only be achieved by embedding the practice of risk management into the process of facility management.

Value engineering and risk management aim at enhancing the value, quality and performance of a project while decreasing the costs as much as possible. Risk management role is to propose many solutions to face risks and uncertainties,

while the role of value engineering is to choose the optimum solution from the proposed ones. The chosen solution is supposed to guarantee the best way for facing the worst case scenario with minimum costs.

2.2.1 Scope of Applying Risk Management in Facility Management

According to "The Facility Management Association of Australia" Risk management can be applied in any context and to any task, phase or activity through the facility management process. The differences in application will be in the tools, techniques and risk approach used. Table (2-4) illustrates the scope of applying risk management through the four phases of facility management as described by "The Facility Management Association of Australia"⁽¹⁾.

Table (2-4): Scope of Applying Risk Management in Facility Management

Tasks and Phases involved in FM	Application of Risk Management
<p>Strategy and Planning (Sustain Phase)</p>	<ul style="list-style-type: none"> - Business interruption procedures and strategies - Contingency planning - Disaster planning and recovery - Fire and life safety management - Facilities strategic plan - Facilities business plan - Triple bottom line - Financial management - Compliance – legal and regulations - Facility plan - Change organizational - Occupational health and safety - Master planning - Accommodation planning - Leasing strategy - Asset management plan - Life cycle budgets - Tax planning - Capital expenditure budgets - Depreciation planning - Operational expenditure budgets - Asset allocation
<p>Acquisition (Transition Phase)</p>	<ul style="list-style-type: none"> - Asset records and data - Policies and procedures - Implementation - Tendering receipt - delivery mode - Commissioning

⁽¹⁾FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

Tasks and Phases involved in FM	Application of Risk Management
	<ul style="list-style-type: none"> - Contract type - Transition - Contract negotiations - Post occupancy reviews - Upgrade/enhancements
<p>Occupancy and Service Delivery (Mobilize and Envision Phases)</p>	<ul style="list-style-type: none"> - Insurance - Internal service level agreement - Emergency response - Security - Occupational health and Safety - planned preventive - planned repairs - conditions assessment - Space Standards - Staff well being - Service standards - Monitoring
<p>Disposal (Transformation Phase)</p>	<ul style="list-style-type: none"> - Property sale - Relocation - Asset sale - Sublease - Transfer - Make good - Asset register update

Source: FM Guidelines to Managing Risks, Copyright Facility Management Association of Australia Ltd, February 2004 ISBN 0-9751896-0-3

2.2.2 Scope of Applying Risk Management in Value Engineering

In his paper "The Integration of Value Management and Risk Management", David Q. Kirk proved that applying risk management in value engineering aims at finding optimum alternatives of solutions to face risks with least cost and best quality and function. This can be achieved by embedding risk management process through the tasks and phases of value engineering as illustrated in table (2-5).

Table (2-5): Scope of Applying Risk Management in Value Engineering

Tasks and Phases involved in VE	Application of Risk Management
Selection	<ul style="list-style-type: none"> - Extract relevant information concerning risk issues - Identifying risk issues - Understand the risk issues - Evaluate the general degree of risk - Prepare a generic checklist of risks
Investigation	<ul style="list-style-type: none"> - Based on the previously collected data, best case and worst case risk scenarios shall be prepared for each item of the project.
Speculation (Creative)	<ul style="list-style-type: none"> - Generate ways to mitigate risks - Brain storming of ideas to achieve functions for improved values.
Evaluation (Judgment)	<ul style="list-style-type: none"> - Compare and evaluate the ideas. - Concentrate on the ideas that can mitigate risks and achieve cost savings at the same time
Development	<ul style="list-style-type: none"> - The evaluated chosen ideas can now be synchronized into one comprehensive alternative to conduct risk analysis and value analysis proposal to be subjected to best case and worst case scenarios.
Presentation	<ul style="list-style-type: none"> - The comprehensive alternative can now be presented to highlight the cost savings resulting from both the functional standard value engineering process and the mitigation of risks.
Implementation	<ul style="list-style-type: none"> - Through this phase, all the parties are assembled together to "accept", "accept with modifications", or "reject" the final comprehensive risk mitigation and value alternative.

Source: David Q. Kirk, *The Integration of Value Management and Risk Management Paper, SAVE proceeding 1995*

2.3 Risk in In-House and Outsourced Services

In Egypt, due to the lack of awareness and believing in over-quality, there is a misunderstanding that outsourcing non-core services of a project would add unnecessary costs to the project's budget, so, in-house services are used instead of outsourcing services especially through operation and maintenance phases. Depending on In-House services and neglecting the positive effective role of outsourcing may cause an increase in the budget and the life cycle cost in addition to a decrease in the quality of the non-core services⁽¹⁾.

⁽¹⁾ Based on a survey and an open discussion with some FM practitioners

2.3.1 In-House Services

Conducting an activity or operation within a company, instead of relying on outsourcing; a firm uses its own employees and time to keep a division or business activity, such as financing or brokering⁽¹⁾.

2.3.2 Outsourcing Services

A practice used by different companies to reduce costs by transferring portions of work to outside suppliers rather than completing it internally⁽²⁾.

2.3.3 Questionnaire Survey

A simple survey and an open discussion were performed among a group of FM practitioners and managers to compare between in-house and outsourced services and to determine the risks of both types of services and their effect on the value of the building and its facilities. The Questionnaire Form is attached in appendix (1).

2.3.3.1 Findings

Table (2-6) compares between In-House and Outsourced Services in Egypt in terms of the reason of choosing each service, the criteria of choice, the scope of services provided by each service and the value added by both types of services in order to determine the risks that may face a project as a result of choosing each type of services.

⁽¹⁾ <http://www.bifm.org.uk/bifm/news/6420> Last access date: 05-06-2014.

⁽²⁾ Business Dictionary: Non-Core Activities Definition <http://www.businessdictionary.com/definition/non-core-activities.html>, Last access date: 08-06-2014.

Table (2-6): Comparison between In-House and Outsourced Services in Egypt

	In-House Services	Outsourced Services
Reason of Choice	<ul style="list-style-type: none"> - Lower costs - Loyalty of workers to their company and their care to improve the quality - Enhancement of quality of workers through time - Higher percentages of users' satisfaction 	<ul style="list-style-type: none"> - Better quality as the service provider is always specialized through his scope - Reduced risks as facing risks and solving any problems is always the responsibility of the provider - It's the present and future worldwide trend - Lower life cycle cost - Less headache as the owner is never responsible for workers' insurance, salaries, transportation, etc. - Saving time, effort and manpower.
Scope of Services	<ul style="list-style-type: none"> - Maintenance - Housekeeping - Driving - Security 	<ul style="list-style-type: none"> - Maintenance - Housekeeping - Catering - Driving - Security - Façade Cleaning - Pest Control
Criteria of Choice	<ul style="list-style-type: none"> - Quality of provided services - Cost of service compared to the quality and the effect on the overall budget 	<ul style="list-style-type: none"> - Reputation compared to other providers - Quality of provided service - Cost of service compared to the quality and the effect on the overall budget
Added Value	<ul style="list-style-type: none"> - No added value 	<ul style="list-style-type: none"> - There is added value as a result of concentrating all the time, efforts and manpower to the core services to achieve better quality and better market place

Source: Based on the Survey and the Open discussion with Some FM Practitioners, Managers and Users

Although the outsourced services initial cost exceeds the in-house services initial cost by 40 to 50 %, the managers prefer the outsourced services in order to decrease risks through lowering the life cycle cost of the building in addition to saving time and helping in enhancing the company's core services, while the owner and the users prefer the in-house services as they trust their company's workers and find it easier to deal with them.

Figure (2-3) is a comparison between in-house and outsourced services in terms of Added Value, Initial Costs, Life Cycle Costs, Quality and Time. Although the initial costs of outsourced services is 40% to 50 % higher than that of in-house, outsourcing achieves 60% added value to a project more than that added by in-

house. Outsourcing also provides 35% lower life cycle cost compared to in-housing in addition to providing better quality, saving more time and effort and consequently decreases risks.

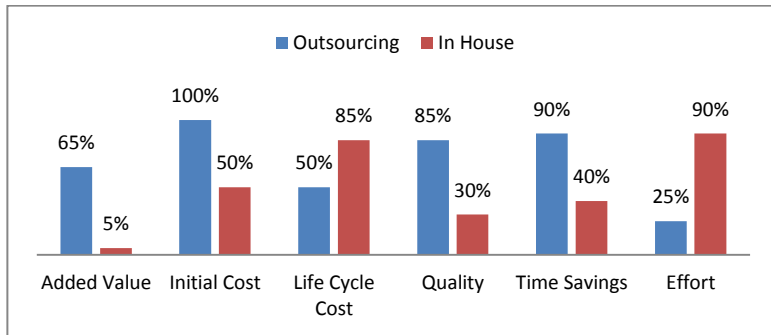


Figure (2-3): Comparison between In-House and Outsourced Services

No specific standards can be determined to compare between outsourcing service providers and that's a clear reason why most companies still prefer in-house services. Also there is a lack in understanding the meaning of life cycle costs, so, the owner is always searching for lower initial costs "Contract budget".

Despite the headache and responsibility of in-house services, the training of workers, their salaries and insurance, the owner still finds risks in outsourcing so he prefers in-house service to have strict control on the attitude of workers and their quality of work.

2.4 Illustrative Examples

Lack of studies during any phase through building life cycle leads to the evolution of various problems, accumulation of problems and absence of a tool that is capable of facing these risks and uncertainties problems make them too complicated to be handled. Integrating Facility Management and Value Engineering may introduce a tool and a coherent aspect to face risks and problems and save time and money. Below are some examples of problems

As a result of the absence of a facility management team", the problem was discovered during construction phase and solving it became more complicated, if it had been discovered early, during design or pre-schematic phases, it would have been solved easily and wouldn't have caused a huge increase in project's total cost.

2.4.2 Project 2: The Mataf Project

The second stage of expanding "The Mataf" started in parallel with expanding the "Haram" and the "Service Building" projects, due to the accumulation of the construction waste, and the lack of studying the waste management procedures which is the responsibility of the facility management team, a part of the Haram



Figure (2-5): A Partial collapse in the Haram Expansion Building during Construction

Source: <http://www.el-balad.com/692781>: Last accessed: 15-03-2014

Expansion Building collapsed as shown in figure (2-5), this caused an increase in the project's budget as the collapsed part should be reconstructed, and it also had a negative effect on the project's time schedule⁽¹⁾.

⁽¹⁾ <http://www.el-balad.com/692781>: Last accessed: 15-03-2014

2.4.3 Project 3: Etisalat Building

Etisalat building in New Cairo City, 5th district, shown in figure (2-6) is considered a landmark, it is famous for its huge white ball at the top of the building with its unique design, after 6 months of operating the building, the bright white color of the ball began to fade due to the accumulation of dusts on the ball, Using in-house services, the owners tried to clean the ball but they found it very difficult, so they decided to outsource the cleaning of the white ball to an FM company and this added much costs to the operation and maintenance budget.



Figure (2-6): The White Ball at the top of Etisalat Building, New Cairo

Source: Captured by the author

During design phase, the architect refused to check the design of the white ball with a facility manager in order to recommend the best design and materials for the ball, the architect was very keen on the design and he thought that involving FM through project's early stages would only add unnecessary costs to the project's budget; while the fact is that involving FM through early stages would have saved huge costs through operation and maintenance phase and consequently, decreased the life cycle cost and added value to the building.

2.4.4 Project 4: Key Bank Building - USA



Figure (2-7): The Key Bank Building, USA

Source:http://www.johnsoncontrols.com/content/us/en/products/globalworkplacesolutions/new_case_studies/KeyBank.html: Last accessed: 21-01-2015

KeyBank shown in figure (2-7) is one of the largest bank-based financial services companies in the United States with assets of over \$90 billion. The project aimed at providing comprehensive facility management, resulting in over \$1.4 million in annual energy and operational savings in addition to developing strategic investment goals not only to optimize building operations but also to achieve sustainability, cost effective and reduced facilities operating costs. Over the past 15 years, the bank's FM unit focused on critical environment uptime, cost standardized maintenance, energy management, financial reporting and project management, among other facility services in order to improve the performance by changing the general approach of managing the building systems and upgrading the existing systems⁽¹⁾. The mentioned changes made a big impact as follows:

- Over 50% reduced energy consumption
- Nearly 1 million dollars savings in 2012
- 9 million dollars investments in energy conservations

⁽¹⁾http://www.johnsoncontrols.com/content/us/en/products/globalworkplacesolutions/new_case_studies/KeyBank.html: Last accessed: 21-01-2015

- 13 LEED certified facilities

2.4.5 Project 5: Dar New Premises



Figure (2-7): Dar New Premises, Smart Village

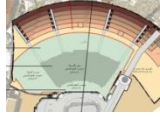




Source: Captured by the author

Dar New Premises, Smart Villages, shown in figure (2-7), is a new office building that aimed at contracting out and outsourcing all the non-core services to different parties in order to provide the chance to concentrate more on the core activities, decrease the operations costs and add value to the project. This project was taken as the thesis's case study and it was studied and analyzed in chapter four.

2.5 General Comparison

Table (2-7) is a general comparison between the previously mentioned five case studies to point out and illustrate the different types, causes and consequences of risks that may face a building through different phases during the building life cycle.

Table (2-7): Comparison between Different Types, Causes and Consequences of Risks on Projects

Project Name	Project 1: Haram Service Building Project	Project 2: The Mataf Project	Project 3: Etisalat Building	Project 4: Key Bank Building - USA	Project 5: Dar Project
Photo					
Scale of Project with reference to Budget	Mega Project	Mega Project	Average Project	Average Project	Average Project
Risk Description	Partial demolition during construction and loss of time, money and effort	A part of the building collapsed. Increase in the project budget and waste of time.	Unplanned operational costs	Low energy and operational savings	Unplanned operational costs and lack of design efficiency
Risk Type	Uncertainty Based Risk	Uncertainty Based Risk	Opportunity Based Risk	Opportunity Based Risk	Opportunity Based Risk
Risk Evolution Phase	During Construction	During Construction	Operation and Maintenance	Operation and Maintenance	Operation and Maintenance
Risk Cause & Phase	Lack of studies and coordination during design phase	Lack of coordination during construction, led to accumulation of construction waste	Absence of the FM team during design phase	Absence of FM team during operation and maintenance phase	Absence of the FM team during design phase
Phase of Controlling the Risk	During Construction	During Construction	Operation and Maintenance	Operation and Maintenance	Operation and Maintenance

The comparison illustrates different types of risks where the cause is almost the same in all projects. The absence of a facility management team that is responsible for overlooking the whole project and coordinating between all parties always affects the project negatively. This will be clearly illustrated in the concluding remarks.

2.6 Concluding Remarks

The FM Company is the company which enters into a contractual agreement with an organization (the project) to take the responsibility of achieving all the non-core services and give this organization the ability to concentrate and perform well on its core services. This process is called “*Outsourcing*”. An organization outsources its non-core services to an FM Company in order to achieve greater budget flexibility and control, reduce short-cut and regulatory costs to focus money and resources to its core services, save time and effort and consequently, decreases risks.

Determining the risks and uncertainties and being prepared to face them through the building life cycle helps in achieving the targets of facility management and value engineering. The lack of understanding the FM roles and responsibilities can have a negative impact on projects, especially in terms of both budget and value. The missing comprehensive tool that shall be ready to face uncertainties and risks, improve the functionality of the built environment, enhance the value, quality and performance of a project and decrease the costs throughout the building life cycle can only be achieved by embedding the practice of risk management into the process of facility management and value engineering.

As illustrated in table (2-8), different types of risks may face a building during different phases through its life cycle.

Table (2-8): Percentages of Different Types, Phases and Causes of Risk



Graph											
Risk Type	<p>A bar chart with a vertical axis from 0% to 70% in 10% increments. Two purple bars represent the data: 'Uncertainty Risk' at 40% and 'Opportunity Risk' at 60%.</p> <table border="1"> <thead> <tr> <th>Risk Type</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Uncertainty Risk</td> <td>40%</td> </tr> <tr> <td>Opportunity Risk</td> <td>60%</td> </tr> </tbody> </table>	Risk Type	Percentage	Uncertainty Risk	40%	Opportunity Risk	60%				
Risk Type	Percentage										
Uncertainty Risk	40%										
Opportunity Risk	60%										
Risk Description	<p>A bar chart with a vertical axis from 0% to 50% in 10% increments. Four teal bars represent the data: 'Demolition' at 20%, 'Collapse' at 20%, 'Low Savings' at 20%, and 'Unplanned Costs' at 40%.</p> <table border="1"> <thead> <tr> <th>Risk Description</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Demolition</td> <td>20%</td> </tr> <tr> <td>Collapse</td> <td>20%</td> </tr> <tr> <td>Low Savings</td> <td>20%</td> </tr> <tr> <td>Unplanned Costs</td> <td>40%</td> </tr> </tbody> </table>	Risk Description	Percentage	Demolition	20%	Collapse	20%	Low Savings	20%	Unplanned Costs	40%
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Phase of Controlling the Risk	Percentage										
O & M	40%										
Construction	60%										

Although the cause of different risks is almost the same, 60% of risks and problems may face a building during operation and maintenance phase, while 40% of problems evolve during the construction phase. Approximately all risks can be easily controlled in the same phase of evolution in case of applying FM approach. The severity of risk and the ability of controlling it differ from one project to another according to the phase of evolution, the consequences and the degree of preparedness to face the problem.

