

Management Career Path for Construction Engineers and the Transition Stage

المسار الوظيفي لمهندسي البناء نحو المنصب الإداري و المرحلة الإنتقالية

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Abstract

Based on several recent studies it had been observed that a lot of engineers are interested to follow a managerial path in their career life. This research is aiming to study the management career path for engineers in the construction industry, focusing on the transition stage to provide guidance for the engineers to override this stage successfully. Wherein, researchers found that engineers face challenges in their transition process from technical engineering to a management position.

This goal has been achieved through an extensive literature review that was conducted to provide an in-depth exploration for the objectives of the study, which lead to the conceptual framework of the study that present the factors that contributes in the transition process for engineers, these factors are: personal characteristics, management skills and working experience. These principles was examine through a qualitative approach to present different experiences for engineers who pursue a managerial path successfully, that was approach through a case study method using a semi-structural interviews; interviews was conducted with two engineers who had a successful experience in the transition from technical engineering to a management position and were successful in fulfilling an important managerial position. The cases were analyzed and compared with the literature review findings.

The most important findings of the research recommend that construction organizations can't promote engineers for a managerial position based on their technical competencies only, they need to take in account other principles like personal characteristics, and managerial skills, in addition construction organizations must provide adequate training for engineers before promoting them officially to a management position. Universities need to add a management course to the curriculums of engineering degrees, and it was highly recommended for engineers to benefit from others' experience and challenges in the transition to help them build an insight for the challenges that they might face.

ملخص البحث

بناءً على العديد من الدراسات الحديثة لقد لوحظ اهتمام الكثير من المهندسين في الإلتحاق بالمجال الإداري في حياتهم المهنية. لذا يهدف هذا البحث الى دراسة المسار الإداري لمهندسين البناء والتشييد مع التركيز على المرحلة الانتقالية لما يوجد فيها من صعوبات قد تعيق المهندسين من مواصلة العمل في المجال الإداري. لتحقيق هذه الهدف فقد تم عرض الكثير من الدراسات التي تدور حول هذا الموضوع. وبناء على هذه الدراسات فقد تم اكتشاف بعض العوامل التي تؤثر على تجاوز المهندسين للمرحلة الانتقالية بنجاح، مما تشمل المراحل التي يمر بها المهندس وصولاً الى المنصب الإداري، والدوافع التي تدفع بالمهندس لاختيار النصب الإداري و المهارات والخبرات التي يحتاجها المهندس لتجاوز هذه المرحلة بنجاح.

تتبع هذه الدراسة منهج البحث النوعي لتقديم بعض التجارب لمهندسين إلتحقوا بالمسار الإداري بنجاح، ولقد تم جمع المعلومات عن طريق المقابلات شبه الهيكلية مع المهندسين الذين انتقلوا بنجاح من المرحلة التقنيه الى المرحلة الإدارية. وقد تم تحليل الحالات ومقارنتها مع نتائج الدراسات السابقة. مما قد بينته صحة نتائج الابحاث السابقة.

ومن ابرز النتائج التي توصل اليها البحث انه يجب على الشركات الاعتناء باختيار المهندسين الذين يصلحون لشغل المناصب الادارية بنجاح فقد بينت الدراسات ان الشركات تعتمد في ترقية المهندسين على نجاحهم بالجانب التقني فقط وهذا ليس كافٍ فقد وضح البحث انه يجب النظر الى عوامل أخرى بجانب النجاح التقني مثل السمات الشخصية والمهارات الادارية. بالإضافة إلى أنه يجب على شركات البناء توفير التدريب الكافي للمهندسين قبل انتقالهم الى المنصب الإداري، و ينصح البحث المهندسين المهتمين بشغل المناصب الادارية بمتابعة الدراسات العليا في المجال الإداري مما قد يساعدهم بتجاوز الصعوبات بنجاح، و اخيرا ينصح البحث الجامعات بتوفير مساق إداري ضمن الدراسات الهندسية مما قد يساعد في تحضير المهندسين لشغل مناصب إدارية في حياتهم المهنية.

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Chapter I

1. Introduction:

The construction industry is dynamic and variable industry; construction projects are not similar, each project has its unique features and special requirement, which makes construction projects more complex and challenging. The booming construction activities in any country represent a good indicator of the country's development (Mouchi, Rotimi, & Ramachandra, 2011).

The construction industry is considered as one of the most important sectors in the UAE. It contributes significantly to the economic status of the country, in the past few years UAE showed an extraordinary growth in the construction industry. Construction projects become more advanced and hence more complex and challenging. The UAE construction companies are competing locally and globally to achieve the goal of His Highness Sheikh Mohammed bin Rashid in getting the UAE in the top among the countries worldwide.

The success of the any construction organization relies significantly on their engineers, either that who are on the technical field or the ones in the management positions. Therefore, the construction industry requires a highly skilled people who can well equipped the technical and managerial positions successfully to cope up with the challenges and the rapid growth of the industry.

Career planning is important for all engineers from the early stages; engineers have to be aware of the career stages that they might pass through in their career, this awareness is very important for achieving a successful career life, and determining the most appropriate career path. Several studies observed that many engineers tend to prefer a managerial path in their career progression (Kocaoglu, 1984; Badawy, 1995; Lyons, Anselmo, and Kuller, 1993; Yeh, 2008; Wilde, 2009). Further, Badawy (1981) explained that 40% of the engineers are engaged in management responsibilities within less than 5 years' experience, and the percentage increases along with the elder age's engineers, wherein 75% were seen in the managerial position between the ages 40-45.

Traditionally, career was seen as modification in a person preference occupation. This process brings up the concept of hierarchy; where the person ambition motivates him to take over higher positions with greater responsibility (Landau & Hammer, 1986; cited in Kilimnik et al, 2011). This might explains the preference for most engineers and scientist to follow a managerial path than any other paths.

A study that was made by Lyons, Anselmo, and Kuller, (1993), state that most of graduated engineers fulfill a managerial position after three to five years from their graduation, the study also assert that engineers must develop their management skills to succeed in the rapid development of the industry; “Management responsibilities for engineering professionals are an unavoidable part of working in modern commercial industries.” (Wilde, 2009, p.7).

Although management skills are crucial for engineers, but many engineers find it challenging in turning to a management position, as well as some of them do not succeed especially in the senior management levels, where there is a chance for derailment to occur (Yeh, 2008). Mainly because, management requires different skills than technical skills that engineers get used to from their technical field and college courses.