Chapter Three	Structure of Chapter Three
<p>The Status of Applying Facility Management</p>	<p>3.1 The National Status of Facility Management “The Egyptian Experience”</p> <p>3.1.1 National FM Codes</p> <p>3.1.2 Services Provided by the Egyptian FM Companies</p> <p>3.1.2.1 Non-Core Services</p> <p>A. Hard Services</p> <p>B. Soft Services</p> <p>C. General Services</p> <p>3.1.2.2 Used Technologies and Soft-wares</p> <p>3.2 The International Status of Facility Management</p> <p>3.2.1 International FM Codes</p> <p>3.2.2 The American Experience</p> <p>3.2.3 The Japanese Experience</p> <p>3.3 The Questionnaire Survey</p> <p>3.3.1 Findings of the Questionnaire Survey</p> <p>3.3.1.1 The Aspects of Facility Management Services</p> <p>A. Scope of Services Provided by FM Companies</p> <p>B. The vision</p> <p>C. The Quality Regulations</p> <p>D. The Efficiency of Provided Services</p> <p>E. Flexibility</p> <p>3.3.1.2 The Percentage of Applying Facility Management on Projects</p> <p>3.3.1.3 The Scale of Projects Applying Facility Management</p> <p>3.3.1.4 The Phases of Applying Facility Management on Projects</p> <p>3.3.1.5 Current Status and Performance of FM in Egypt from the Point of View of Managers, End Users and Service Providers</p> <p>3.4 Conclusion of Chapter Three</p>

Chapter Three

The Status of Applying Facility Management

The chapter's target is to clarify and determine the application status of facility management both nationally and internationally. This is achieved through a comparative analysis between the services provided by FM companies in Egypt and the international FM companies in addition to a questionnaire that was distributed among general construction projects managers, FM practitioners and academicsetc. who are involved in the field of FM. The target of the questionnaire was to gather data and conclude the current status and progress of FM in Egypt.

3.1 The National Status of Facility Management “The Egyptian Experience”

In Egypt, FM is commonly understood as housekeeping and maintenance function in buildings⁽¹⁾. There are about 20 Facility Management Companies in Egypt; the first company was established in 1999. All FM companies are concentrated in the North (Lower Egypt) especially in Giza and Cairo, connected to the new construction communities. Figure (3-1) illustrates the timeline that represents the establishment and progress of facility management companies in Egypt starting from 1999 till 2004.

⁽¹⁾ Based on a survey and an open discussion with some FM practitioners in Egypt

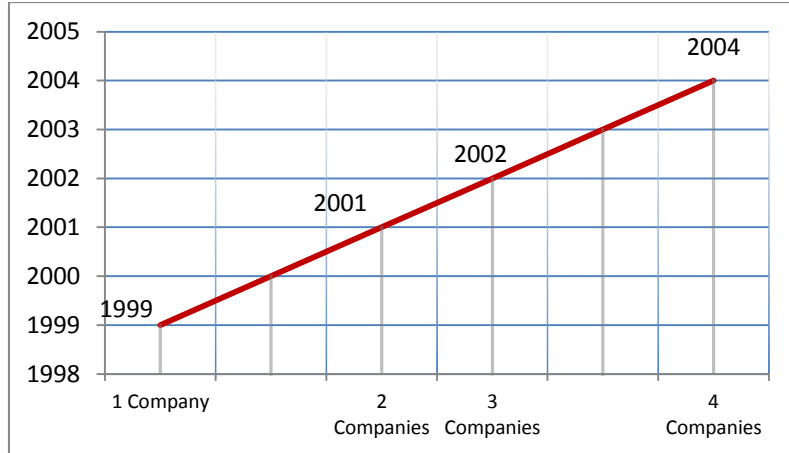


Figure (3-1): Timeline representing the Establishment and progress of facility management companies in Egypt

Source: Based on an open discussion with some FM Practitioners in Egypt

FM with its integrated definition appeared clearly in Egypt in 2004 when "The Nile Towers, Mega Project" needed to outsource its non-core services to an FM company through testing and commissioning and operation and maintenance phases, after that, "The Smart Village, Mega Project" found it necessary to outsource its infrastructure works to an FM company in order to be accomplished with least cost and time, and this was just the start, after achieving a great success with the mentioned mega projects, the market was totally opened to FM services⁽¹⁾. Nowadays, not only mega projects⁽²⁾, but also average projects are outsourcing their non-core services to FM companies in order to add value to the projects through their life cycle. From 1999 to 2004, FM companies in Egypt were concerned with providing only maintenance services to the buildings. Before 1999, The Egyptian FM companies were only providing housekeeping and security services.

⁽¹⁾ Based on a survey and an open discussion with some FM practitioners in Egypt

⁽²⁾ Mega Projects are defined as those complex projects that contain more than one type of average projects; where, a complex project may contain office buildings, hotels, malls, cinemas, restaurants, etc.

3.1.1 National FM Codes

In Egypt, at the beginning, there were only Maintenance companies and Housekeeping companies, after that, In-house services appeared, then a combination between maintenance and housekeeping companies occurred, this combination is then developed to become "Non-Comprehensive" FM companies, in addition to one or two "Comprehensive" FM Companies. The above may be the reason why FM is commonly applied through testing, commissioning and O&M phases. No clear codes are found for applying FM through design or pre-schematic phases. FM Comprehensive Code, can be considered an integration "or a collection" between Design Codes, Fire and Safety Codes, Health, Safety & Environment (HSE) Codes, ISO Codes, Maintenance codes, Risk Management Codes, Housekeeping Codes, Catering Codes, etc. The Main Service Provider shall provide and keep on site up to date copies of all relevant Regulations, Standards and Codes of Practice. He shall allow the Client/Employer access to such copies at all reasonable times.

3.1.2 Services Provided by the Egyptian FM Companies:

The new worldwide trend is to make the best use of time and money to achieve optimum performance by hiring an outsource company and working in a partnership with it to manage and provide comprehensive services to all business fields starting from establishing policy, up to, run into business itself. The Egyptian FM companies aim at following the new worldwide trend through providing integral systems services and delivering non-core services (hard and soft services) which are concerned with reducing costs and risks while increasing flexibility and quality, optimizing operational performance, smoothing out the work process and minimizing the running costs.

3.1.2.1 Non-Core Services:

Non-core services are services aspects that are not necessarily required by a firm in fulfilling its value proposition to its customers, such as installation, operation, or maintenance of a system, which can be outsourced to third parties⁽¹⁾. Non – Core Services include: Hard Services, Soft Services and General Services.

A- Hard Services:

Hard services concern the technical operations and maintenance of all building systems⁽²⁾, including the following:

Electrical Power Reticulations:

Electrical power reticulations includes daily works of repairing and maintaining simple to complex electrical systems of a building such as, repairing a fluorescent light or changing bearings on an electric motor, troubleshooting and repairing complex motor control circuits and Programmable Logic Controller systems⁽³⁾, etc.

Refrigeration Technology:

Air-conditioning consumes the highest amounts of energy in a building. So, it is very important to manage this system in a professional way to achieve the thermal comfort levels for the users using the least amount of energy by implementing specific preventive maintenance programs⁽⁴⁾.

⁽¹⁾ Business Dictionary: Non-Core Activities Definition <http://www.businessdictionary.com/definition/non-core-activities.html>: 17-11-2013

⁽²⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 17-11-2013

⁽³⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 20-11-2013

⁽⁴⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 20-11-2013

Light Current Engineering:

It is concerned with application of low power electrical systems such as maintaining, installing and managing the equipment and components used in telecommunications, navigation, data processing and process control⁽¹⁾.

Domestic & Fire Reticulations:

Operating and maintaining the domestic water and firefighting water systems shall be carried for all the systems components including pumps, valves, network, control circuits and periodic function test to ensure the continuity of service and the proper operation in case of emergency⁽²⁾.

Architectural Maintenance:

Architectural maintenance services include⁽³⁾:

- Door, window and screen repair/replacement
- Glass, window and shade repair/installation
- Interior and exterior locking installation/repair and key replacement
- Interior signage installation
- Outdoor signage/banners for all campus events
- Painting, plastering, patching and other repairs for walls, floors and ceiling.

Mechanical Engineering Reticulations:

Mechanical engineering reticulations include⁽⁴⁾:

- Optimizing the building maintenance procedures
- Analyzing the repetitive failures of equipment
- Estimating maintenance costs and evaluating the alternatives
- Controlling the spare parts

⁽¹⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 1-12-2013

⁽²⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 1-12-2013

⁽³⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 10-12-2013

⁽⁴⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 10-12-2013

- Assessing the need for equipment replacement and establishing replacement schedules
- Determining the required maintenance tools and required skills for efficient maintenance of equipment
- Assessing the safety of hazards associated with maintenance of equipment

Building Management Systems:

Building management systems include⁽¹⁾:

- Operating all the building systems
- Ensuring that all the building systems are working with maximum efficiency and complies with the original design parameters
- Making sure that any changes do not affect other systems or work progress

B- Soft Services:

Soft services are the range of support services dedicated to the building and occupants⁽²⁾. They include:

House Keeping:

The scope of housekeeping services covers⁽³⁾:

- Post construction initial deep cleaning
- Consulting services on cleaning issues and problems
- High-rise window and internal façade cleaning
- Marble floor care & maintenance services
- Vinyl and parquet polymer polishing & refinishing
- Carpet cleaning & maintenance
- Professional computer cleaning & antistatic treatment
- Cleaning and conditioning of upholstery & leather furniture

⁽¹⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽²⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽³⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

- False Ceiling cleaning
- Professional air duct cleaning and disinfection
- Boilers, generators, and kitchen exhaust equipment cleaning
- Water or fuel tank cleaning

Façade Cleaning:

Façade cleaning includes the cleaning of all the external elevations and multi-floor atriums by spider-men team who are equipped with suitable equipment, machines and tools to help them applying the best scientific techniques of cleaning the façades safely⁽¹⁾.

Security & Fire Safety Services:

Security and safety services are an important part of FM services to ensure the protection and safety of the building and the client's assets, their staff and visitors. The security officers are responsible for inspecting all escape corridors and staircases, fire escape doors, checking on all fire protection equipment to ensure they are working properly. They are also responsible for managing the evacuation of a building during any emergency and training the users to deal with all types of emergencies⁽²⁾.

Health & Safety:

FM companies are responsible for providing a healthy and safety environment for the users through implementing the required health and safety regulations. They are responsible for ensuring that any activity is achieved safely without causing any pollution and that the pollution is terminated immediately in case of occurrence⁽³⁾.

⁽¹⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽²⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽³⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

Landscaping:

Landscape program covers landscape maintenance of all the building surroundings as well as the maintenance of trees, shrubs and indoor plants⁽¹⁾.

Pest Control:

Integrated Control for pests means improving sanitation plus conventional treatment by the use of safe and recommended chemicals by all international agencies as well as local concerned authorities. Rodents, rats, flying and crawling insects are controlled through a regular periodic plan that ensures total control results⁽²⁾.

C- General Services:

Integrated Services:

Integrated services include⁽³⁾:

- Physical and passive security services.
- Consulting services.
- Evacuation policies and procedures.

Corporate Services:

Corporate services include⁽⁴⁾:

- Space Management and Tenant Installation
- Stationery Control
- Mail Room and Courier Services
- Receptionist and Telephone
- Network Management

⁽¹⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽²⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 25-12-2013

⁽³⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 28-12-2013

⁽⁴⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 28-12-2013

Asset Management:

Asset management integrates the practices, processes and technologies to achieve the best effective efficiency and value of money. It also helps the facility manager with managing and understanding the operation costs⁽¹⁾.

Property Management:

Property management is providing a service that spans the entire life cycle of any high value commercial real estate specially retails and commercial offices through managing the below⁽²⁾:

- Design criteria that will have a cost impact on the operating cost later
- Operating criteria to achieve the best investments
- Leasing criteria, structure and strategy
- Managing the operating costs of services
- Relationship management
- Tenants
- Governorate
- Utility service providers

3.1.2.2 Used Technologies and Soft-wares (TIFM)

TIFM technology or Total Infrastructure and Facilities Management technology can be considered as a keystone and future worldwide trend that for sure will help in providing and applying integrated facility management solutions for different projects. The most common used FM soft-wares in Egypt are Timberline and Archibus.

Archibus:

ARCHIBUS is one of the best facilities management solutions. It provides a single, comprehensive document about an organization's people, places, processes, and physical assets. This integrated information system facilitates the

⁽¹⁾ Contrack FM official site: Hard Services http://www.contrackfm.com/hard_services.html Last accessed: 28-12-2013

⁽²⁾ Contrack FM official site: http://www.contrackfm.com/property_management.html: 20-11-2013

strategic decisions making which in return helps achieving maximum investments, lower asset life cycle costs and better productivity and profitability⁽¹⁾.

Timberline:

Timberline is software that eliminates obstacles between accounting and business operations by synchronizing information smoothly between different departments in the company to streamline the whole management processes from payroll and job costing to receivables and cash flow⁽²⁾.

3.2 The International Status of Facility Management

There are about 4 main FM associations all over the world; “The International Facility Management Association, IFMA” was the first to be established in America in 1982, “The Facility Management Association of Australia, FMAA” was the established in 1988, then “The British Institute of Facilities Management, BIFM” was founded in 1994 and “The South African Facilities Management Association, SAFM” in 1997. Figure (3-2) represents the establishment and progress of the international FM associations.

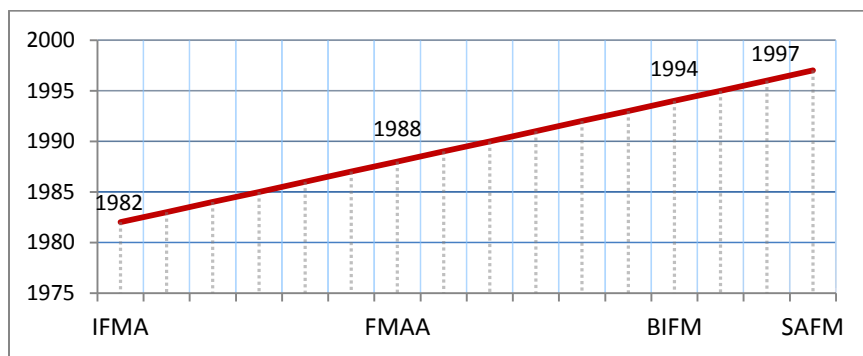


Figure (3-2): Timeline representing the Establishment and progress of facility management associations internationally

⁽¹⁾ Contrack FM official site: <http://www.contrackfm.com/technology.html>: 20-11-2013

⁽²⁾ Contrack FM official site: <http://www.contrackfm.com/technology.html>: 20-11-2013

3.2.1 International FM Codes

Before establishing the previously mentioned associations and determining a specific definition and role of the facility management; FM was considered to be maintenance works in buildings. Building maintenance works were defined in different ways by many international maintenance codes. Those codes were then developed and modified to cover some housekeeping requirements, catering requirements, air quality requirements, etc. till it then became the "Code of Practice - FM Briefing" as follows:

In 1972, the Committee on Building Maintenance commended this definition of maintenance:

Work carried out in order to keep, restore or improve every facility, i.e. every part of the building, its services and surrounds to a currently acceptable standard and to sustain the utility and value of the facility⁽¹⁾.

The British Standards - BS 3811: 1984 defines Maintenance as:

A combination of any actions carried out to retain an item in, or restore it to an acceptable condition⁽²⁾.

BS 8210: 1986 (BSI, 1986), defined building maintenance as:

Work other than daily and routine cleaning, necessary to maintain the performance of building fabric and its services⁽³⁾.

BS 3811 in 1993 defines Maintenance as:

The combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function⁽¹⁾.

⁽¹⁾ Hill, M. G. (Copyright © 2004). Facility Design and Management Handbook. Downloaded from Digital Engineering Library @ McGraw-Hill (www.digitalengineeringlibrary.com).

⁽²⁾ M. K. Kurdia, A.H. Abdul-Tharim, N. Jaffar, M.S. Azli, M.N. Shuib, A.M. Ab-Wahid. Outsourcing in Facilities Management- A Literature Review

⁽³⁾ <http://www.dmmserver.com/DialABook/978/140/517/9781405179676.html>, Last access date: 01-06-2014.

BS 8536:2010 - Facility Management Briefing – Code of Practice:

"This standard gives recommendations for facility management briefing to ensure that design takes account of the expected performance of the facility in use⁽²⁾.

The Code of Practice presented the most comprehensive definition of "Maintenance" since it defined maintenance as an important part of facility management that should be considered through early design stages of a building in order to reduce building life cycle cost, achieve better quality and save time.

3.2.2 The American Experience

The science of FM was first illustrated and clarified in America after establishing the International Facility Management Association (IFMA) in 1980. International FM companies provide Hard, Soft and General Services. The detailed scope of services provided by the American FM companies was determined by IFMA in its online buyer guide as mentioned in table (3-2)⁽³⁾.

⁽¹⁾ M. Khattab, Ayman. Facility Management as a Tool for Managing Building Maintenance and More.

⁽²⁾ <http://www.dmmserver.com/DialABook/978/140/517/9781405179676.html>, Last access date: 03-06-2014.

⁽³⁾ International Facility Management Association official site, Buyer's Guide: <http://onlinefmguide.com/>: 22-11-2013

Table (3-1): Classification of Services Provided by the American FM Companies

Services Provided by The International FM Companies			
Building Accessories			
<ul style="list-style-type: none"> - ADA Compliance Signage - Art - Art Storage - Backflow Prevention - Bike Lockers - Bike Racks - Clock Systems - Custom Framing - Dry Erase / Marker Boards - Equipment Brokers - Fiber Manufacturers 	<ul style="list-style-type: none"> - Flags / Flagpoles - Floor Mats - Frames and Displays - Hand Dryers - Ice Dispensers / Machines - Indoor Playground Equipment - Ladder Safety - Landscape - Laundry Equipment - Library Equipment 	<ul style="list-style-type: none"> - Magazine Racks - Material Handling Equipment - Modular Walls - Office Partitions - Office Products / Accessories - Planters - Podiums - Projection Screens - Refrigerators - Restroom Products 	<ul style="list-style-type: none"> - Roofing Accessories - Sign Holders - Signage - Systems Integrator - Turnstiles - Waste Receptacles - Water Fountains - Way finding - Window Cleaning Equipment - Window Treatments - Logo Mats
Building Components			
<ul style="list-style-type: none"> - Acoustical - Adhesives - Air Fresheners - Anchors - Asphalt - Aviation Facility Supplies - Cable Management - Cabling / Fiber Optics - Carpet / Floor Covering - Ceilings / Ceiling Care - Commercial Roofing - Concrete Protection - Conveyors - Cool Roof - Countertops / Cabinets - Custom Staircases - Davits - Demountable Walls - Dock Equipment - Door / Door Hardware - Drywall / Joint Compound - Electrostatic Painting - Elevator Cab - Elevator 	<ul style="list-style-type: none"> - Fabric / Fabric Care - Fire Door - Fixtures - Retail / Store - Flooring Repair / Restoration - Flooring Systems - Germicidal Lighting - Glass Tinting / Coating - Ground Power Cable Assemblies - Ground Support Equipment (GSE) - Handicapped / Door Operators - Handrails - Heating Exchangers - HVAC - Industrial MRO - Insulation - Jet Bridge Parts - Lighting - Locker Room / Steam Baths - Locks - Lumber - Marble, Stone & Wood Refinishing - Metal Refinishing - Elevators 	<ul style="list-style-type: none"> - Movable Walls - Office Systems - Paging & Music Systems - Paints - Parking Lot Safety Management - Pavement Management - Paving - Piping Systems - Plants / Plant Care - Plumbing - Plumbing Fixtures - Plumbing Parts - Pneumatic Tube Systems - Polished Concrete - Portable Heat - Records Storage - Repair / Restoration - Restroom Partitions - Retrofit - Roofing - Rolling Steel Door - Roof Coatings - Roof Repair / Replacement 	<ul style="list-style-type: none"> - Satellite Systems - Sealants - Seal coating - Seating - Sheet Metal - Sound Masking - Spot Coolers / Portable Air Conditioners - Storage / Shelving / Filing - Surfacing Materials - Surge Protection - Sustainable Walls - Tables - Terrazzo - Textiles - Toilet Seats - Transformers - Uninterruptible Power Supplies and Service - Wall Covering / Protection - Wall Systems - Waterproofing - White Noise - Window Film - Windows - Wiring Systems - Modular Walls

Services Provided by The International FM Companies			
Maintenance		<ul style="list-style-type: none"> - Roofing - Room Dividers - Modular / Portable Buildings 	
Building Construction / Design			
<ul style="list-style-type: none"> - Architecture - Art Consultant - Carpenters - Construction & General Construction Management - Construction Products - Data Center Design - Design Build 	<ul style="list-style-type: none"> - Earthquake Mitigation - Engineering - Environmental Assessment - Ergonomics - Garden Roof - HVAC Installation - Industrial Design - Interior Construction - Interior Design 	<ul style="list-style-type: none"> - Interior Landscaping Services - Interior Restoration - Kitchen Design - Landscape Architecture - LEED - Lighting Control - Masonry - Mechanical 	<ul style="list-style-type: none"> - Operable Partitions - Pre-Engineered Metal Buildings - Railing Systems - Roof Lifting - Scaffolding - Shot Blasting - Solar Shades - Surface Preparation - Documentation Services
Business Management			
<ul style="list-style-type: none"> - Asset Management - Dining Facility Alternatives - Equipment Brokers - High Density Filing 	<ul style="list-style-type: none"> - Lease book Service - On-Line Print Management - Permit Management 	<ul style="list-style-type: none"> - Project Management - Records Management - Roof Asset Management 	<ul style="list-style-type: none"> - Space Planning / Management - Vertical Lift Storage - Warehouse Management
Business Services			
<ul style="list-style-type: none"> - Advertising - Art Appraisal - Art Installation - As-Built - Asset Liquidation - Audio / Visual - Auditing Services - Background Checking - Benchmarking - Beverage Companies / Coffee / Vending - Bird Control - Building Supplies / Services - Catering - Certification / Continuing Education - Clean Room Services - Coil Cleaning - Combustible Dust - Commissioning - Concierge Services - Controllers - Copier Dealers 	<ul style="list-style-type: none"> - Desk Sharing - Digital / Commercial Printing - Duct Cleaning - Educational Seminars / Workshops - Equipment Brokers - Equipment Rental - Event Planning - Executive Search - Expansion Control - Express Shipping - Feasibility Studies - Field Verification - Financial Management - Floor Plan Surveys - FM Providers - Food Service - Hoisting Services - Holiday Decorations - Holiday Lighting - Hot Desking 	<ul style="list-style-type: none"> - Interior Landscaping Services - Inventory Services - Irrigation - Janitorial - Key / Lock Core Services - Lease Audits - Legal Services - Magazines & Publications - Mail - Mail Pick Up / Delivery - Manage Print Services - Millwork - Mobility Assessment - National Purchasing - Odor Control - Organizations - Other - Outsourcing - Paper Shredding 	<ul style="list-style-type: none"> - POS Systems - Preconstruction Budgeting - Procurement - Property Management Companies - Reprographics - Restroom Services - Retailing - Risk Management - Scheduling - Staffing - Trades - Teleconferencing - Trade Show Shipping - Trade Shows - Tree Maintenance - Vendor Screening - Videoconferencing - Waste Removal - Waste Water Treatment - Water Conservation - Water Coolers - Water Purification Systems - Water Treatment

Services Provided by The International FM Companies			
- Crane Rentals - Decoration Plant Rentals	- HVAC - Air Filtration - HVAC - Water Treatment - Insurance	- Parking Lot Sweeping / Maintenance - Parking Services - Pest Control - Photography / Imagery	
Computer / Technology			
- Area Calculations Software - Asset Management - Bid Facilitation - Blueprints - Scanning - Building Automation - CAFM Services - CAFM / CAD / FM Software - Chargeback Software - Cloud Computing	- CMMS - Communication Systems - Computer Support Products - Custodial Management - Digital Closeout Documentation - EAM Software - Graphics / Graphic Design - Information Technology - Security - Inspection Software	- Internet Based FM Resources - IWMS Software - Landscape Water Management - Lease Management Software - Maintenance Software - Mobile / Wireless - Quality Assurance - Reporting Analytics - Reprographics	- RFID - Room Scheduling Software - Software and Technology - Surge Protection - Telecom Consultants - Telecom Site Management - Telecommuting / Remote Access Solutions - Virtual Office
Consultants / Contractors			
- Accessibility - Air Quality Evaluation / Remediation - Arborist - Area Calculations - Art Consulting - Building Envelope Consultants - Communications - Cabling Systems - Concrete Contractors - Contract Cleaning - Contractor	- Electrical Contractor - Electrical Engineering - Engineering Consultants - Environmental Consultants - Equipment Brokers - FM Consultants - Food Service Consultant - Food Service Management - Handyman - Indoor Air Quality / IAQ - Pest Management	- Janitorial Consultants - LEED Carpet / Flooring - Inspection - LEED Consultants - Low Voltage Contractors - Materials Management / Handling - Mechanical Contractors - Mechanical Engineering - Paint Consultant / Inspector	- Plumbing - Property Management Consultants - Real Estate - Relocation Services - Roof Consultants - Roof Lifting Contractors - Roofing Contractor - Staircase Design / Build - Workplace Violence Consultants
Energy / Electrical			
- Commercial Heating - Critical Power - Day Lighting - Electrical - Electricity / Energy Solutions - Emergency Lighting	- Energy Retrofits / Performance Contracting - Generator Connection - Cabinets - Generators - Green Building - HVAC / IAQ /	- Power Distribution - Power Factor Correction - Power Quality - Preventive Maintenance - Renewable Energies	- Solar Energy - Solar Lighting - Sub-Meeting - Sustainable Energy - Uninterruptible Power Supply - Utilities - Watthour Meters - Wind Turbine

Services Provided by The International FM Companies			
- Energy Conservation - Energy Consultants	Energy Management - Infrared Testing - Lighting - Lighting Control	- Renewable Energy Consultants - Sky Lighting - Solar Companies	-
Fire Protection Systems			
- Fire Alarms - Fire Detection - Fire Extinguishers - Fire Protection	- Fire Protection Systems - Fire Sprinklers - Fire Stop - Fire Suppression Systems	- Kitchen Exhaust Cleaning - Mass Notification - Pipe Coverings - Pipe Enclosures	- Pipes & Pumps - I D Label / Tagging - Pump Systems - Soffits
Flooring			
- Carpet Care - Janitorial Products / Services - Carpet Replacement - Carpet / Floor Covering - Concrete Polishing	- Fiber Manufacturers - Floor Coatings - Flooring Consultants / Inspection - Flooring Design	- Flooring Installers - Flooring Systems - Interlocking Tile - Raised Access Flooring	- Repair / Restoration - Terrazzo - Tile
Furniture			
- Caseworks - Chair Maintenance / Repair - Chair Mats - Custom Woodworking - Furniture - Ergonomic - Furniture - Laboratory - Furniture - Lease	- Furniture - New - Furniture -Rental - Furniture Restoration / Refinishing - Furniture Seating - Furniture - Tech / LAN - Furniture - Used / Refurbished - Furniture Installation and Management	- Furniture Moving - Furniture Systems - Healthcare Furniture - Keys / Lock Cores - Mail - Modular Furniture / Cubicles - Mounting Accessories - Office Furniture	- Pre-owned Office Furniture - Restaurant Furniture - Storage / Liquidation / Disposal - Surplus Property - Work Bench - Work Station
Health / Safety / Security			
- Access Control Systems - ADA - CCTV / Surveillance Systems - Corporate Fitness - Drug Testing - Earthquake Preparedness - Emergency Preparedness	- Environmental Safety - Executive Protection - Fall Protection - Fencing / Perimeter Fencing - Flood Protection - General - GPS	- Health / Safety Training - Industrial Hygiene - Mold Testing - Parking Management Systems - Pipes & Pumps - I D Label / Tagging - Safety - Safety Systems	- Security - Security Bollards - Security Officers / Guards - Security Services - Security Systems - Visitor Management
Janitorial Products / Services			
- Air Freshener Services - Building	- Dust Control - Floor Care - Furniture	- Janitorial - Janitorial Consultants	- Janitorial Supplies - Waste Management - Window Cleaning

Services Provided by The International FM Companies			
<ul style="list-style-type: none"> - Maintenance Carpet Care 	<ul style="list-style-type: none"> Cleaning 	<ul style="list-style-type: none"> - Janitorial Services - Construction Cleanup 	
Restoration / Maintenance / Recycling			
<ul style="list-style-type: none"> - Art Restoration - Awning Cleaning - Biohazard / Crime Scene Cleanup - Building Maintenance / Repair / Restoration - Ceilings / Ceilings Care - Commercial Snow Removal - Concrete Repair - Demolition - Design for the Environment (DFE) - Disaster Planning / Recovery / Restoration - Document Destruction 	<ul style="list-style-type: none"> - Drainage Systems - Electronics Recycling - Environmental Control Systems - Environmental Remediation - Equipment Brokers - Equipment Rental - Escalator - Escalator Cleaning - Facility Auditing - Fire / Water Damage - Flooring Repair / Restoration - Glass Recycling - Pavement Marking 	<ul style="list-style-type: none"> - Graffiti Removal - HVAC Repair / Maintenance - Identification / Labels / Wire & Cable Markers - Interior Landscaping Services - Irrigation - Landscape Maintenance - Machinery Condition Monitoring - Metal Maintenance - Mold Remediation - Outdoor Maintenance 	<ul style="list-style-type: none"> - Pipes & Pumps - Maintenance / Repair - Pressure Washing - Recycling - Restorative Drying - Roof Restoration - Stone Restoration - Terrazzo Repair - Tile / Grout Restoration - Tool / Parts - Vibration Analysis - Waterproofing - Pipes & Pumps - I D Label / Tagging - Drain Cleaners
Transportation / Moving / Travel			
<ul style="list-style-type: none"> - Air Courier / Freight - Baseline Inventory - Computer Disconnect / Relocation / Re-connect - Corporate Hoteling 	<ul style="list-style-type: none"> - Decommissioning - Hoteling - Moving Equipment - Moving Services 	<ul style="list-style-type: none"> - Moving Supplies - Office Moving - Relocation Coordinators - Rigging 	<ul style="list-style-type: none"> - Transportation / Logistics - Utility Vehicles - Warehouse Fulfillment & Distribution

Source: International Facility Management Association official site, Buyer's Guide:
<http://onlinefmguide.com/>: 22-11-2013

3.3 The Questionnaire Survey:

This questionnaire form was distributed in order to gather data about facility management in Egypt, its history, when appeared, what tasks are involved in it, if there are tools to apply it, if value engineering is considered one of these tools, if it is involved in risk management and what kind of projects are applying it. The Questionnaire Form is attached in appendix (2).

The survey was performed on a number of FM companies in Egypt and through the open discussion that was conducted among a group of general construction projects managers, FM practitioners, and academics ...etc. To evaluate the performance of FM provided services, five main aspects were identified; vision, efficiency, flexibility, quality and scope of services. The questionnaire comprises 10 main questions; each two investigates one of the five main aspects that were previously identified. Table (3-2) shows both the questions and the intended objective of each of them.

Table (3-2): Questionnaire Survey: Questions and Objectives

Identified Aspect	Objective	Questions	Evaluated variable
Vision	Knowing the main target of the company and its provided services	Would you please introduce your company to me and explain what services do you provide to your clients?	Status
	Knowing the main target of FM companies	What is the main target of FM companies in Egypt?	
Quality	Knowing if there are any <i>codes or standards</i> to define and assess the percentage and impact of applying FM on a building	From your point of view, why is applying FM important?	Status
Scope of service	Knowing the <i>approximate budget and types</i> of projects that were the first to apply and use FM tools in Egypt	What were the types and the scales of projects that were the first to use FM tools since appearing of this scope in Egypt?	Importance
	Judging the future of FM in Egypt and the scale of their work in the Egyptian market since they have opened	What is the scale of projects that are supposed to be applying FM in 2014?	
Efficiency	Knowing <i>the effect of applying FM</i> through building life cycle	Through which phases (design, pre-schematic, construction, operation, etc...) and Why, FM is commonly applied? And in your opinion, which phases should it be applied and why?	Impact
	Knowing the effect of applying FM on risk management	Do you have any experience with risk management in projects? How can Risk Management and benefit from applying FM?	
Flexibility	Knowing and measuring <i>the effect of flexibility</i> on the quality of FM Services	How do you assess the flexibility in your company? Do you need to outsource some services and why?	Status

3.3.1 Findings of the Questionnaire Survey:

The Egyptian FM companies aim at providing integral systems services and delivering non-core services (hard and soft services) which are concerned with reducing costs and risks while increasing flexibility and quality, optimizing operational performance, smoothing out the work process and minimizing the running costs.