This research attempted to investigate management career path for construction engineers, and explore the reason behind the highly preference for engineers in following management path. In further, it defines the challenges and the common obstacles that engineers face in their transition from the technical field to the management responsibilities, and presenting some recommendations that will assist the construction engineers in their transition to the management level.

1.1 Research Background

1.1.1 Career Path:

Tremblay, Wils, & Proulx, (2002) argued that there are five career paths that an engineer can take, which are Technical Path, Managerial Path, Project-Based Path, Hybrid Path and Entrepreneurial Path. However, the technical path and managerial path are the most

common preference career paths among engineers. Understanding each career path is important to help engineers determine their preference.

Technical Path involves a high degree of specialization. Engineers expected to follow a technical path if the technical tasks continue at the centre of their career. The Technical career implements the knowledge acquired in their college courses, by time and experience engineers in the technical path become an expert (Wilde, 2009, Tremblay, Wils, & Proulx, 2002).

Managerial Path requires the engineers to pass through different career stages before they become managers so they can acquire all the experience needed to fulfil a managerial position. Managerial career path usually get filled up by the successful engineers, those who get recognized in the technical field by being assigned to enormous amounts of responsibilities. Usually engineers in the managerial positions drop the technical issues gradually to focus on the management activities (Wilde, 2009; Tremblay, Wils, & Proulx, 2002).

Project-based Path engineers deal with technical projects in sequence that helps them to expand their technical skills in the full project instead of focusing on a specific task in the project. While this path does not provide a real progress or a proper guideline, still some engineers prefer it (Bailyn, 1991; Allen & Katz, 1989; McKinnon, 1987, cited in Tremblay, Wils, & Proulx, 2002).

Some engineers experience several career paths (technical, project base and managerial) without defining a specific career direction that named “Hybrid Path”.

Finally, the “entrepreneurial path” define the engineers who aim to establish their own private company, recently entrepreneur path get popularity among engineers ; however engineers need experience to pursue such a path, this path should be well-studied by organizations wherein engineers in the entrepreneurial path may become a competitor to them (Tremblay, Wils, & Proulx, 2002).

This study will focus on the Managerial Path. Wherein studies, indicates that most of the graduate engineers aim to pursue a Managerial Path.

1.1.2 Construction Engineering Management:

In the past years, construction managers were either a craftsmen with no specific certificate or a graduate engineer with certain experience. (Oglesby, 1990; Atalah and Muchemedzi, 2006; Levitt, 2007; cited in Arditi and Polat, 2010). However, that changed after the War World II in America; when there was a massive demand for various kinds of construction building such as schools, hospitals, civil infrastructure and many other commercial, industrial and governmental projects. Later in 1960s there were many projects out for construction bids; it was challenging for the construction industry at that time, wherein problems start to rise up for example project delays, high bids and irrational cost increase (Heery, 2011; Kharbanda & Stallworthy, 1990). All of that and more called out for more specialized managers to manage the construction projects.

This complexity of the projects claims for the development in the construction industry in several aspects, such as: project management, computer technology, and new construction equipment. All of that, emphasis on the importance of educated construction managers that have all the necessary information about building and business management (Atalah and Muchemedzi 2006, cited in Arditi and Polat, 2010)

In addition, in late 1950s and early 1960s, universities in United States started in developing management courses for the graduates and undergraduate programs of civil engineering (Oglesby 1990; Chinowsky and Diekmann 2004; Willenbrock and Thomas Jr. 2007; Tucker 2007; Levitt 2007; cited in Arditi and Polat, 2010).

Between 1970s and 1990s the United States and many other countries witnessed great number of graduated students from Construction Engineering Management program, as well as a significant development in the scope and quality of researches where out at that time (Atalah and Muchemedzi 2006; Levitt 2007; cited in Arditi and Polat, 2010).

Researchers seems to agree that management skills are essential for construction engineers, and they argue that construction managers responsibilities are not limited to the technical activities like building and maintenance of constructed projects, but extend to a more

extensive management and administrative activities such as: HR management, contract law, marketing, accounting, finance, environmental analyses, and many other duties (Atalah and Muchemedzi 2006; Russell et al. 2007; cited in Arditi and Polat, 2010)

According to the Construction Management Association of America (2007) Construction managers roles are: organising the work, developing the management plan, supervising the contributor's work according to the plan and defining the taken procedure if there is any change in the plan. In addition, Construction managers are responsible for assisting the owners with their decisions in accomplishing the project.

1.2 Overview :

The construction industry is a diversified and innovative industry; it represents an important economic axis of any country. In the UAE the construction industry considered one of the most important sectors for the economic development of the country. In the past few years the UAE showed impressive growth in the construction industry by investing in large number of construction projects. This reflects positively in the annual GDP rate of the country.

According to Dubai Chamber of Commerce & Industry (2012), the construction industry contribution in the total GDP of 2008 was 10.6% and in 2011 was 10.3%; however it is expected to increase in 2015 to 11.1% and in 2021 to 11.5%. Comparing with the GCC countries the UAE hold the maximum value for construction projects in 2011 among the six countries.

Additionally, the construction industry expected a booming in the coming years especially after the announcement of the Expo 2020, the country is planning to invest in many infrastructure and real estate projects, where it is expected to have more than 25 million visitors attending the Expo 2020, 70% of them are from outside the country (Dubai Economic Council, 2014). According to A MEED Insight report (2014), there was more than \$27bn worth projects waiting for agreement, and \$9.5bn worth projects under bidding. Consequently, this will open the door for more jobs, wherein it is expected to have 227,000 new jobs by 2021, 30% of them in the construction industry.

The UAE expect extraordinary achievements from the construction Industry. Construction companies are competing with global companies across the world. According to the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Vice President, Prime Minister and Ruler of Dubai, he said about the UAE in being the ‘number one’ (Salama,2014):

“We, in the UAE, have no such word as “impossible”; it does not exist in our lexicon. Such a word is used by the lazy and the weak, who fear challenges and progress. When one doubts his potential and capabilities as well as his confidence, he will lose the compass that leads him to success and excellence, thus failing to achieve his goal. I require you, youth, to insist on number one.”

He also said at the closing of a Cabinet meeting in 2010 about the vision of 2021, according to a document by Dubai Electrical & Water Authority DEWA (n.d p.10 of 74):

“The Vision aims to make the UAE among the best countries in the world by the Golden Jubilee of the Union. In order to translate the Vision into reality, its pillars have been mapped into six national priorities which represent the key focus sectors of government action in the coming years.”

Therefore, construction companies must be prepared for the upcoming challenges by providing innovative ideas, good services, high qualities, lowest prices, and time responsibility manner, achieving this required skilful engineers not only in the technical activities, but also in the management side, so they can cope up with the intensity and complexity of the construction industry and deliver the projects successfully to reach the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum.