3.3.1.1 The Aspects of Facility Management Services

The previously mentioned five main aspects that can be used to evaluate the performance of FM provided services are vision, efficiency, flexibility, quality and scope of services. They can be illustrated as follows.

A. Scope of Services Provided by FM Companies

As previously mentioned in this chapter, FM companies provide non-core services (Hard, Soft and General Services). Table (3-3) clarifies the classification of the services provided by FM companies in Egypt.

Table (3-3): Classification of Services Provided by the Egyptian FM Companies

Non – Core Services		
Hard Services	Soft Services	General Services
<ul style="list-style-type: none"> - Electrical Power Reticulations - Refrigeration Technology (HVAC) - Light Current Engineering - Domestic and Fire Reticulations - Architectural Maintenance - Mechanical Engineering Reticulations - Building Management Services 	<ul style="list-style-type: none"> - House Keeping - Façade Cleaning - Security and Fire Safety Services - Landscaping - Pest Control - Concierge Program (Guard) 	<ul style="list-style-type: none"> - Consultancy - Integrated Services - Corporate Services - Asset Management - Property Management - Inspection and Repairs - Rent Collection - Accounting Services - Advertising - Utility Payment - Archibus - Timberline - Process Support

Source: Based on the survey and the discussion with some FM practitioners

B. The vision

While the “vision statement” for facilities management companies forms a key stone in their work, this is not the case with the FM companies in Egypt. The employees working in the facility management companies form an important part in realizing the vision of their company. Their role includes assuring that

FM work-place is a valued and motivating place where everyone can exchange experiences, participate, learn and grow⁽¹⁾.

Through the applied questionnaire on a number of FM Egyptian companies' managers and employees in addition to an internet survey to determine the exact vision and aim of FM companies in Egypt, the vision of FM Egyptian companies can be summarized as follows:

- Vision of the company is always designed based on the client's needs
- Managing and delivering non-core services through reducing cost and risk while increasing flexibility and quality.
- Preserve facilities without allowing them to fall into disrepair.
- Introducing practical solutions to help enriching the field of FM in Egypt
- Considering people as a core asset and encouraging a culture of continuous personal development through career progression, knowledge enhancement and skill development.
- Encouraging the staff to continually focus on improving their deliverables to customers in a sustainable way, professionally executed, and reaching out to customers, so as to understand the best way to support their core business interests.
- Enhancing project's sustainability

C. The Quality Regulations

Originally, there is no code that can be named FM code or Quality code for outsourced services. FM is only guided through a number of maintenance codes and ISO standards. An FM company can be ISO certified through implementing some international standards like ISO 14001 Environment management standard or OHSAS 18001 standard.

⁽¹⁾ N.E.M.Nik-Mat, S.N.Kamaruzzaman, M.Pitt-2011-Assessing the maintenance aspect of facilities management through a performance measurement system: Amalaysian case study- the 2nd international building control conference 2011- Elsevier publisher-procedia engineering 21- pp329-338].

In Egypt, at the beginning, there were only Maintenance companies and Housekeeping companies, after that, In-house services appeared, then a combination between maintenance and HK companies occurred, this combination is then developed to become "Non-Comprehensive" FM companies, in addition to one or two "Comprehensive" FM Companies. The above may be the reason why FM is commonly applied through testing, commissioning and operation and maintenance phases. No clear codes are found for applying FM through design or pre-schematic phases. FM Comprehensive Code, can be considered an integration "or a collection" between Design Codes, Fire and Safety Codes, HSE Codes, ISO Codes, Maintenance codes, Risk Management Codes, Housekeeping Codes, Catering Codes, etc. The Main Service Provider shall provide and keep on site up to date copies of all relevant Regulations, Standards and Codes of Practice.

ISO 14001:"Environmental Management Standard":

ISO 14001 was first published in 1996 to clarify the exact requirements for an environmental management system. It can be applied to any environmental aspects that should be handled by an organization ⁽¹⁾. ISO 14001 standards is applicable to any organization that wishes to:

- Implement, maintain and improve an environmental management system
- Assure itself of its conformance with its own stated environmental policy (those policy commitments of course must be made)
- Demonstrate conformance
- Ensure compliance with environmental laws and regulations
- Seek certification of its environmental management system by an external third party organization
- Make a self-determination of conformance

⁽¹⁾ <http://www.iso14000-iso14001-environmental-management.com/iso14001.htm> Last accessed: 20-7-2014

OHSAS 18001: "Occupational Health and Safety Assessment Series":

OHSAS 18000 is an international occupational health and safety management system specification. It comprises two parts, 18001 and 18002 and embraces BS8800 and a number of other publications. OHSAS 18001 was a result of an organized effort by a number of the world's leading national standards parties, certifications, and specialist consultancies; it helps minimizing risk to employees, improving the health, safety and environment management systems, demonstrating diligence and gaining assurance⁽¹⁾.

Control of Substances Hazardous to Health "COSHH Basics":

COSHH is defined by the Health and Safety Executive (HSE) as: "The law that requires employers to control substances that are hazardous to health"⁽²⁾. The employees' exposure to hazardous substances can be prevented by:

- Finding out what the health hazards are.
- Deciding how to prevent harm to health (risk assessment).
- Providing control measures to reduce harm to health.
- Making sure they are used.
- Keeping all control measures in good working order.
- Providing information, instruction and training for employees and others.
- Providing monitoring and health surveillance in appropriate cases.
- Planning for emergencies.

Control of Substances Hazardous to Health (COSHH) Assessment Form:

COSHH is a form that should be filled in for each hazardous substance that is used in a building that may cause harm to the users or that employees, it addresses the risk of harm to health from the listed substances. The COSHH form identifies the state of the used chemical or substance, the exposed people,

⁽¹⁾ <http://www.ohsas-18001-occupational-health-and-safety.com/> Last accessed: 20-07-2014

⁽²⁾ <http://www.hse.gov.uk/coshh/basics.htm> Last accessed 19-09-2014

the location of the exposure, the harm that may be caused, the first aid measures, the ways of protection and the disposal requirements⁽¹⁾. A sample of the COSHH Assessment Form is attached in appendix (3).

D. The Efficiency of Provided Services

Evaluating the efficiency of provided services of FM companies delivery of FM services to the end users is a function of the FM performance itself and this is linked to the “Key Performance Indicators” provided. There are KPI standards that have been established to monitor the performance of the services provided by the FM companies. Amongst the values that define the standards of a company or organization are the excellence of their products or services, the integrity in their actions, and the accountability in the value of work. Also providing customers with a single point of contact to manage all facilities related inquiries where the response time shall depend on the nature of request is a prompt and professional way and indicator of the effectiveness of the FM Company⁽²⁾.

The Facilities Check list can be the measure of the supplier's "provider" satisfaction and evaluation to the quality of the provided service, the Key Performance Indicators can be the measure of the manager's satisfaction and assessment to the quality of the provided services and the local surveys can be the measure of the user's satisfaction and assessment to the quality of the provided services.

E. Flexibility

A survey was conducted to stand on the number of companies that provide each service, figure (3-3) illustrates that almost all the FM Egyptian companies

⁽¹⁾<http://www.hse.gov.uk/coshh/basics.htm> last accessed 19-09-2014

⁽²⁾ N.E.M.Nik-Mat, S.N.Kamaruzzaman, M.Pitt-2011-Assessing the maintenance aspect of facilities management through a performance measurement system: Amalaysian case study- the 2nd international building control conference 2011- Elsevier publisher-procedia engineering 21- pp329-338].

provide housekeeping and security services. On the other side, very few number of companies provide real estate and financial services; approximately, 100% of FM companies in Egypt provide operation and maintenance service "housekeeping", 87.5% provide administrative service "security", 87.5% provide facility planning service, 62.5% provide architectural and engineering service, 50% provide health and safety service, 37.5% provide space management service, 25% provide real estate service and 25% provide financial planning service.

The flexibility of the FM company includes the possibility to contract out the services to another party, or in other words, to transfer it. The FM Company may transfer the housekeeping service or the pest control service if its employees are more concerned with operation and maintenance services in order to provide comprehensive FM services as per the contract agreement with client.

The flexibility can also appear in the quality, efficiency and criticality through applying agreed key performance indicators (KPIs) and monitoring the performance of providers where the key performance indicators are “a set of quantifiable measures that a company or industry uses to judge or compare performance in terms of meeting their strategic and operational goals. KPIs vary between companies and industries, depending on their priorities or performance criteria”⁽¹⁾.

⁽¹⁾ <http://www.investopedia.com/terms/k/kpi.asp> Last accessed: 16-01-2015

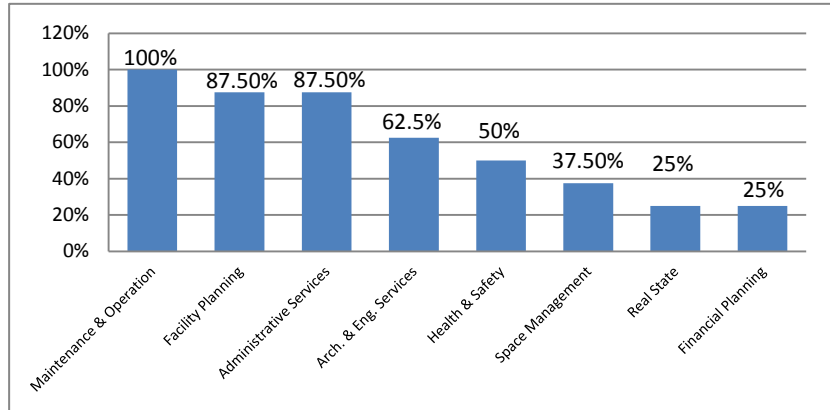


Figure (3-3): Percentage of Companies Providing Different FM Services

3.3.1.2 The Percentage of Applying Facility Management on Projects

Figure (3-4) represents the percentage of applying FM on projects in Egypt. FM was first applied in Egypt in 2004 where the Egyptian FM companies started with providing 60% of the FM roles which were defined by the “International Facility Management Association”. This percentage is then increased to reach 70% in 2014. It is supposed to reach 100% in the future by providing all the eight described FM roles, which means full applied comprehensive FM.

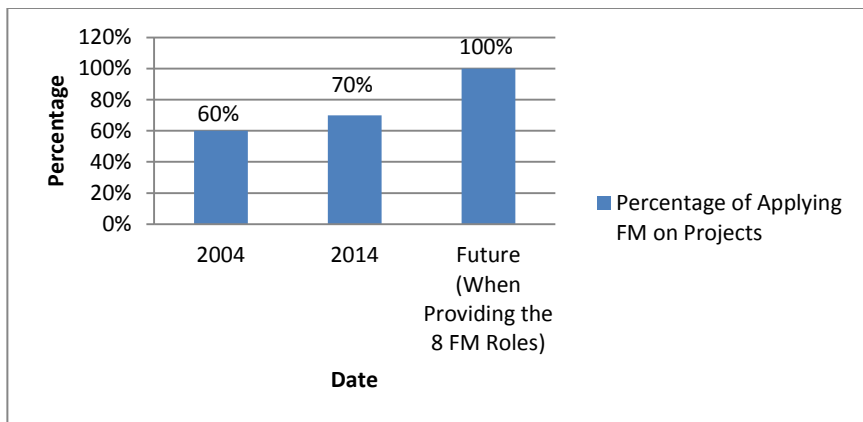


Figure (3-4): The Percentage of Applying FM on Projects

3.3.1.3 The Scale of Projects Applying Facility Management

Figure (3-5) represents the scale and percentage of projects applying FM in Egypt. The start was in 2004, when Nile City Towers Project was the first mega project to apply comprehensive FM in Egypt. In 2014, about 50% of the mega projects, 30% of the average projects and 2% of the small projects start applying FM. In the future, all the mega and the average projects in addition to 70% of the small projects are expected to be applying FM⁽¹⁾.

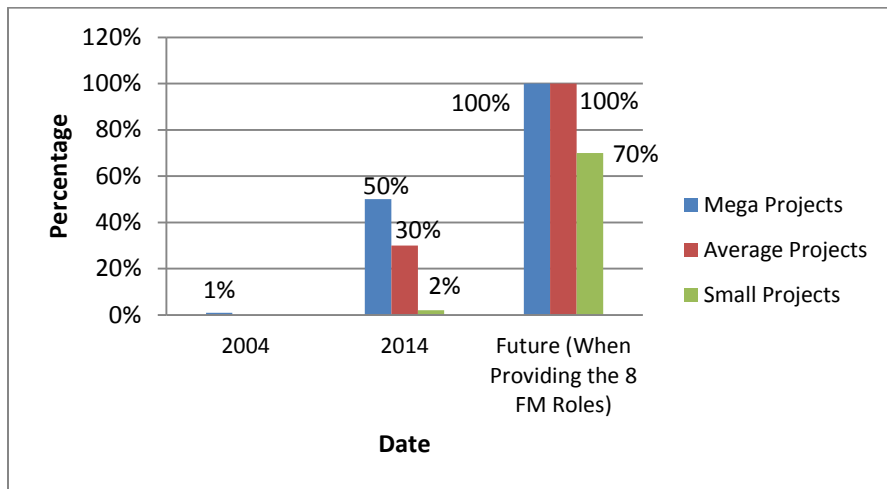


Figure (3-5): The percentage of different project scales that apply FM in past, present and expected future times when providing the 8 FM Roles

3.3.1.4 The Phases of Applying Facility Management on Projects

Figure (3-6) represents the percentage of applying FM through different project phases in Egypt. FM is commonly applied during late project phases. About 100% of the projects that considers applying FM start applying it through Operation & Maintenance phase. About 80% of the projects apply FM during testing and commissioning phase⁽²⁾ and only 30% of the projects apply FM

⁽¹⁾ Based on a survey and an open discussion with some FM practitioners in Egypt

⁽²⁾ Testing and Commissioning Phase, as adapted from ASHRAE Guideline 0-2005, https://www.wbdg.org/pdfs/comm_def.pdf, last accessed: 11-04-2015, is: "A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and

through construction phase. FM has never been applied through early project phases like pre-schematic or design phases⁽¹⁾.

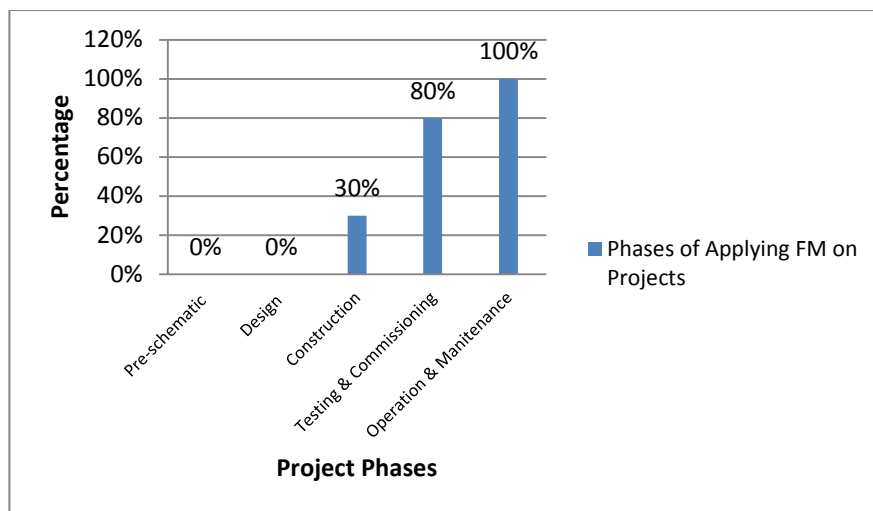


Figure (3-6): Phases of Applying FM on Projects in Egypt

3.3.1.5 Current Status and Performance of FM in Egypt from the Point of View of Managers, End Users and Service Providers

The open discussion and the survey results have shown that there is a discrepancy between the opinions of the target groups regarding the status of FM in Egypt as shown in figure (3-7) and table (3-4).

The service providers group is the most satisfied group, while the end users group is the least satisfied. 55% of the service providers who went through the questionnaire think that FM is achieving Good rates in Egypt and that it will be achieving better rates in the future, while only 20% of the end users group is satisfied with performance of the FM in Egypt. 35% of the end users think that FM is achieving average rates, while 25% found no difference between in-house

documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements". This phase is an intermediate phase between construction phase and operation and maintenance phase. Testing and commissioning phase ensures that all the building systems are working in a good condition and ready for operation and for users' use

⁽¹⁾ Based on a survey and an open discussion with some FM practitioners in Egypt

and outsourced services. On the other side, 40% of the target managers think that FM is achieving good rates, 60% think that FM is achieving average rates.

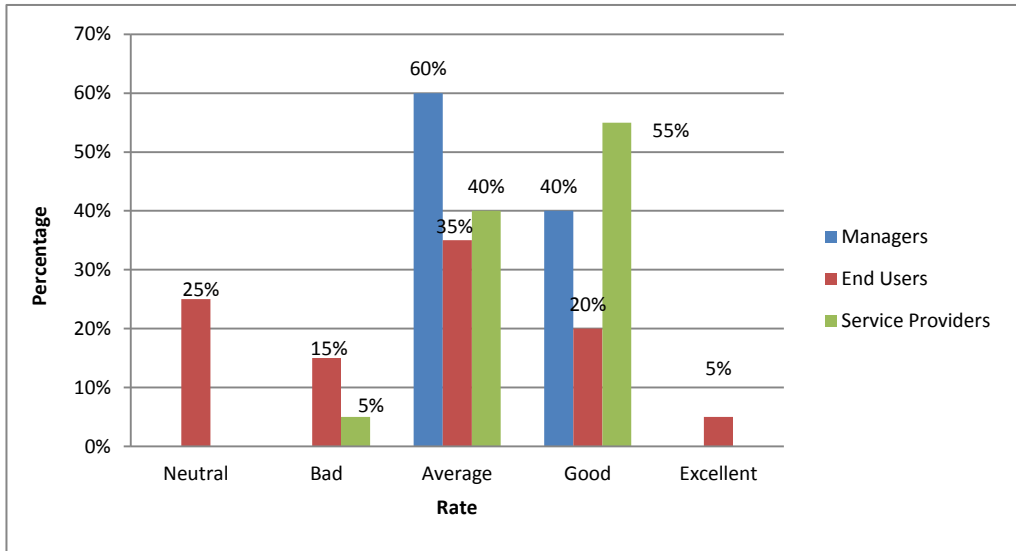


Figure (3-7): Performance and Status of FM in Egypt

Table (3-4): Performance and Status of FM in Egypt

Target Group	Rate	Percentage
Managers	Neutral	-
	Bad	-
	Average	60%
	Good	40%
	Excellent	-
End Users	Neutral	25%
	Bad	15%
	Average	35%
	Good	20%
	Excellent	5%
Service Providers	Neutral	-
	Bad	5%
	Average	40%
	Good	55%
	Excellent	-

Good applied FM can be achieved by decreasing the percentages of discrepancy between the 3 involved parties, the managers, the end users and the service providers. The service providers should consider the role of the managers and their requirements and points of view to improve the provided services. And both of them should consider the role of end users in evaluating and improving the performance and quality of the provided services which in return will help in achieving good applied FM in Egypt. An integrated team with a representative from each group shall be working together to establish a comprehensive management process to study and evaluate all the requirements and the optimum ways of providing satisfying performance of FM.

3.4 Conclusion of Chapter Three:

FM is an integrated process that should be involved in project's design phase and should have a continuous input through the building's life cycle even after demolition and recycling phases, but it all depends on the owner's and the project manager's deal with the FM company, they are responsible for deciding when to apply through which phase it should be applied.

Internationally, FM is always applied from day one; it has an effective input through design phase, it gives precautions and highlights all the risks that may face the building in construction and operation phases, it is responsible for preventative maintenance and for adding value to the project through its life cycle and it gives recommendations for making the best use of the building after demolition. Before establishing the FM associations; FM was considered to be maintenance works in buildings. Maintenance works were defined many international maintenance codes which were then developed to cover some housekeeping requirements, catering requirements, air quality requirements, etc. till it became the "Code of Practice - FM Briefing". Figure (3-8) is a time line that represents the development of the FM code and progress of FM internationally.

Housekeeping represents the highest value between all the provided services in the FM contract budget and this may be one of the reasons why FM services are misunderstood as housekeeping services in a building.

Maintenance and Security services represent the second two highest values after the housekeeping services and this may be one of the reasons why the Egyptian market considers a company providing the three mentioned services to be an FM Company according to their value and weight in the FM contract budget.

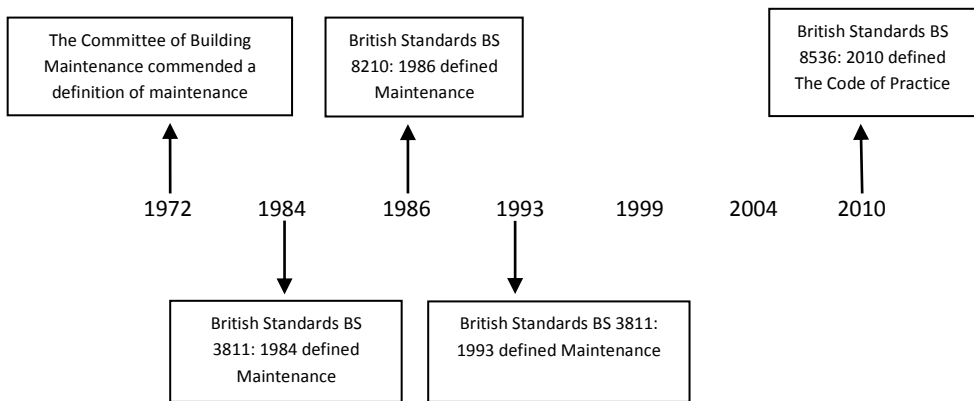


Figure (3-8): Timeline representing the progress of the International FM Codes

In Egypt, due to the lack of awareness, believing in over-quality and that anyone involved in the project can achieve any task related to that project, there is a misunderstanding that applying FM in early stages "design phase" would add unnecessary costs to the project's budget, so, in-house services are used instead of outsourcing services, and FM is only involved through testing, commissioning and operation and maintenance phases. In case of appearing of design phase problems or its consequences through late project phases, (construction, operation and maintenance), FM company will be responsible for solving these problems but more costly in terms of both time and money. Egyptian FM companies were only providing maintenance services from 1999 to 2004, before 1999, FM companies were only providing housekeeping and

security services. Figure (3-9) is a time line that represents the progress of the FM provided services in Egypt.

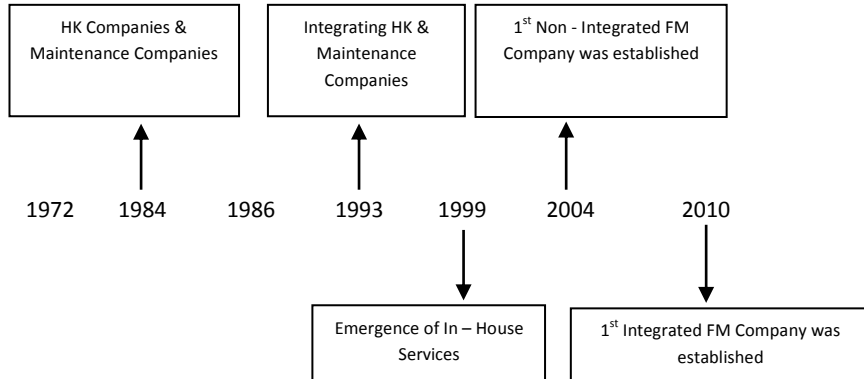


Figure (3-9): Timeline representing the progress of the FM provided services in Egypt

Table (3-5) is a check list of applied FM services in Egypt compared to those mentioned by IFMA. Egyptian FM companies provide the same maintenance services as those provided and mentioned by the international FM companies and associations. Facility planning services come in the second place where Egyptian FM companies provide 50% of the facility planning services as defined and described by the international FM companies. The rest of percentages are illustrated in figure (3-10).

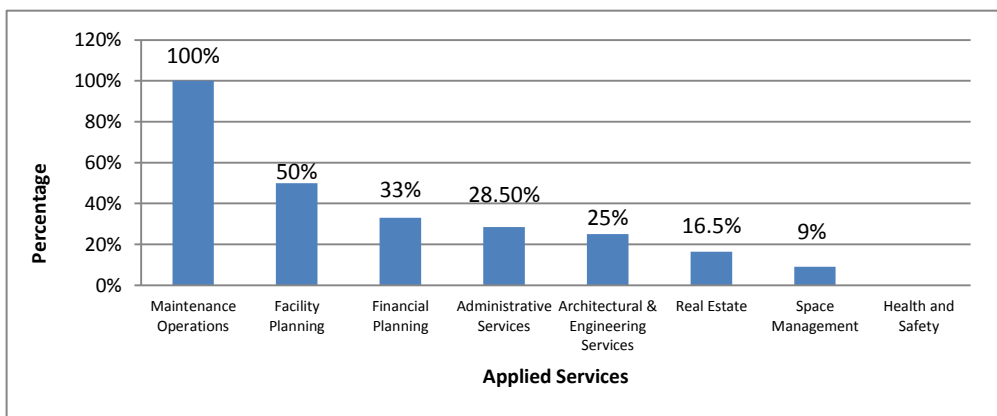


Figure (3-10): Percentage of Applied FM Services in Egypt Compared to Those Mentioned by IFMA

Table (3-5): Check List of Applied FM Services in Egypt Compared to Those Mentioned by IFMA

The Eight Headings of FM Responsibilities Internationally	The Forty One Responsibilities of FM Internationally (100%)	Check List for the FM Responsibilities in Egypt	Percentage of Applied FM Services in Egypt Compared to Those Mentioned by IFMA
Maintenance Operations	Furniture maintenance	✓	100 %
	Finishes maintenance	✓	
	Preventive maintenance	✓	
	Breakdown maintenance	✓	
	Exterior maintenance	✓	
	Custodial/housekeeping	✓	
	Landscape Maintenance	✓	
Administrative Services	Corporate artwork	✓	28.5 %
	Mail services	X	
	Shipping/receiving	X	
	Records retention	X	
	Security	✓	
	Telecommunications	X	
	Copy services	X	
Space Management	Space inventory Space policies	X	9 %
	Space allocation	X	
	Forecasting needs	X	
	Furniture purchase	X	
	Furniture specifications	X	
	Furniture inventory	✓	
	Interior plans	X	
	Furniture moves	X	
	Major redesign	X	
	Trash/solid waste	X	
Hazardous materials	X		
Architectural and Engineering Services	Code compliance	X	25 %
	Construction management	X	
	Building systems	✓	
	Architectural design	X	
Real Estate	Building leases	✓	16.5 %
	Site selection	X	
	Acquisition/disposal	X	
	Building purchases	X	
	Property appraisals	X	
Facility Planning	Subleasing	X	50 %
	Operational plans	✓	
	Emergency plans	✓	
	Strategic plans	X	
Financial Planning	Energy planning	X	33 %
	Operational budgets	✓	
	Capital budgets	X	
Health and Safety	Major financing	X	0 %
	Ergonomics	X	
	Energy management	X	
	Indoor air quality	X	
	Recycling program	X	
	Emissions	X	

Chapter Four	Structure of Chapter Four
<p>Case Study, Conclusion and Recommendations</p>	<ul style="list-style-type: none"> 2.1 Defining Risks <ul style="list-style-type: none"> 2.1.1 Types and Characteristics of Risks 2.1.2 Steps of Managing Risks <ul style="list-style-type: none"> 2.1.2.1 Establishing the Context 2.1.2.2 Identification of Risks 4.1 Case Study “Dar Premises” <ul style="list-style-type: none"> 4.1.1 Vision 4.1.2 Quality regulations 4.1.3 Scope of Services <ul style="list-style-type: none"> 4.1.3.1 Services delivered by the FM Companies 4.1.4 Flexibility <ul style="list-style-type: none"> 4.1.4.3 Flexibility in Payments 4.1.5 Efficiency 4.3 Interfering Facility Management with Value Engineering 4.4 Conclusion of Chapter Four

Chapter Four

Case Study, Conclusions and Recommendations

In addition to the survey that was mentioned in the previous chapter which focused on the status of FM provided services in Egypt; another survey that was concerned with the case study analyses of “Dar Premises” at the smart village in Egypt was performed. The interviewees were asked to indicate the evaluation of the performance of each of the FM provided services using a 5-point scale (1:5). The interviews included both services suppliers and occupants of the building. This later tool aimed at uncovering the discrepancies amongst both target groups, in addition to evaluating the performance of FM provided services.

4.1 Case Study “Dar Premises”

Dar Premises creates a professional and unique workplace for 1600 professional staff, it provides the opportunity to concentrate on the core value, target, vision and culture through outsourcing its non – core services to Smart Village as an operator and general FM company. Smart Village Company in its turn transferred all the services to 4 facility management companies (service providers) as per its contract agreement with Dar.

4.1.1 Vision

The new corporate is concerned with adding value to the organization and providing the opportunities to create a flexible and unique work environment to achieve the international quality standards; that was the main reason why the company decided to outsource all the non-core services "housekeeping, catering, maintenance, etc." to FM companies "service provider". These FM companies will take the responsibility of providing high standard non-core services and giving the corporate the chance to concentrate more on achieving the target goals and the required standards.

4.1.2 Quality regulations

Dar Premises aims at improving the business, increasing the investments and achieving better worldwide rank for the corporate, so, it is working on implementing the International Standards of the "HSE Management System"; Where, HSE refers to "Health and Safety Executive" in England and "Health, Safety and Environment" in America. HSE is the national independent watchdog for work-related health, safety and illness; it's an independent regulator and act in the public interest to reduce work-related death and serious injury across Great Britain's workplaces⁽¹⁾.

To implement a proper HSE management plan; the organization must apply all the requirements of ISO 14001 Environment management standard and OHSAS 18001 standard for occupational health and safety management system. These requirements can be summarized as follows:

- Preparing an HSE manual
- Preparing an adequate safety planning
- Preparing an environment control system
- Working on motivating the employees
- Achieving a risk free organization, where HSE provides a five steps risk assessment to assess and control risks in the workplace as follows:
 - Identify the hazards
 - Decide who might be harmed and how
 - Evaluate the risks and decide on precaution
 - Record your findings and implement them
 - Review your assessment and update if necessary

A sample of the Risk Assessment Form is attached in appendix (4).

⁽¹⁾<http://punyam.wordpress.com/category/hse-standard/> last accessed 11-10-2013

4.1.3 Scope of Services

In the Dar building, the managers outsourced services related to their project to different companies, where 70% of the services were delegated to one of the top FM companies while the rest of services were delegated to waste management, housekeeping and catering companies. The general supervisor is the smart village management that supervises all the service providers. Figure (4-1) represents the organizational chart of the project.

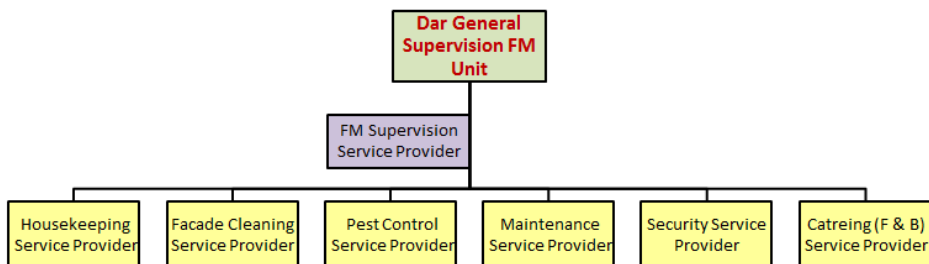


Figure (4-1): Organizational chart of Dar FM Unit

Dar's facility manager is managing the whole process with the help of a technical unit which consists of about 10 engineers who are specialized in different fields; architects, landscape engineers, mechanical engineers and electrical engineers in addition to some workers, carpenter, plumber, cleaning supervisors, security supervisors, etc. to supervise and assess the quality and progress of the provided services and interfere when needed to take the suitable decisions. Smart village as the main service provider provides a general supervision unit to work in parallel with Dar's FM unit to supervise all the service providers, coordinate and arrange the common works between them or may terminate a contract with one of the providers and replace it with another upon Dar's request in order to achieve the best quality of services as per the contract agreement with Dar.