1.3 Problem statement:

Most of the studies concerning the issue of engineers and management transition were concentrated in the United States and United Kingdom (Halliday, 1996), with no evidence of similar study in the GCC region and specifically UAE. This has provided the motivation to undertake this research here in UAE.

Managers play a dynamic role in the success of their organization; they handle an enormous amount of responsibilities, which place them in a very critical position that can contribute in the success or failure of their organization.

Porbahaie (1994), states that there are more than 50% engineers get hired in a management position or take a leadership responsibility during their career life, which emphasize on the importance of management skills for engineers. Several studies state that engineers handle managerial responsibilities after three to five years from their graduation (Long, 1997; Fetzer, 2005). However, according to Halliday (1996) an early transition for engineers may lead to dissolution of self-respect and inefficient performance because of the insufficient experience in the domain of management.

Commonly engineers who are success in the technical occupations are the ones usually selected to take a managerial position in their organization (Lyons, Anselmo, and Kuller, 1993). Yet, construction engineers struggle with their transition to the management position is still a common issue, wherein skills and the way of thinking required by engineering managers are different from the skills required for technical engineers, some brilliant engineers are not capable of making a successful transition or they need to do considerable effort to become successful managers (Fetzer, 2005).

In addition, Thamhain (1991) survey highlighted that 85% of the engineers in the management field emphasis on the importance of developing new engineering managers' skills to survive in their occupations. Badawy (1995), point out that engineers and scientist transition into managers is a challenging task for the management in the 21st century.

Imprecision in the construction industry is very costly, especially with the high competition between all organizations, construction engineering managers position is extremely critical position, their responsibilities expand more and more as they transit to

the higher levels. In addition, according to Halliday (1996) deep changes in the behaviour and interpersonal skills are often needed for the technical profession in order for them to succeed in the management role, being an effective manager in a construction organization is challenging task for new engineers.

This study is undertaken to investigate the management career path for construction engineers, and pave the way for engineers who are planning to take a management path in their career, by illustrating some theories that will provide a clear perception for engineering manager transition. In further, focusing on the transition stage from the technical field to the managerial position and providing some key solutions that would assure an easier and smoother transition for the engineers and the organization.

1.4 Aim & Objectives:

This research aims to investigate the management career in construction industry, through examine various career paths for construction engineers to support them reaching management levels, and identifying the factors that influence them to pursue such a decision. This aim will be achieved by the following objectives:

- Investigate the major milestones for construction engineers, to provide clear understanding for their career progress toward management levels.
- Examine the experience and qualifications required for construction engineers that prepare them to work in the management position.
- Investigate the personal and contextual factors that motivate engineers to climb the management ladder.
- Critically evaluate the challenges that engineers might go through in their transition from technical engineering to management position.

1.5 Research Questions:

Q1: What are the major milestones that influence on the engineers behaviour to pursue a managerial path and how career planning can improve engineers' ability for management position?

Q2: What is the required experience and skills for the engineers to be able to move on for the management position?

Q3: What are the reasons and motivations that push construction engineers to follow a managerial path rather than any other path?

Q4: What are the challenges and difficulties that facing construction engineers during their transition to the management level?

1.6 Research Outline:

The dissertation consists of 5 chapters to help achieving the research objectives and answering the research questions. The Five chapters will include:

Chapter I - Introduction: The first chapter starts with introducing the reader to the research topic “Management Career Path for Construction Engineers and the Transition Stage”, presenting the significant of the research topic, and the important of management for construction engineers and how it influences on their career path. Followed by, the background of the problem and the appearance of construction management as a qualification. An overview of the construction industry in the UAE and the importance of construction engineers role in advancing the country locally and globally. Research problem presenting the struggling stage for engineers during their transition narrowed down to the research goal, objectives and research questions.

Chapter II - Literature Review: This chapter provide an in-depth exploration for previous research related to engineering management career. First it introduces a general concept about the career path for engineers. Then, it is clarify the main milestones for construction engineers, followed by the motivation features for engineers to pursue management path. Next a comprehensive explanation for the skills and experience required in the management level. Finally, it presents a critical discussion for the challenges that engineers are exposed to in the transition phase.

Chapter III – Conceptual Framework: This chapter illustrates a comprehensive understanding for the literature review illustrated in a conceptual framework chart to show out the direction of the study and identify the main principles that influence the research.

Chapter IV – Methodology: Presenting different types of research methodologies, and define the suitable research method for this research and data collection techniques to meet the research goal and objectives.

Chapter VI – Data analysis and Discussion: This chapter analysis the collected data and results to present the best way for construction engineers to follow a management position successfully and to mitigate from the struggling in their transition phase.

Chapter VII – Conclusion: Presenting the conclusion and recommendations that support construction engineers to take a managerial position successfully in there career path. In addition this chapter represents the research suggestions for further study.

Chapter II

2. Literature Review

2.1 Career:

Traditionally careers were viewed as a linear, stable, and rigid path (Greenhaus, Callanan and Godshalk 2010; cited in Grimland, Vigoda-Gadot and Baruch, 2012), however currently careers are seen as active, boundary-less and unpredictable (Arthur and Rousseau 1996; Lips-Wiersma and Hall 2007; cited in Grimland, Vigoda-Gadot and Baruch, 2012)

Career is a sequence of improvements in individual experience over-time (Hall and Lawrence's, 1989; cited in Grimland, Vigoda-Gadot and Baruch, 2012). Career planning is a plan that an individual set for his professional growth through a continuous manner (Souder 1983). According to Simpson (1994), career is upward movement process which called progress and it is usually measure by increased remuneration (cited in Srour et al., 2013).

Career success is well-defined as the work progress that gathered from individual working experience and the psychological consequences resulting from it. (Venn, et al., 2003; cited in Ganiron and Ganiron, 2013). Researches classify career success measurements to objective and subjective values. The objective values can be seen and measured by other objectives, and subjective values are concern one's subjective judgments such as life satisfaction. Theory by Everett Hughes' (1937, 1958) suggests measurement for career success through two dimensions objective (external) and subjective (internal) measurements (cited in Heslin 2005). The objective (external) criteria linked with the personal observable, verifiable and measurable attainments that recognized in the salaries, upgrading and occupational position (Grimland, Vigoda-Gadot and Baruch, 2012); and such elements recognized as a hallmarks of profession in several societies (Nicholson, 2000, cited in Dries, Pepermans & Carlier 2008). On the other hand, the Subjective (internal) factors recognized by the job satisfaction which depends on the self-perception of success, career achievements, the individual future visions and goals

that he set for himself (Greenhaus, Parasuraman and Wormley 1990; cited in Dries, Pepermans & Carlier 2008; Grimland, Vigoda-Gadot and Baruch, 2012).