4.1.3.1 Services delivered by the FM Companies

The services provided by the chosen FM companies include housekeeping, façade cleaning, pest control, maintenance services, security and catering, the scope of outsourced services can be summarized as follows:

a- FM Supervision Service

A general contract is signed with the FM supervision service provider to manage and supervise the service providers selected by Dar in order to fulfill the scope of all FM services to the highest level. The Contract is of a “service level agreement” type which is subject to continuous evaluation through agreed key performance indicators (KPIs) and deductions against lists of failures which will be applied on the service provider payments.

b- Façade Cleaning Service

The Façade Cleaning service provider is responsible for cleaning all the exterior facades, interior facades of the atrium, bridges, atrium ceiling, skylight, roof structures, photovoltaic structures, and terraces so that all the mentioned items are in condition all the time. The service provider is also responsible for providing all the necessary labor, uniforms, cleaning materials, tools, etc. to provide the required level of performance as per the contract agreement.

c- Pest Control Service

The Pest Control service provider is responsible for controlling all the pests that may enter the building and interrupt the work process or the comfort of employees through applying scheduled visits away from the working hours. The service provider is also responsible for providing all the necessary labor, uniforms, cleaning materials, tools, etc. to provide the required level of performance as per the contract agreement.

d- Maintenance Service

The Maintenance service provider is responsible for the operating and maintaining all the building electromechanical assets, providing the operation and maintenance services of the special systems such as elevators, UPS, CCTV, etc. in addition providing an “Operation and Maintenance Manual” for the whole building. The provider is responsible for using the Archibus technology in order to facilitate and control the operation and maintenance procedures and provide a monthly progress report to Dar’s technical unit.

e- Security Service

The security service provider is responsible for ensuring 24/7 security and life safety services for the building users through guarding the building and providing an evacuation plan to be applied in case of emergency. The security team is also responsible for training the users to apply the evacuation plan in case of fire or how to deal with any kind of emergencies.

f- Housekeeping Service

The Housekeeping service provider is responsible for indoor and outdoor cleaning services in the building so that the mentioned items are in a perfect condition all the time. The service provider is also responsible for providing all the necessary labor, uniforms, cleaning materials, tools, etc. to provide the required level of performance as per the contract agreement.

4.1.4 Flexibility

The flexibility in Dar project is achieved through permitting the operation and maintenance service provider to transfer the pest control service to a subcontractor under the supervision of the general subcontractor. The flexibility is also achieved in the quality, efficiency and criticality through applying the agreed key performance indicators (KPIs) and monitoring the performance of providers.

4.1.4.1 Flexibility in Performance Measures and Satisfaction

Dar FM unit as the client and Smart village as the operator measure and assess the performance of provided services against the key performance indicators in addition to assessing the client's and users' satisfaction through audits and appointed meetings which are held on constant basis between all the parties (the service providers, the operator and the client). The audits assess the below:

- Response time: On Time/Some Delays/ Excessive Delays
- End-user Complaints: Low/Moderate/High
- Compliance with Procedures and Policies: Compliance/Non-Compliance
- Performance: Good/Medium/Poor
- Equipment and Systems Operating Condition: As expected/requiring remedial work/Poor condition
- Quality of Materials Supply: As required/not meeting specifications/Poor Quality
- Qualification and Number of Staff: above required/as required/not meeting requirements

The performance measures are ranked as follows:

- Good, ranges from 90% to 100%
- Medium, ranges from 50% to 89%
- Poor, ranges from 0% to 49%

Services getting three consecutive KPI of less than 50% shall be corrected within 1 month from Client/Employer's notice otherwise the service could be taken out from the scope of provider or the contract may be terminated.

4.1.4.2 Flexibility in Criticality and Response Time

The grading of criticality raked from 1 to 5 and the response time ranges from immediate to 3 days is based on the impact that the failure of a specific service may cause in terms of its overall function as shown in table (4-1).

The provider shall abide by the response time and rectification period of each grade in order to achieve the required quality, performance levels and users' satisfaction as per the contract and the agreed KPIs; otherwise the contract may be terminated.

Table (4-1): Criticality Grades and Response Time

Criticality Grade	Definition	Maximum Rectification Period
1	Major incident, accident or safety or environmental breach	Immediate Response
2	Prevents or causes a major disruption of normal activities	1 hour
3	Has a significant impact on normal activities causing activities to be limited or reschedule	2 hours
4	Has a minor impact only on normal activities	1 day
5	No noticeable impact on normal activities	3 days

4.1.4.3 Flexibility in Payments

In Dar's FM service contract with the FM service providers, the payment is adjusted based on the performance measurements using the KPIs and scoring system. The deductions are determined according to the number of failures where 100 % deduction means 10% of the monthly contract value "suppose that the monthly FM contract value is X" of the service as shown in table (4-1). If a problem is catastrophic, 100% will be deducted. If repeatable, an agreed penalty is applied per failure. After an agreed acceptable number of failures, a total penalty of certain value is deducted as shown in table (4-2).

Table (4-2): Performance levels, List of KPIs and Failures Deductions

Service Provider	Monthly Contract Value for the Service	Maximum Deduction Percentage	Maximum Deduction Value
Operation, Maintenance & Archibus	0.3 X	10%	0.03 X
Façade Cleaning	0.034 X	10%	0.0034 X
Pest Management	0.006 X	10%	0.0006 X
Security	0.24 X	10%	0.024 X
Housekeeping	0.339 X	10%	0.0339 X
Subcontractors Management & Supervision	0.096 X	10%	0.0096 X

Table (4-2) represents the key performance indicators of housekeeping provided services. Each KPI represents a certain weight and value. A value of a KPI may be partially or totally deducted upon failure according to the severity and number of accepted and agreed number of failures as per the contract agreement. Dar's full detailed key performance indicators for all FM provided services are attached in appendix (5).

Table (4-3): Performance levels, List of KPIs and Failures Deductions for Housekeeping Service

#	Section	Service	KPI	Weighting	Total Penalty on Failure	Acceptable Number of Failures	Deduction per Failure
4.1	Housekeeping	Interior Cleaning Services	Working places cleanliness	8 %	800 EGP	4	200 EGP
			All other spaces and equipment cleanliness as per the housekeeping scope of works	5 %	500 EGP	4	125 EGP
			Non-Compliance with schedule of tasks and frequencies	15 %	1500 EGP	4	375 EGP
			Bathrooms, showers, and janitors hourly cleanliness	8%	800 EGP	4	200 EGP
		Consumables	Bathrooms, showers, and janitors to fully equipped with consumables continuously and at the start of each working day	10 %	1000 EGP	4	250 EGP
4.2	General Management	External certification or accreditation (LEED, ISO Standards)	Compliance with LEED & ISO requirements	3 %	300 EGP	0	300 EGP
		Health and Safety	Comply with statutory maintenance and inspections	3 %	300 EGP	0	300 EGP
			Health, Safety and Quality on the job training report	3 %	300 EGP	0	300 EGP

#	Section	Service	KPI	Weighting	Total Penalty on Failure	Acceptable Number of Failures	Deduction per Failure
4.3	Waste Management	Helpdesk and work order request	Comply with HSE Regulations	300 EGP	300 EGP	1	300 EGP
			Meet all requests within response time (criticality tables)	5 %	500 EGP	0	500 EGP
			No recurrent requests as a result of incomplete or ineffective response	5 %	500 EGP	0	500 EGP
			Number of recurrent calls on the same unsolved problem	5 %	500 EGP	0	500 EGP
			Staffing	Complains due to staff hygiene or improper behavior	7 %	700 EGP	4
		Availability of staff as per agreed numbers, qualifications and organization chart		7 %	700 EGP	0	700 EGP
		Indoors	Waste collected and moved to garbage room at the end of each working day	4 %	400 EGP	2	200 EGP
			Complains due to odor leakage and emissions from the garbage room	3 %	300 EGP	0	300 EGP
			Outdoors	Hardscape and landscape waste is collected and disposed as per the method statement	3 %	300 EGP	2
Waste to be collected from the garbage room and disposed at the end of each working day	3 %			300 EGP	0	300 EGP	

Source: Dar's Outsourced Services Management Agreement

4.1.5 Efficiency

A survey was conducted to assess the users' satisfaction, Dar FM unit satisfaction and the provider's satisfaction to the quality of the provided service through 10 months; the results are summarized in the chart below which is a comparison between users', provider's and FM unit's opinions regarding the quality of the HK provided service. The quality of the provided services has three repeatable phases as shown in figure (4-2).

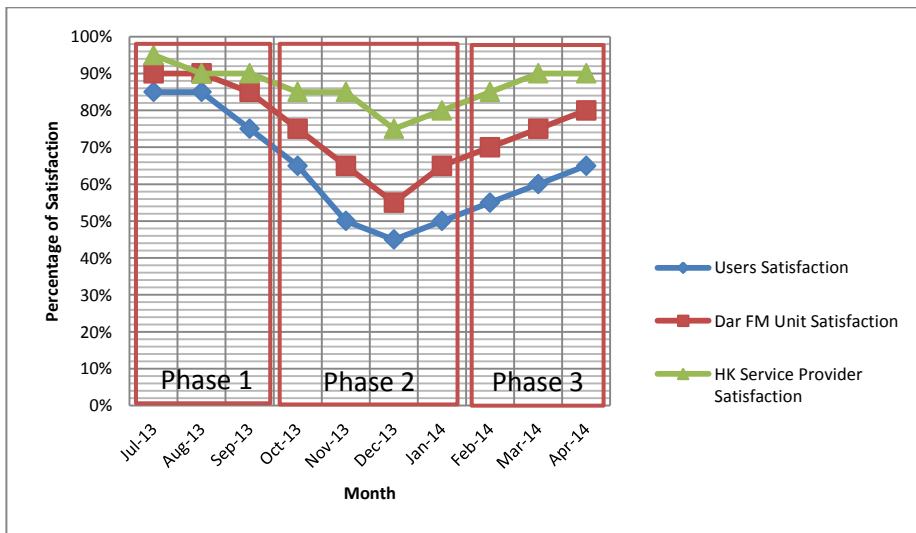


Figure (4-2): Discrepancies amongst the level of User's Satisfaction, FM Unit Supervisors Satisfaction and Provider's Satisfaction with the Quality of HK Service during the period from July 2013 to April 2014

Phase 1, at the beginning where perfect quality of services is provided and the gap between the percentages of satisfaction of all parties is minimum. This is positively reflected on the satisfaction percentage of the users and the FM unit. At a certain point in phase 1 the satisfaction percentage of the FM unit and the provider becomes the same, this means perfect quality and high standard provided services. Phase 2, where the gap between the percentages of satisfaction of all parties decreases gradually till it reaches its minimum. At this phase, the FM unit has the right of applying the KPIs mentioned before to apply

some deductions on the monthly fees of the provided service in order to reach the required quality, otherwise the FM unit has the right to terminate the contract and replace the service provider with another. Phase 3, where the provider does the best to provide better quality of services in order to decrease the gap between the satisfaction percentage of the users and the FM unit.

The previously mentioned phases are always repeated on constant basis. The adjustment of the quality of services needs continuous supervision from the FM unit to achieve the required standards as per the agreed KPIs.

4.2 The Value of the Provided FM Services

Figure (4-3) is a comparison between the different values of the provided FM services, each provided service is supposed to be adding a certain value to the project.

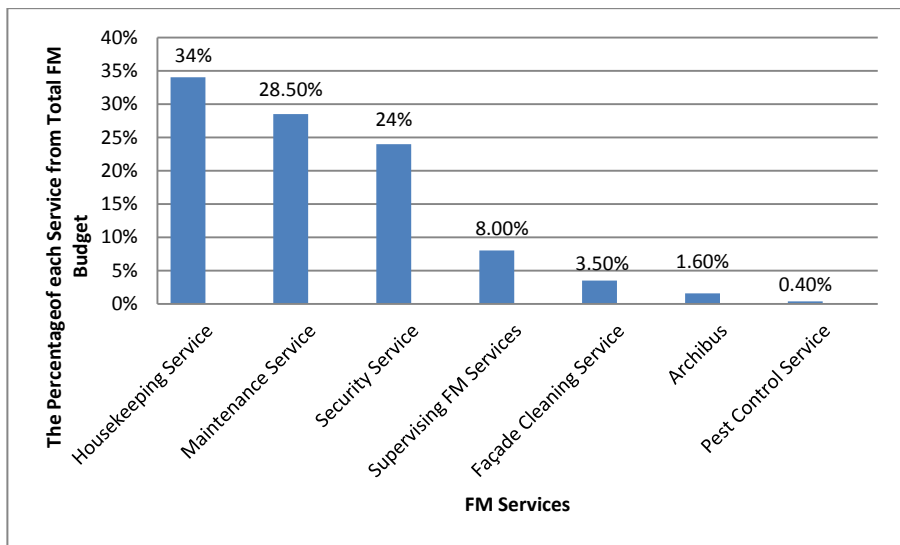


Figure (4-3): Value of Each FM Provided Service from the Total Monthly FM Budget

Housekeeping service comes in the first place as it represents 34% of the total monthly FM budget. Maintenance services come in the second place and they represent 28.5% of the total FM budget. Security service represent 24% of the total FM budget and it comes in the 3rd place. The general supervision services

represent 8%, then the Façade cleaning services with 3.5%, the Archibus service with 1.6% and finally the pest control service which represents 0.4% of the total FM budget.

Further to occupying the highest weights in the FM contract budget; housekeeping, maintenance and security services are supposed to be adding the greatest values to the building by achieving the agreed performance levels and satisfaction as per the agreed.

4.3 Integrating Facility Management with Value Engineering

The integration between value engineering and facility management was achieved in Dar project more than once during the testing and commissioning and operation and maintenance phases. Table (4-4) summarizes and illustrates some problems that faced Dar project during commissioning and operation phases due to the lack of detailed studies and the absence of an FM team to revise and approve the project design. The table focuses also on the role of integrating VE and FM to face those problems and the consequences of this integration.

Table (4-4): Integrating Value Engineering and Facility Management

Risk Description	Risk Type	The Main Cause of the Problem	The Phase when the problem was discovered	FM recommendations to Solve the Problem	VE recommendations to Solve the Problem	Consequences
Atrium of 26 m height at the reception where operation, maintenance and cleaning procedures were not considered during design phase	Opportunity risk	<ul style="list-style-type: none"> - Insufficient studies - Absence of FM team to revise the design 	Testing and Commissioning Phase	<ul style="list-style-type: none"> - Buying a hydraulic man lift boom to be used in cleaning and maintaining the atrium - Hiring the machine to the surrounding buildings to cover the purchasing costs 	Comparing the available hydraulic booms in the market to choose the optimum solution, good quality, low cost and what serves our needs	<ul style="list-style-type: none"> - Maintenance and cleaning problem was solved - The overload of the hydraulic boom caused cracks on the marble floor at the reception

Risk Description	Risk Type	The Main Cause of the Problem	The Phase when the problem was discovered	FM recommendations to Solve the Problem	VE recommendations to Solve the Problem	Consequences
Cracked marble at the reception	Uncertainty risk	Overload of the hydraulic boom on the marble floor	Operation and Maintenance Phase	Replacing the marble at the reception with another kind that can bear the load of the hydraulic boom without getting damaged	Comparing the different types of marble to choose the optimum type that achieves the FM recommendations and requirements without adding extra costs to the project budget	Problem Solved; the marble is replaced with a tougher type that can bear heavy loads
Finding the suitable service provider to operate and maintain the building	Opportunity risk	The presence of many non-comprehensive companies that are called FM companies, this may cause risk to the project	Testing and Commissioning Phase	Comparing between the available FM companies according to the reputation among the market and the quality of provided services from the client's point of view	Comparing between the companies that were recommended by the FM unit to choose the optimum company within the determined budget for the FM services and operations phase	Problem Solved; A general contract is signed with a FM supervision service provider to manage and supervise the service providers selected by Dar in order to fulfill the scope of all FM services to the highest level.
Determining the value of each provided service	Opportunity risk	Discrepancies of the values of provided services between different FM companies	Testing and Commissioning Phase	Comparing between the different services in terms of the provided quality and the value that the service may add to the building	Setting a certain budget to each service based on the type and quality of service and its effect according to the value that this service will add to the building or keep in it	Problem solved; the value of each service is determined through integrating the recommendations of both VE and FM units to determine the value of each provided service
Determining the KPIs, the value of each KPI and the deduction percentage with respect to the total monthly budget	Opportunity risk	The absence of a measurement to determine the values of or deduction values in case of failure	Testing and Commissioning Phase	Determining the effect of each KPI on the work progress and the negative effect in case of failure	Determining the value of each KPI and the percentage of deduction per failure	Problem solved; integrating the recommendations of both FM and VE units to choose the optimum KPIs and percentages of deductions upon failure
Erosion of some stainless steel furniture pieces	Uncertainty risk	Absence of a facility management team during the design phase to approve the chosen furniture and its compatibility with the users' use and the way of cleaning as per the housekeeping provider recommendations	Operation and Maintenance	<ul style="list-style-type: none"> - Painting the damaged parts with water proof paints - Changing the way of cleaning the furniture pieces as per the housekeeping provider recommendations 	The damaged pieces are still in the warranty period, so they shall be replaced with new pieces at the furniture supplier's cost	Problem solved, the damaged furniture pieces were replaced at the furniture supplier's cost and new cleaning procedures were applied by the housekeeping service provider to keep and maintain the new furniture pieces

4.4 Concluding Remarks

There are five main aspects to evaluate the performance of FM provided services in Dar; vision, efficiency, flexibility, quality and scope of services. The aim of the mentioned aspects is achieved by applying some agreed KPIs that were determined in a general contract which was signed with an FM supervision service provider to manage and supervise the service providers selected by Dar in order to fulfill the scope and performance of all FM services to the highest level and achieve maximum satisfaction to the users.