2.1.1 Career Planning

Career planning is the best way for an individual to develop his career through a series of job milestones. In addition career planning assures engineers achieving their goals and helps them to determine which path to pursue (Souder 1983). Career upgrading system is not certain it is different from engineer to another; it is influence by their career preference and desire, in addition to some other circumstances that might influence their decision (Srour et al., 2013).

Srour et al. (2013) research present a career model by Dirver (1994) that explains four types of career progression consistent with three dimensions: Occurrence of movement, movement orientation, and kind of adjustment in the job content. Figure (1) illustrates these four types.

First type in the figure is the “linear” career type that presents a uniform way of positive movement on a clear outline ladder within a specific profession. As in this type individuals in certain stage of their career start thinking about management and business associated positions. The second line graph below the first type is “Steady- State Expert” which expresses individuals who select one specific career for lifetime, with no job change and one profession commitment. In career life these individuals become “expert” in their profession by time. But they don’t take any management responsibilities. The third type is the “Spiral” career; Individuals in this type like to develop new skills by keep on shifting between related professions each 7 to 10 years. The last type is the “Transitory” career, is distinguish by moving frequently from field to another without a uniform period every 1 to 4 years.

Engineers usually take the single ladder path, which mean the “linear” career type, it’s the most career type selected by scientific and engineers since it allow them for a managerial positions (Allen and Katz, 1986; cited in Srour et al., 2013). However, some engineers prefer to stay in the technical field and might not be satisfy by a management position.

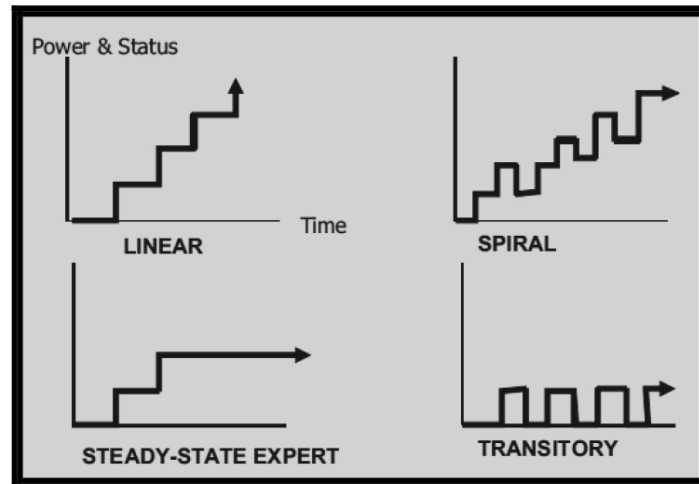


Figure 1: Four Career Types (from Driver, 1994; cited in Srouf et al., 2013)

2.1.2 Career anchor

Career anchor was established by Schein (1968, 1975) to manage career path. Career anchor is the individual self-concept that include self-perception of one's talents, skills, fundamental values, and mainly the development feeling of "motives" and "needs" as individual get involved with his career. Schein (1996) set eight career anchors which are: (1) Technical and functional competence, (2) Autonomy/independence, (3) Security/stability, (4) Service/dedication to a cause, (5) Pure challenge (or variety), (6) Lifestyle (7) Entrepreneurial creativity and (8) Managerial competence. People need to discover one anchor from the eight anchors during their career development process. Many careers fulfil more than one need which motivates different anchors, discovering this specific anchor that an individual will not give it up, occur when they go out of their comfort zone and face new challenges like new promotion, firing or changing in functions. Some researchers argued the one anchor concept and noted that an individual can have "multi anchors" "primary" and "secondary" anchors (Wils, Wils and Tremblay, 2014).

According to Kilimnik et al. (2011) Career anchor used in individuals' professional career life to organize their experience, identify the main zones of contribution in their path, creating the principles for several career types and identify the patterns of desire

and success that a person can draw for himself, therefore career anchors use to guide and stabilize individual career. In fact, Kilimnik et al. (2011) states that now a day Individuals become the main responsible for their career choices, and they need to be conscious about their goals in life and their values concerning their career, so they can develop the suitable skills that they need to accomplish their goal. Each anchor is concern a certain principles in the individual life:

- 1) Entrepreneurship: responsible about creating new things; the courage to take risks and the ambitions for personal success in what to be reached.
- 2) Technical and functional competence: responsible for individual proficiency and skill, shaping the career in specific technical field.
- 3) Lifestyle: responsible for improving a lifestyle that capable to balance between career and family needs, so none of them take a preference on the other.
- 4) Pure challenge: responsible for resolving complicated problems that seems to have no solution, and find the possibility to overcome the obstacles.
- 5) Autonomy: responsible for self-determination and independence, and being unconstrained by organizational rules;
- 6) Security/stability: responsible for the stability and the assurance of employment, safety, benefits and advantageously retirement.
- 7) Service and dedication: responsible for using interpersonal skills and assisting to others, obligation to an important life needs and devote to it.
- 8) Managing people: mainly responsible for the integration of different people's efforts to get effective results, and for clarifying the different roles in an organization.

Tremblay, Wils, & Proul (2002) Study pointed that career anchor is a very helpful strategy which assessing individuals' professional ambitions and career orientations, that consider an important element in determining a desired career path for individual.

Researches reveal that engineers who follow a managerial path have a strong management anchor and strong desire for promotion, and those who follow technical path have a strong technical anchor and strong security anchor. This hypothesis was verified by Tremblay, Wils, & Proul (1998) study, and Rynes, Tolbert and Strausser,(1988) study emphasis on this point as well.

According to Schein strategy for career anchor, managerial and technical anchors are discovered by time as individuals get more experiences in their work. Therefore, career anchor would be easier to expect within experienced engineers than journeys or fresh graduates engineers. It is essential to note that managerially anchored individuals bloom on management critical situations, new responsibilities, or situations that required authority or power; on the other hand the technical path individuals fear or dislike handling this kind of activities (Schein, 1978; cited in Rynes, Tolbert and Strausser, 1988).

Bailyn, & Lynch (1983), study find that engineers who remain in the same job through their mid-age period, they are more family oriented, however they still satisfied and feel successful about their career. It also reveals that adding responsibilities and supervisory role to engineers' career in this age seems to increase stimulation toward job, which means that engineers promotion to managerial position increase work involvement and lower the family orientation.

2.2 Millstones:

Engineer to reach a senior management position they usually pass through different positions and stages, where they can acquire skills and knowledge that enable them to be in a senior management position.

Fresh graduate engineers start their career with few amounts of responsibilities, and as they get more experience and improvement, they get more trusted with larger tasks that required a higher level of responsibility. However an entry-level engineers task is vary from a company to another, in some companies an entry-level engineer responsibility is limited as being a monitor for construction field presenting the “eyes and ears” of the senior design engineers, but in other companies they might handle a regular task such as analysing and designing under the supervision of a senior engineer . On the other hand, experienced engineers do more complex work as they get more progressive such as more advanced analysing and designing work, or managing design project, or managing design teams, or more advanced as being specialized consultant (Tomas & Ganiron, 2013).

Tomas & Ganiron (2013) suggest a path way for civil engineers in the construction industry, who are responsible to transform architectural designs from paper to reality. Civil engineers in construction industry may be involve on various size and type of projects like airports, building, bridges, roads and different infrastructure projects. Civil engineering education program prepare engineers for the critical thinking that is needed for working in the construction industry. Tomas & Ganiron (2013) also states, that the most successful engineers are those who have strong technical and employability skills that are acquired from mentoring, networking and professional relationships. Figure (2) illustrate the positions that engineers might pass through in their career. According to Lynn Dessert (2012), suggested career levels for engineers in Figure (3), which divide the engineers’ career to three main milestones: Professional Level, Management Level and Executive Level. In applying these milestones to Tomas & Granion (2013) career path the professional level can be seen in the beginning of the chart, the management level can be seen the middle of the chart and the executive level in the end of the chart. This is supported by Lannes (2001) study which also divides the career to three milestones (Lannes study is explained extensively in the Skills and Experience section 2.3).



Figure 2: Career path of civil engineers in construction (Tomas & Ganiron 2013, p. 619)

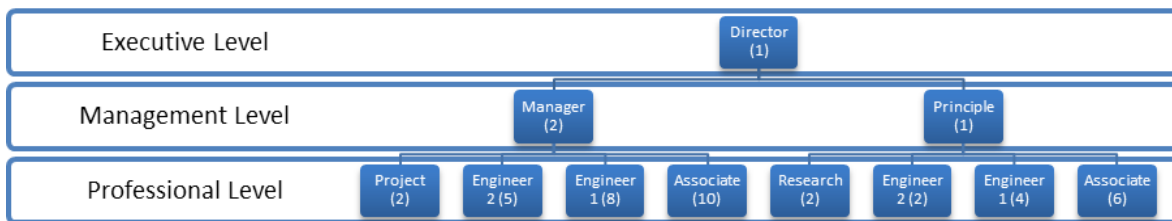


Figure 3: Engineers Career Levels (Dessert, 2012)

A study by Srour et al. (2013) was done on 58 Engineering Management Master's degree graduated engineers in Lebanon most of the engineering managers had civil engineering background, in addition to some other specialist IT/Telecom, Management Consulting and Manufacturing/ Suppliers, those engineers had an rate of 9.6 years' experience. Figure (4) diagram illustrates the career path for these engineering managers. Each profession has its special mark that identifies it. The starting point as shown in the diagram is the entry level for the technical position, each career path have the same line type with in and out arrow from an each phase, the number of years engineers spends in each phase are written between the phases. The Letter "M" in the diagram indicates the millstones that engineers choose to enter the Engineering Management degree. The vertical dark bold line in the end of the career path expresses survey date.

This diagram can be useful in assisting graduate engineers, working engineers, organization / engineering managers and researches. Graduate engineers usually are uncertain of which career path they need to follow, this chart illustrate some guidance for them. First of all, it shows that there are several starting point that they can start with mainly there is the "Entry-level technical position", however some engineers had

different starting positions like project management position, mid-level technical position, and in one example senior technical position. Working engineers with few experiences in the specific path, they can use the diagram to benefit from other engineer experience, where they can set a plan for their next stage and knowing the possible career progression in their path, moreover it can help them determine the right time in making a transition. Organizations and managers can use this diagram to exam the possible career progression for their employees and run better career management for engineers who are interested to get a management position. Furthermore, they can take advantage of learning from other organizations process in managing career progressing for their engineers. Researchers can use the career diagram in any further researches to improve engineers' career path progression.

According to Bailyn, & Lynch (1983) there is no specific pattern in the career path for engineers; engineers are so different from each other, successful engineers career path come in several different ways.