All the problems that faced Dar project were either due to the unavailability of complete data and sufficient studies or due to the division and limited scope and vision of project phases. Each team is working separately without a global look or a comprehensive tool that can integrate all the parties to prevent any further problems. This led to the accumulation of problems in testing and commissioning and operation and maintenance phases. Solving the problems became difficult in terms of cost, effort and time. Figure (4-4) illustrates the risks initiation phases, where, 30% of risks started during the design phase, while 70% of risks started during the testing and commissioning phase.

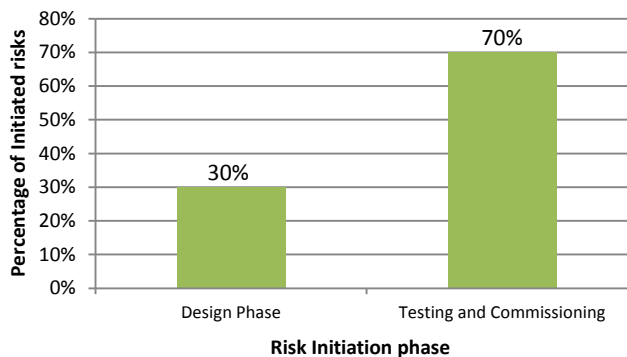


Figure (4-4): Percentages of risks that happened but evolved and were discovered during late project phases

Although the risks that faced Dar project started during design and testing and commissioning phases but, they evolved and were discovered during testing and commissioning and operation and maintenance phases as shown in figure (4 - 5).

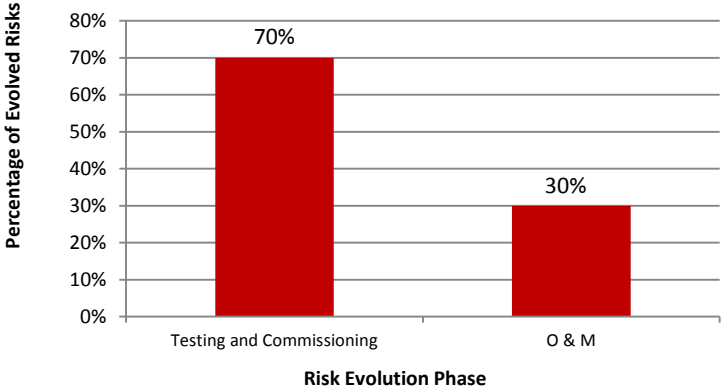


Figure (4-5): Risks Percentages and Evolution Phases

Figure (4-6) represents the different types of risks that faced Dar project, where, 30% of the evolved risks that faced Dar project are classified as uncertainty risks, while 70% of the evolved risks are classified as opportunity risks.

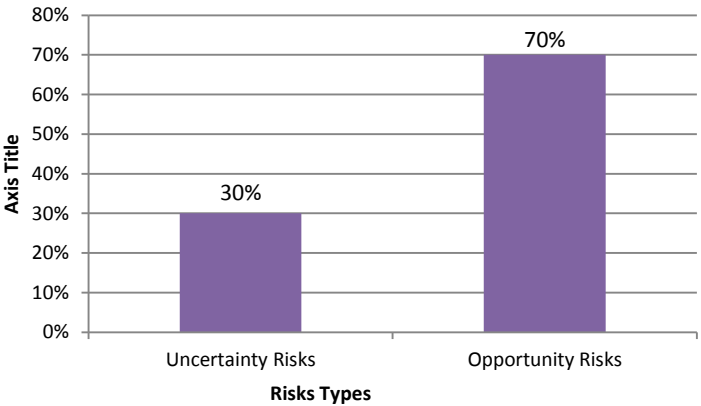


Figure (4-6): Types of Risks that faced Dar project

Table (4-5) summarizes and illustrates the different types of risks that faced Dar project through different phases. It also highlights the risks initiation and evolution phases and the role of integrating VE and FM on dealing with those risks.

Table (4-5): Effect of Integrating Value Engineering and Facility Management on Different Types of Risks through different Project Phases in Dar project

Risk Type	The Phase when the Risk Evolved	Risk Initiation Phase	Percentages of Risks	Action	Consequences
Opportunity Risk	Testing and Commissioning Phase	Design Phase	16.5 %	Integrating VE & FM	Problem Solved
Uncertainty Risk	Operation and Maintenance	Design Phase	16.5 %		
Uncertainty Risk	Operation and Maintenance Phase	Testing and Commissioning Phase	16.5 %		
Opportunity Risk	Testing and Commissioning Phase	Testing and Commissioning Phase	50 %		
Opportunity Risk	Testing and Commissioning Phase	Testing and Commissioning Phase			
Opportunity Risk	Testing and Commissioning Phase	Testing and Commissioning Phase			

The previous table clarifies that 50% of the risks that started and evolved during testing and commissioning phase are classified as “Opportunity Risks”; the other 50% are divided between risks that started during design and evolved during testing and commissioning phase and they are also classified as “Opportunity Risks”, the represent only 16.5%. The rest of risks started during design and testing and commissioning phases, they were discovered during the operation and maintenance phase, those are classified as “Uncertainty Risks” and they represent about 33% of risks.

It is worth mentioning here that all the previously illustrated problems were solved by integrating the efforts of both FM and VE teams. They were applied

together to find optimum solutions for the present problems and to prevent future problems as much as possible. This integration helped providing best qualities of FM services and consequently keeping the value of the project and adding to it. The mentioned results should have been increased if this comprehensive system had managed the project from the beginning and continued through the project's life cycle.

Conclusion

The research concluded that when FM is applied through any project phase, VE is automatically interfered and applied without any previous intentions to compare, evaluate and choose a suitable FM company or to help the facility manager achieving the required purposes and the best quality using the lowest possible costs. VE can be considered as a tool to apply FM to achieve perfect results.

The risks are classified as “Opportunity Risks” when the initiation phase and the evolution phase are the same and they are always linked to early project phases. The risks are classified as “Uncertainty Risks” when the initiation phase is different from and the evolution phase, and this type of risks is always linked to late project phases especially when the risk evolves during the operation and maintenance phase.

As shown in figure (4-7), when the integration between VE and FM is considered and applied during testing and commissioning and operation and maintenance phases; 30% of the risk that may face a building during its life cycle are classified as uncertainty risks, while, 67% are classified as opportunity risks and only 3% are classified as hazard risks⁽¹⁾; where, hazard risks can only be mitigated, while uncertainty and opportunity risks can be mitigated and resolved. The mentioned percentages are variable based on the phase of integrating VE and FM, where, the percentage of the opportunity risks can be increased to 80% in case of considering the integration during pre-schematic and design phases.

⁽¹⁾Based on the study and an open discussion with some FM practitioners, security managers and quality engineers in Egypt

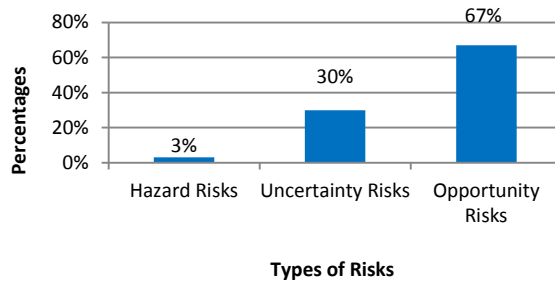


Figure (4-7): Percentages of Different types of risks that the integration between VE and FM can resolve or mitigate

Figure (4-8) illustrates that; as a result of integrating VE and FM and starting to apply this integration during the project’s testing and commissioning phase, 30 % of the risks that may face a building evolve during operation and maintenance phase, while 70% of risks appear during testing and commissioning phase. Those percentages can be decreased in case of integrating FM and VE during early project phases like design or pre-schematic phases, where the risks evolve and being resolved or at least mitigated and considered before getting more complicated to be resolved in terms of time, cost, effort and quality.

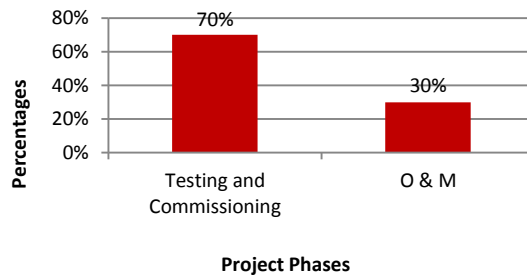


Figure (4-8): Percentages of risks that evolve during testing and commissioning and operation and maintenance phases in case of integrating FM and VE during testing and commissioning phase

Figure (4-9) is a theoretical diagram that represents the percentages of risks that are supposed to evolve during different project phases in case of integrating FM and VE and applying the integration from early pre-schematic and design phases⁽¹⁾. More than 55% of risks are expected to appear during early project phases (pre-schematic and design phases), while the other 45% are divided between construction, testing and commissioning and operation and maintenance phases.

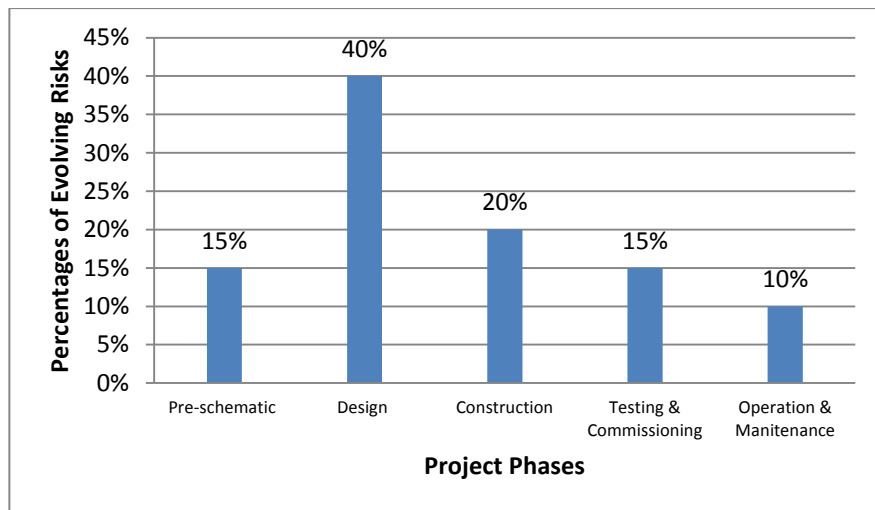


Figure (4-9): A theoretical diagram that represents the percentages of risks that may evolve during different project phases in case of integrating FM and VE during early project phases

As a result of integrating VE and FM and applying them during early project phases, the percentage of the expected risks were decreased from 70% to 15% during the testing and commissioning phase which means 55% added value to the project during the mentioned phase. The percentage of the expected risks were also decreased from 30% to 10% during the operation and maintenance phase, which means 20% added value to the building during operation.

⁽¹⁾Based on a survey and an open discussion with some FM practitioners in Egypt

VE & FM are two approaches with three common targets and six integrated parameters that were previously mentioned in the conclusion of chapter one. Those targets can be successfully achieved by integrating both approaches to present a comprehensive tool that is capable of facing risks, saving time, money and efforts in addition to adding value to the project.

Applying only one of the two approaches (FM or VE) is a perfect way to enhance a project's value and performance, however, integrating and applying the both approaches together and dealing with them as a one comprehensive tool can be considered a better successful way to manage a project and improve its performance.

Recommendations

The research strongly recommends the below:

- FM and VE shall be integrated and applied together through early project phases and during the whole life cycle of the building to enhance the quality of provided services, increase the building life cycle, achieve better quality and add value to the building
- Complete detailed data shall be provided and sufficient amount of studies shall be performed to cover all the project items to prevent the evolution of unexpected problems and risks and face it if happened in order not to have negative impacts on the project.
- Providing better understanding to the roles of FM and VE and the importance of interfering them through early project phases
- Focusing on the positive impacts and consequences of integrating FM and VE and their ability to face risks and adding value to the projects

Appendices

Appendix (1): Questionnaire Form (A)

This questionnaire is part of a research conducted by Eng. Samar El - Motasem in order to compare between "Outsourced Services" and "In-House Services" in buildings.

Target group: Building Administrative Manager, Operation and Maintenance Manager and Users.

Name:

Position:

Part (1) – Managers:

1- What type of services do you use in your company?

In-House Outsourced Both Other

2- How do you assess "In – House" Services in your company?

Neutral Average Good Bad Excellent

3- How do you assess "Outsourced" Services in your company?

Neutral Average Good Bad Excellent

4- What services do you outsource in your company and Why?

Housekeeping Security Maintenance Catering Other

*Please state the reason:

5- What problems do you face with "In-House" services?

Bad Quality Lack of experince Over Cost Other No Problems

6- What problems do you face with "Outsourced" services?

Bad Quality Lack of experince Over Cost Other No Problems

7- What are the advantages of using "In-House" services?

Good Quality Saving effort Low Cost Other No Advantages

What are the advantages of using "Outsourced" services?

Good Quality Saving effort Low Cost Other No Advantages

8- What about the cost of Outsourced services (OS) compared to the cost of In-House services (IS)?

(OS) = (IS) (OS) = 1/2 (IS) (OS) < 1/2 (IS) (OS) > 1/2 (IS)

9- What is the effect of "Outsourced" services on the life cycle cost of the building?

Neutral Average Good Bad Excellent

10- What is the effect of "In - House" services on the life cycle cost of the building?

Neutral Average Good Bad Excellent

Part (2) – Users:

1- How do you assess the cleanliness in your building?

Neutral Average Good Bad Excellent

Comment:

2- How do you assess the attitude of workers?

Neutral Average Good Bad Excellent

Comment:

3- How do you assess the cleanliness of the stair?

Neutral Average Good Bad Excellent

Comment:

4- How do you assess the cleanliness of toilets?

Neutral Average Good Bad Excellent

Comment:

5- How do you assess the cleanliness of floor?

Neutral Average Good Bad Excellent

Comment:

6- How do you assess the cleanliness of your desk?

Neutral Average Good Bad Excellent

Comment:

7- How do you assess the cleanliness of your PC, cisco, tools, etc. ...?

Neutral Average Good Bad Excellent

Comment:

Do any tools, food, money, anything, disappear from your desk?

Yes No

Comment:

Appendix (2): The Questionnaire Form (B)

Date:

Name:

Age:

Gender:

Female

Male

Job Title:

1- When opening the company, what was the percentage of applying FM on the projects?

10-25% 25-50% More than 50% less than 10%

2- Nowadays, what is the percentage of applying FM on the projects?

10-25% 25-50% More than 50% less than 10%

3- In the Future, what will be the percentage of applying FM on the projects?

10-25% 25-50% More than 50% less than 10%

4- What is the scale of projects that are supposed to be applying FM in 2014?

Mega Project Average Projects Small Projects

5- What were the types and the scales of projects that were the first to use FM tools since appearing of this scope in Egypt?

Mega Projects Average Projects Small Projects

6- How do you assess the performance of FM in Egypt?

Neutral Bad Average Good Excellent

7- What is the effect of applying FM on project budget?

Neutral Bad Average Good Excellent

8- What is the effect of applying FM on project L.C.C.?

Neutral Bad Average Good Excellent

9- What is the effect of applying FM on project time schedule?

Neutral Bad Average Good Excellent

10- What is the effect of applying FM on project quality?

Neutral Bad Average Good Excellent

11- What is the effect of applying FM on risks that may face the project?