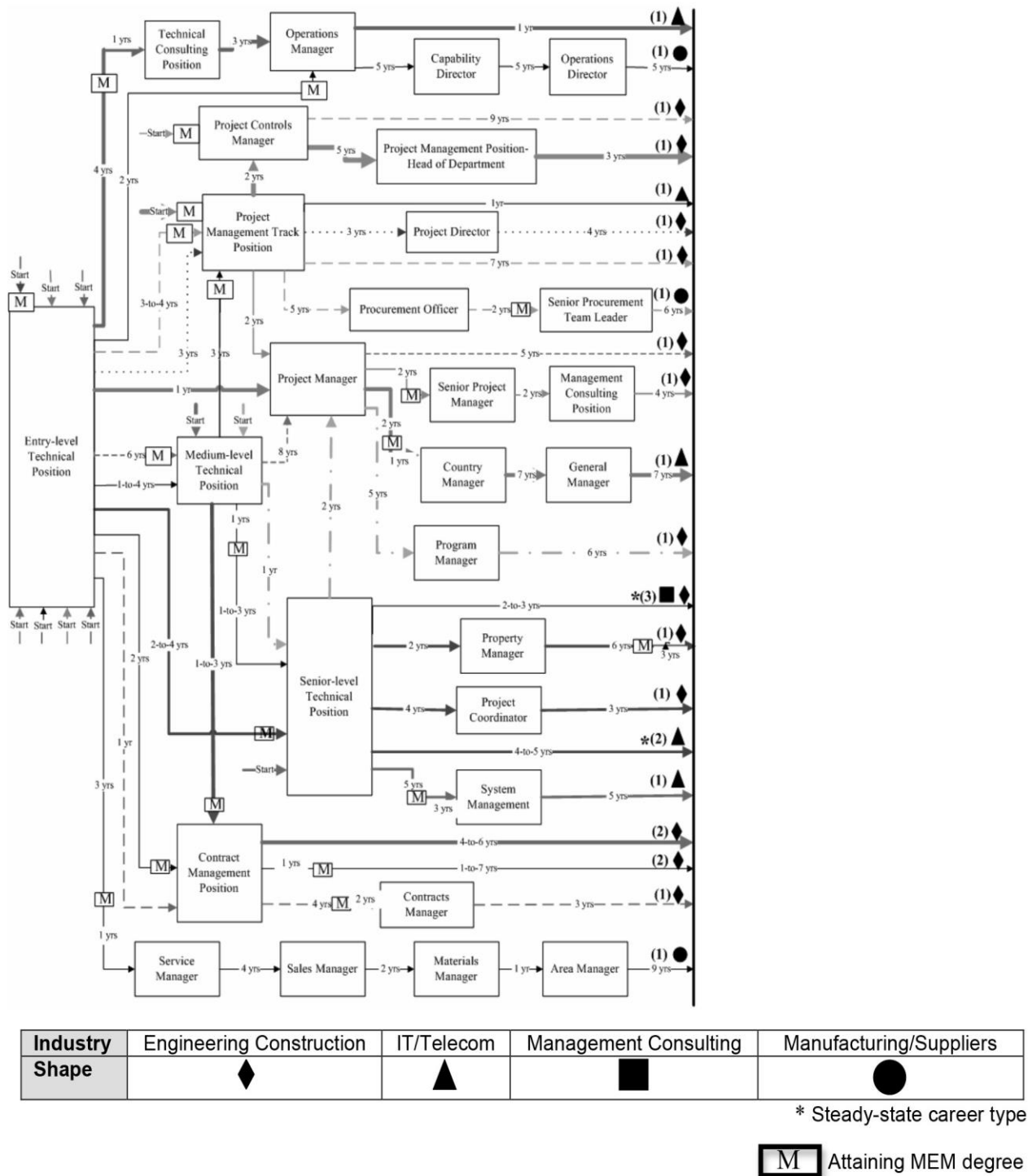


Figure 4: Career Path for Engineering Managers (Srour et al. 2013, p. 93)

It is common for engineers to be in a managerial level after five years from their graduation, this fast promotion can lead to dissolution of self-respect and inefficient performance because of the lack of experience in the new role (Halliday, 1996).

Halliday (1996) divide technical profession into three groups: those with no ambition to take a managerial responsibility, those with ambition for a managerial responsibility where they need some support and training to achieve their ambitions successfully, and those who are not satisfied by their technical career and are seeking for challenging somewhere else.

2.3 Motivations for Management:

Although engineers as professionals have a great appreciation for their professional competence, but most of them don't continue as engineers; they prefer to establish and manage their own business or being managers in a large organization (Badawy, 1982; cited in Halliday, 1996). Different motivational aspects were defined by several researches explaining the reason behind engineers' preference for being in managerial positions.

Roberts and Biddle (1994) states that engineers are shifting to management for the purpose of looking for better compensational opportunities. RJohnson and Sargeant (1998) pointed that it is for the reason that achieving to a higher management positions viewed as successful achievement in many organizations (cited in Srour et al., 2013). Al-Buraey & Ghani (1986) and Halliday (1996) both agreed that engineers' desire in moving to management position is due to the advantages that associated with the managerial position such as: controlling, authority, prestigious, position and financial rewards, which are missing in the technical path; technical path compensations doesn't meet the expectation of many engineers in comparing with the compensations in the management path.

Personal development and one's desire to follow management path are the best motivational features for engineers, wherein engineers who are seeking for professional development are more likely to succeed in their transition to managerial position and keep in progress themselves (Wilde, 2009; Tremblay, Wils, and Proulx, 2002). In

addition, Wilde (2009) states that being in a management positions was not the decision of some engineers, they were asked to shift to management position by their organizations; wherein organizations usually promotes engineers who bright in their technical work.

Tremblay, Wils, & Proul (2002) study several factors that influence the career path decision for engineers which are: (1) factors related to individual career path, (2) factors related to the work context and (3) socio-demographic and personal characteristics as control variables.

- 1- Factors related to individual career paths: consist of three related influence elements: Actual experience, Professionalism and Career attitudes

- 1.1 Actual experience: experience influence career path decision for engineers, studies that had been investigated by Tremblay, Wils, & Proul (2002) pointed that engineers in a certain path have a highly preference for their existing path. Practically, engineers in the technical path prefer the technical path more than others in different career path, and those who are in the managerial path prefer it more than others (Allen and Katz, 1988; cited in Tremblay, Wils, & Proul, 2002). Scarpello and Vandenberg (1992), explains the preference for the actual career path for engineers, due to that the environment that it is fitting the individuals and realizing their professional satisfactions. Tremblay, Wils, & Proul, (2002) conclude that actual career path and experience have a strong influence in engineers career determining; wherein those who prefer their current career path are concern about their dominant anchor and they do not want to take the risk to lose it. Or it might indicate that engineers made the right choice in their career and they find their dominant anchor.

- 1.2 Professionalism: it is an attitude toward a profession, for professional engineers' professionalism is distinctive by "local orientation" and "cosmopolitan orientation". The local orientation indicate a low obligation for a profession and high loyalty for the organization; local orientation related to engineers who have managerial path. In contrast with the cosmopolitan orientation which indicates high commitment for a profession and low loyalty

for an organization, and it is related to engineers in technical path. Tremblay, Wils, & Proul (2002) indicates that a high professionalism for engineers refer for higher technical path preference than managerial path.

- 1.3 Career attitudes and strategies: Having the necessary aptitudes are not enough to ensure career advancement for engineers. In order for an engineer to advance in his career he needs to have a clear aspiration. Desire for promotion linked with managerial path preference. Career- related behaviours also influence career path determination, such as working-time, the study verify that individuals who are working hard and for long hour are more likely to follow managerial path, Tremblay, Wils, & Proul (2002) represent Rynes (1987) study that pointed that engineers who follow management path spend more hours in work than those in the technical path.
- 2- Work related determinants: consist of three related influence factors: organization type, plateau forms and work-related attitudes toward the job.
 - a. Organization type: its significant effect on the selected career path, for instants engineers with technical orientation were attract by the public sector organizations, but private sector where more preferred by engineers with managerial orientation, as well as those with managerial preference tend to seek for large private-sector organizations where they can find more chances for promotion, in contrast with the technical preference engineers tend to work for small or medium privet firms.
 - b. Plateau Forms: career plateau reflect the possibility of promotion within organizations. For engineers there are two measurements of plateaus: structural and payment. Tremblay, Wils, & Proul (2002) that engineers that search for a plateau in the structural and salary levels they prefer managerial path than technical path.
 - c. Work-related attitudes: the career attitude toward organization such as career commitment with a specific organization shows a strong desire for management path which provide a higher chance for promotion.
- 3- Socio-demographic and personal characteristics as control variables: personal characteristics like: age, gender, education and personal motivation have an

impact on the selected career path preference. Research indicates that there is a positive correlation between engineers' age and managerial path preference, wherein many engineers are more interest in promoting for managerial levels in their elder ages. Moreover, the technology rapid evolution seems to be an obstacle for many engineers in their elder ages, new software and updates might be difficult for some engineers to learn and cope up with in certain ages, so they prefer to move up to management position to replace the lack of technological skills. The age factor is supported also by an investigation done by Dalton & Thomopson (1977) which emphasize that engineers in their elder ages become less productive. Hughes (1958) argued that an engineer who still makes drawings at the age of forty is a failure (cited in Bailyn, & Lynch, 1983).

Tremblay, Wils, & Proul (2002) present some studies that indicates that males and females have the same interest for management promotion, however females are attracted toward technical path for the reason that they have more responsibilities towards their families and organizations promotion for management levels concern the males more than the females.

Education appears to be a strong indicator for career orientation. Engineers who complete their studies in MBA or any management course after completing their undergraduate course are more likely to pursue a managerial path in their career.

2.3.1 Dual –Ladder Career Concept

Researches indicate that the majority of engineers who transfer to management where motivated by the advancement of the management position, the financial advancement and the organizational status (Raudsepp, 1972; cited in Sedge 1985). The Dual-ladder system established as an upward strategy for those who don't aim for managerial position in their career. And to solve the problem for technical engineers who are shifting to management positions searching for advancements that they can't find in their field. It is well-known that the highest rewards in the organizations concern those with managerial responsibilities. For many technical professions achieving success with high rewarding is very limited in the technical ladder, some of them are pressured to choice the

management ladder only for the purpose of higher salary and more prestigious status (Katz, Tushman & Allen, 1990). Promoting a technical profession for management position under the pressure of reward could be a big loss for both the organization and its engineers, wherein the organization is losing an important technical capability and adding an incompetent manager. Badawy (1988) emphasizes that not all technical professions are capable of achieving the managerial task successfully.

The dual-ladder system is created to secure the technical professions reward and solve the problem for organizations and individuals, with providing alternative career ladder with meaningful reward for technical professions, where they can keep on developing their skills and technical knowledge (Kaufman, 1974; cited in Katz, Tushman & Allen, 1990). Dual ladder is a promotions system along two parallel hierarchies' managerial and technical ladders. The dual ladder system is established from more than 60 years ago to promote scientific and engineers without removing them from their profession (Shepard, 1958; cited in Katz, Tushman & Allen, 1990). Figure (4) presents a chart by Hill (1992) that illustrates the dual career ladder for engineers.

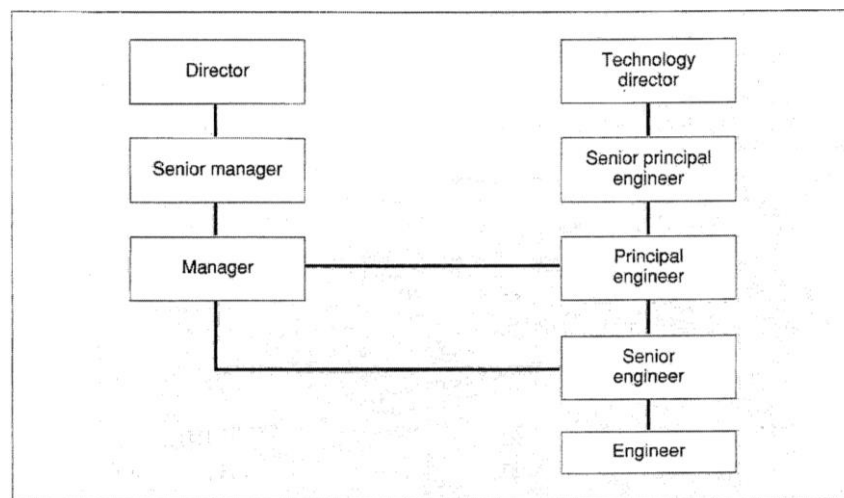


Figure 5: Dual Ladder Career Path (Hill, 1992 , p.16)

Organizations that fail to recognize the technical abilities of its professions lose the opportunity to improve and expand innovative technologies and products (Hill, 1992). Applying the technical path in the organization, increases the motivation and job satisfaction over the hierarchy advancement for professionals which benefits both

professionals and organizations (Halliday, 1996). Unfortunately not all organizations apply the dual career system accurately, for example adding prestigious advancement in the designation for technical professions; titles such as “Vice President” and “General Manager” seems to be more successful comparing with the designation and titles are given that for scientific and engineers (Katz, Tushman & Allen, 1990). Furthermore, as much as the technical profession get advanced in the technical ladder, still there are some authorities that left in the hand of the management such as decision making (Halliday, 1996). Badawy (1986) and Michael-Roth (1986) suggest that in order for the dual ladder to work successfully, an equal desirable reward systems should be applied in the organization, with consequential career opportunities on different levels, and form an organizational philosophy that reinforces the possibility and viability of the managerial ladder and the technical ladder as legitimate career paths (cited in Halliday, 1996).

2.3.2 Maslos’ Hierarchy

Success is defending as “advancement” for many scientific and engineers (Katz, Tushman & Allen, 1990). Dr. Maslow set a theoretical study for the motivational influences of an individual; the theory indicates that individual passion to satisfy his own needs play as a motivator affecting on his performance positively. According to the theory individual needs classifies into five categories: physiological, safety, love / social, self-esteem, and self-actualisation (Venkatesan, Varghese, & Ananthanarayanan, 2009).