Neutral Bad Average Good Excellent

Appendix (3): COSSH Assessment Form

This assessment only addresses the risk of harm to health from the substances listed. Additional risk assessments may be required to control the risk from other hazards associated with this work/the procedures used.		
Assessor (print) ⁽¹⁾	Employer/Supervisor ⁽²⁾	
Assessment Date ⁽³⁾	Dates reviewed ⁽⁴⁾	
Hazards Identified If the substance has a R45 or R49 risk phrase or a H350 or H350i hazard statement, it must also be registered on your personal carcinogen return (at Occupational Health) where exposure is not adequately controlled.		
Substance ⁽⁵⁾ Name of Chemical, etc. as appropriate	Hazardous Properties ⁽⁶⁾ Provide details of how the substance could cause harm, e.g. harmful by inhalation, skin contact, flammable, carcinogen, allergen, etc.	Quantity ⁽⁷⁾ Indicate how much of the substance will be used
Additional information ⁽⁸⁾ Workplace Exposure Limits: R-phrases: S-phrases: H and P statements:		
Emergency Procedures ⁽⁹⁾ Eye contact: Inhalation: Skin contact: Ingestion: Spill procedure:		
What will the chemical be used for? (insert title of experiment or experimental procedure) Who may be exposed? ⁽¹⁰⁾		

Methods Of Prevention Or Control Of Exposure (select all that apply by circling/ticking/highlighting the appropriate statement)	
1- Engineering controls required⁽¹¹⁾ <ul style="list-style-type: none"> - total containment - fume cupboard - local exhaust ventilation - blast screen 	2- Access control⁽¹²⁾ <ul style="list-style-type: none"> - restricted to competent personnel - special containment facility (give specific area):
3- Special procedures⁽¹³⁾ <ul style="list-style-type: none"> - Standard Operating Procedure (SOP) required <input type="checkbox"/> - Code of practice, local rules, etc <input type="checkbox"/> 	4- Approved PPE⁽¹⁴⁾ (<i>Note: PPE is to be used as the 'last resort' when controlling exposure</i>) <ul style="list-style-type: none"> - gloves (specify type) - eye protection (specify type) - laboratory coat/overalls (specify type) - other PPE (specify)
Disposal Procedures⁽¹⁵⁾ (Give details of waste disposal procedure to be used) <ul style="list-style-type: none"> - Are chemicals with risk phrases R50-R59 or hazard statements H400 – H413 (environmental hazards) involved? Yes / No 	
TRAINING REQUIREMENTS⁽¹⁶⁾ List any specialized training requirements before work can begin	
HANDLING AND STORAGE REQUIREMENTS⁽¹⁷⁾ Note any special requirements e.g. ventilation, chemical incompatibility, flash point, etc.	
Assessment Of Risk Using Controls Detailed Above⁽¹⁸⁾ Are the hazards/risks suitably controlled, using the control measures detailed above? If not, state the further actions required, e.g. Requirement for a standard operating procedure (SOP), etc.	
<u>Authorizations by Employer/Supervisor</u>⁽¹⁹⁾ I confirm that I have considered and understand the chemical to be used and the associated hazards. I am satisfied that all of the hazards have been identified and that the control measures to be followed will reduce the risks to as low a level as reasonably practicable. Print name: _____ Signed: _____ Date: _____	

<u>Declaration by Employer/Supervisor</u> ⁽²⁰⁾			
I confirm that I have read this COSHH Assessment and that I understand the hazards and risks involved and will follow all of the safety procedures stated.			
<u>Declaration by Employee</u> ⁽²¹⁾			
I confirm that the employee who has signed below is competent to undertake the work. My counter-signature indicates that I am happy for the work to proceed.			
Name (please print)	Signed	PI countersignature	date

Guidance Notes for COSHH Assessment Form

This form must be completed for every hazardous chemical used within the company. The form must be signed by the employee and their employer/supervisor before the work starts.

- (1) **Assessor:** Insert the name of the person doing this assessment
- (2) **Employer/Supervisor:** Insert the name of the Employer/Supervisor.
- (3) **Assessment Date:** Insert the date that the assessment form is completed. The assessment is valid for a maximum of 1 year. It must be reviewed after 1 year, or if a significant change occurs (change of lab, pregnancy, etc.)
- (4) **Dates reviewed:** all COSHH assessments must be reviewed annually (as a minimum). The review date should be entered here, and signed by the assessor to confirm that the assessment is still valid. **Substance:** insert name of the chemical to be used. NB. Biological hazards must not be assessed on this COSHH form.
- (5) **Hazardous properties:** insert details of all of the hazardous properties of the chemical – egg. Flammable, explosive, carcinogen, harmful by inhalation, etc.)
- (6) **Quantity:** insert quantity to be used (mg, g, ml, etc.)

- (7) **Additional information:** Include details of any additional information, including any workplace exposure limits. Detail fully all R/S phrases and H and P statements (it is not sufficient to simply state R45, full details are needed).
- (8) **Emergency procedures:** provide full details of emergency procedures to be employed following contact with the chemical (skin contact, eye contact, inhalation and ingestion) – such as use of diphoterine, administration of emergency oxygen, etc. Also include details of emergency spill procedures.
- (9) **What will the chemical be used for? Who may be exposed? :** Insert title of experiment or experimental procedure that the chemical is to be used in, and detail who may be exposed (individual worker? People in close proximity? Cleaners? Engineers?).

Methods of prevention or control of exposure

Sections 11-14 detail the methods for preventing or controlling exposure to the chemical. The COSHH hierarchy of control measures should be used when determining the methods to be used to prevent/control exposure, with engineering and group control measures being employed in preference to individual measures (such as individual PPE).

- (10) **Engineering controls** required: identify the control measures necessary to prevent/control exposure, such as use of a fume cupboard, LEV or blast screen, by circling/ticking/highlighting the appropriate statement(s).
- (11) **Access control:** In order to prevent/control exposure, is it necessary to restrict access to competent personnel? Are special containment facilities required? Please circle/tick/highlight the appropriate statement(s).
- (12) **Special procedures:** please identify any special procedures necessary to prevent/control exposure. This might include the need for an SOP to be developed, or for local rules to be drawn up. Please circle/tick/highlight the appropriate statement(s).

- (13) **Approved PPE:** PPE is to be used as the ‘last resort’ when preventing/controlling exposure. Please detail the PPE to be used when handling the chemical. Please circle/tick/highlight the appropriate statement(s) and include details of the type of gloves, etc. to be used.
- (14) **Disposal procedures:** Identify whether the chemical is an environmental hazard; Detail fully how the chemical waste is to be disposed of (down sink, by specialist contractor, etc.)
- (15) **Training requirements:** detail any specialized training requirements that must be met before the work can begin – e.g. Attendance on a gas safety course, etc.)
- (16) **Handling and storage requirements:** Note any special requirements e.g. ventilation, chemical incompatibility, flash point, etc.
- (17) **Assessment of risk using controls detailed above:** Are the hazards/risks suitably controlled, using the control measures detailed above? Provide details; If not controlled, state the further actions required, e.g. Requirement for a standard operating procedure (SOP), etc.
- (18) **Authorizations by Employer/Supervisor:** the employer/supervisor must sign and date the assessment, to confirm that they have considered and understand the chemical to be used and the associated hazards, and that they are satisfied that all of the hazards have been identified and that the control measures to be followed will reduce the risks to as low a level as reasonably practicable.
- (19) **Declaration by employee:** the employee must sign and date the assessment to confirm that they have read the COSHH Assessment, understand the hazards and risks involved and will follow all of the safety procedures stated.
- (20) **Declaration by Employer/Supervisor:** the employer/supervisor must sign and date the assessment, to confirm that the researcher is competent to undertake the work.

Health and Safety Policy		
This is the statement of general policy and arrangements for:		<input type="text"/> (Name of company)
(Name of Employer/Senior manager)		has overall and final responsibility for health and safety
(Member of staff)		has day-to-day responsibility for ensuring this policy is put into practice
Statement of general policy	Responsibility of: Name/Title	Action/Arrangements (What are you going to do?)
Prevent accidents and cases of work-related ill health by managing the health and safety risks in the workplace		
Provide clear instructions and information, and adequate training, to ensure employees are competent to do their work		
Engage and consult with employees on day-to-day health and safety conditions		
Implement emergency procedures – evacuation in case of fire or other significant incident. You can find help with your fire risk assessment at: https://www.gov.uk/workplace-fire-safety-your-responsibilities		
Maintain safe and healthy working conditions, provide and maintain plant, equipment and machinery, and ensure safe storage/use of substances		

Appendix (4): Risk Assessment Form

Health and safety law poster is displayed at (location)			
First-aid box is located:			
Accident book is located:			
Signed: * (Employer)		Date:	<input type="text"/>

You should review your policy if you think it might no longer be valid, e.g. if circumstances change.

If you have fewer than five employees, you don't have to write down your policy

- Accidents and ill health at work reported under RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations)
<http://www.hse.gov.uk/riddor>
- To get an interactive version of this template go to
<http://www.hse.gov.uk/risk/risk-assessment-and-policy-template.doc>
- Combined risk assessment and policy template published by the Health and Safety Executive 08/14

Risk Assessment

- All employers must conduct a risk assessment. If you have fewer than five employees you don't have to write anything down.
- We have started off the risk assessment for you by including a sample entry for a common hazard to illustrate what is expected (the sample entry is taken from an office-based business).

- Look at how this might apply to your business, continue by identifying the hazards that are the real priorities in your case and complete the table to suit. You can print and save this template so you can easily review and update the information as and when required. You may find our example risk assessments a useful guide (<http://www.hse.gov.uk/risk/casestudies>). Simply choose the example closest to your business.

- Company name: Date of risk assessment:

What are the hazards?	Who might be harmed and how?	What are you already doing?	Do you need to do anything else to control this risk?	Action by whom?	Action by when?	Done
Slips and trips	Staff and visitors may be injured if they trip over objects or slip on spillages.	General good housekeeping is carried out. All areas well lit, including stairs. No trailing leads or cables. Staff keeps work areas clear, e.g. no boxes left in walkways, deliveries stored immediately.	Better housekeeping in staff kitchen Needed. E.g. on spills. Arrange for loose carpet tile on second floor to be repaired / replaced.	All staff, supervisor to monitor Manager	From now on xx/xx/xx	xx/xx/xx /xx xx/xx/xx /xx

- You should review your risk assessment if you think it might no longer be valid (e.g. following an accident in the workplace or if there are any significant changes to hazards, such as new work equipment or work activities)
- For information specific to your industry please go to <http://www.hse.gov.uk>.
- For further information and to view our example risk assessments go to <http://www.hse.gov.uk/risk/casestudies/>
- Combined risk assessment and policy template published by the Health and Safety Executive 08/14

Appendix (5): Key Performance Indicators

PERFORMANCE LEVELS

Service Provider	Maximum deduction percentage
Operation and Maintenance	10%
Interior and Exterior Façade and Window Cleaning	10%
Pest Management	10%
Security	10%
Housekeeping, Cleaning and Waste Management	10%
Catering & Beverage	10%
Contractors Supervision	10%

PERFORMANCE LEVELS

#	Section	Service	KPI	Weighting	
Operation and Maintenance	1.1	General Management	External Certification or Accreditation	Compliance to LEED and ISO requirements	5.00%
			Health and Safety	Comply with applicable laws, standards and codes	1.00%
				Submit Health, safety and quality on the job training awareness report	1.00%
			Monthly Report	Provision of complete and accurate report	1.00%
			Helpdesk	Meet all requests within response time (Corrective and Preventive)	5.00%
				No Recurrent requests as a result of incomplete or ineffective response	5.00%
				All helpdesk calls logged onto the system correctly and accurately	3.00%
				No Failure to staff reception desk during required hours	5.00%
				All pre-booked requests for service to be delivered	5.00%
				No overdue work orders	6.00%
				Call center availability 24/7	3.00%
				No open service requests by the end of a working day	3.00%
			Staffing	Number of recurrent calls on the same unsolved problem	6.00%
				Complains due to staff hygiene or improper behavior	5.00%
	1.2	Maintenance	Planned Preventative Maintenance	No maintenance rework as a result of failed actions	10.00%
CMMS failure to issue PPM work order				5.00%	
Failure to repair major parts or equipment				10.00%	

			Interruptions due to failure in complying with the set PPM	10.00%
		Reactive Maintenance	Delayed work orders due to lack of manpower	6.00%
		Critical Maintenance	Reactive maintenance treatment are met based on Criticality grade and the dedicated response time as per table under item 4.1.1 in the Scope of services document	100.00%
		Check	100.00%	100.00%

2.1	Façade and Windows	Façade and Windows Cleaning	All facades and windows are clean and in a spotless condition	50.00%
			Compliance with planned schedule for cleaning	50.00%
		Check	100.00%	100.00%

3.1	Pest Management	Pest Control	No complaints from indoor air quality and human health	10.00%
			Compliance to regular visits	10.00%
			Respond with 2hr notification	10.00%
			Animal or insect spot	50.00%
		Health and Safety	Comply with LEED/ISO requirements, applicable laws, standards and codes	15.00%
			Submit Health, safety and quality on the job training awareness report	5.00%
		Check	100.00%	100.00%

PERFORMANCE LEVELS

#	Section	Service	KPI	Weighting
4.1	Housekeeping	Interior Cleaning Services	Working places cleanliness	8.00%
			All other spaces and equipment Cleanliness as per the Housekeeping Scope of Works	5.00%
			Non-compliance with schedule of tasks and frequencies	15.00%
			Bathrooms, Showers and Janitors hourly cleanliness	8.00%
		Consumables	Bathrooms, Showers and Janitors to fully equipped with consumables continuously and at the start of each working day	10.00%
4.2	General Management	External Certification or Accreditation (LEED, ISO Standard)	Compliance to LEED & ISO requirements	3.00%
		Health and Safety	Comply with Statutory maintenance and inspections	3.00%
			Health, safety and quality on the job training awareness report	3.00%
			Comply with H&S Regulations	3.00%
		Helpdesk and Work order requests	Meet all requests within response time (criticality tables)	5.00%
			No Recurrent requests as a result of incomplete or ineffective response	5.00%
			Number of recurrent calls on the same unsolved problem	5.00%
		Staffing	Complains due to staff hygiene or improper behavior	7.00%
Availability of all staff as per agreed numbers, qualifications and organization chart	7.00%			

	4.3	Waste Management	Indoors	Waste collected and moved to garbage room at the end of each working day	4.00%
				Complains due to odor leakage and emissions from the Garbage room	3.00%
			Outdoors	Hardscape and Landscape waste is collected and disposed as per the method statement	3.00%
				Waste to be collected from the garbage room and disposed off site at the end of each working day	3.00%
			Check	100%	100.00%

PERFORMANCE LEVELS

#	Section	Service	KPI	Weighting
Safety and Security	5.1	Patrol	All patrols to be carried out at the required times. All agreed checks to be undertaken	5.00%
			24/7 Monitoring to security desk consoles	5.00%
			Compliance with regular periodic checks and procedures for Fire and Life Safety tools and Equipment	5.00%
		Staffing	Complains due to staff hygiene or improper behavior	8.00%
			Availability of security staff as per agreed numbers, qualifications and organization chart 24/7	10.00%
		Passes	All daily checks of records of visitor passes issued to be deemed to be fully satisfactory. This means the complete reconciliation of all passes.	7.00%
		Access	No unauthorized person to be admitted on the premises.	10.00%
			No failure to lock down building/s at the end of the business day	10.00%
			Prevent fire, theft, damage and trespass on the building	5.00%
			Failure to response to emergencies	10.00%
		Theft	No theft of the Employer and his employees	25.00%
		Check	100.00%	100.00%

PERFORMANCE LEVELS

Catering and Beverage	#	Section	Service	KPI		
	6.1	Catering	Set Menu	Availability of the agreed food and beverage menu items		
			Services	Response time to service at hand		
				Deliver all pre-booked requests for within the prebooked time		
				No complains clearance and cleaning of tables		
	Food Quality		No Complains from the quality of the food and its freshness			
	#	Section	Service	KPI	Weighting	
	6.2	Beverage	Water Filling Service	Availability of one week stock	20.00%	
				Availability of water bottles at floor	20.00%	
			Beverage Service Paid by Dar	Drinks not served on time	10.00%	
Drinks not served to agreed number of people				10.00%		
6.3	General	Staffing	Complains due to staff hygiene or improper behavior	10.00%		
			Availability of all staff as per agreed numbers, qualifications and organization chart 24/7	20.00%		
		Health and Safety	Comply with applicable laws, standards and codes	5.00%		
			Submit Health, safety and quality on the job training awareness report	5.00%		
Check			100.00%	100.00%		

PERFORMANCE LEVELS

Operators' Supervision	#	Section	Service	KPI	Weighting
	7.1	General Supervision	Own Staffing	Complains due to staff hygiene or improper behavior	25.00%
				Availability of staff as per agreed numbers, qualifications and organization chart	25.00%
			Operators' Performance	All daily checks of records of visitor passes issued to be deemed to be fully satisfactory. This means the complete reconciliation of all passes.	50.00%
Check			100.00%	100.00%	

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