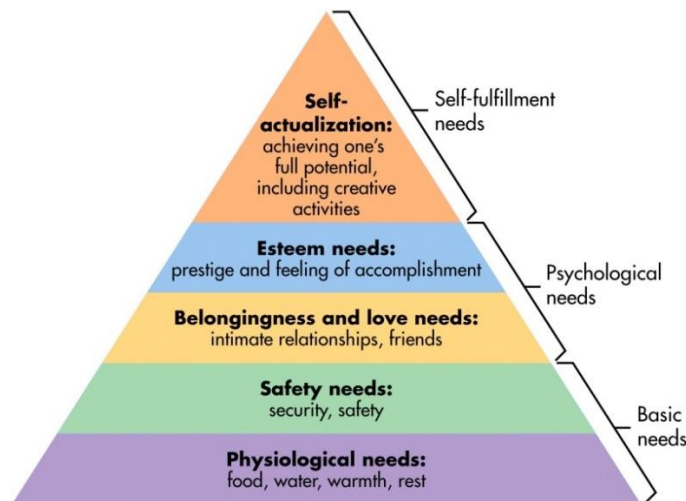


Figure 6: Maslow Hierarchy (James, 2012)

Maslow focused on the top achievers people in their fields, named “self-actualizing people”; as top management people usually concern about “Self-actualization” (Shoura & Singh, 1998). Self-actualization is reached when all the needs are satisfied, as describe by Heylighen (1992) self-actualizations is a continuous development process that doesn’t end. Shoura and Singh (1998) highlighted that the total self-development is important to achieve the self-actualization need for the engineering managers. They also present the characteristics of self-actualization people that observed by Dr. Maslow on high achiever people, which are: Meaningfulness, Self-reliance, Effortlessness, Creativeness, Specialized creativity, Self-understanding, Individualism/strength, Individuality and sense of mission, Harmony with environment, Integration with culture, and Goodness. Shoura and Singh (1998) study the self-actualization need on engineers of the construction sector from different levels, and they state that:

- Performances of Meaningfulness, Self-reliance, and Effortlessness essential are crucial to the performance of technical employees and basics of their job, wherein construction engineers and engineering managers’ activities related to scientific, sequential, or organizational tasks that required these elements.
- Specialized creativity and Professional Creativeness: Creativity refers to the method of performance applying brainstorming and imagination. Professional creativeness refers to the technical features, skill, originality, and expertise during the work. Engineers and construction mangers work usually characterized as tough and stressful, instead it can also be named as original and creative, physical and useful, and practical and active. These qualities are necessary for engineers’ performance, wherein the construction industry is well-known for its creative business feature. As well as it is necessary for individuals who want to promote for the higher position in the organizations.
- Performances of Self-Understanding, Individualism/Strength, and Individuality and sense of mission, are related to the self-esteem, wholeness, completeness, and distinction of an individual, which convert into faith and confidence of professional competences that help in decision making task. As well as these

qualities helps in refining one's personality, for instance raised self-respect and honour, and a distinguished estimate of individual self and goal line of life. As an engineer grows in organization toward the management positions he/she should enhance these qualities. The fact is that these qualities of self-actualization are formed of categories vital in shaping the one's character, leadership style, charisma, and many other potentials that are essential for moving up to managerial level.

- Performances of Harmony with around environment and Integration with culture: these qualities require linking the individual role with the world, by relating one to all, and parts to whole, as well as outline a harmony among simplicity of parts and reliability of entirety. These needs are important to set an order to the chaos and set a harmony with the universe.
- Performance of Goodness: present the individual view of life and integrity, its links to loveliness and aliveness, to rich and practicality, to comprehensiveness and fact. Perception for "Goodness" raises the individual thinking toward positive thoughts, and brings out the best of the individual self-consciousness.

Ladenberger (1970) study the self-actualization dimensions and specific biographic and development factors of top and middle management people. The study finds that there are significant differences in the personal dimensions between the top management and the middle management groups, these dimensions were measured by following categories: (1) intellectual curiosity and ambition for challenges and improvement, (2) security, independence, and self-confidence, (3) self-vision for the future, and (4) realistic ambition or plans for non-stop progression and development.

The both groups in the study were similar in the interpersonal skills including: (1) actual interest in and attention for others and (2) the ability to encourage others to develop, as well as (3) attitude control. As there were no considerable differences for these variables, the top management people were considered by having much better level of individual warmth and integration of personal competence comparing with middle management group. However both groups were similar in the level of aggression and kindness.

In the study the two groups had significant differences in the “Self-actualizing” and “Self-regard” levels, wherein the top management people are more focus in actualizing their own potential than in assisting others to grow and develop toward self-actualization, as well as they have a think positively about themselves and they have positive idea for their personal powers.

For both groups the status of good health and being married were the same for both groups. Other scales such as: time percentage, reactive feeling, cooperative interaction, Self-acceptance, spontaneity, acceptance of aggressiveness, ability for Close Contact, Existentiality and Support Percentage. The top management group had higher level of personal adjustment and greater number of the total peaked experiences

The top management group including people like presidents, vice-presidents, and CEO, they don't think of being stabilized at any point, they continue thinking of the growth principles. The possibility for the top management group to get more years of education is higher than the middle group, which reflect their desire for continuing in growth and improvement after being in the business world.

The study concludes that the top management group usually put higher level of ambitions for themselves at earlier stage in their life, and they are more self-actualizing people.

2.4 Skills and Experience required:

2.4.1 Skills and Characteristics

Engineering managers originally they are engineers who pass through different stages and experiences in their career path. Mostly engineers who are blooming in the technical field are the ones selected for a managerial position; however technical skills are insufficient for selecting an effective manager (Halliday, 1996). In fact, lack of management skills is what make the transitions process difficult for many engineers; management skills are crucial for all engineers, wherein the rapid development of the world technology and the economy changes, make management skills inevitable even for engineers who want to follow technical path, wherein they are required to use leadership skills in some stages through their career path (Wilde, 2009).

Many researches emphasize on the important of “Soft Skills” for engineers, wherein the main focus of the engineers in their education and working experience is on their technical skills (Souder, 1983; Hood, 1990; Halliday, 1996; El-Sabaa, 2001; Summers, Davis and Tomovic, 2004; Wilde, 2009; Mouchi, Rotimi, & Ramachandra 2011; Srour et al., 2013). Studies reveal that engineers in the management level are lacking for soft skills like: communication, administrative skills and human skills. (Seethamraju and Agrawal, 1999).

Engineers when they become managers they need to change their mind-set from dealing with things to deal with people, engineers need to know how to motivate people and get the work done through them. Effective managers are those who keep on developing their managerial skills (Badawy, 1983; cited in Visser, Naudé & Schepers, 2004).

According to Hood (1990) study survey result that present the managerial characteristics for the engineering managers ranked according to its importance: (1) communication skills, (2) appropriate staffing for the organization, (3) ability to manage the organizational efforts, (4) guide and motivate the subordinates, (5) handling new problems wisely. Moreover his study presents the key leadership characteristics according to its important for engineers: (1) bringing out the best in people, (2) being a positive example for the subordinates, (3) having a dynamic and active approach, and (4) managing day to day processes.

Another study by Howard (2003) investigates the transition issue for engineering managers and its recommend the following skills that an engineering manager should develop:

- 1- Human Skills: like build team and motivating skills.
- 2- Administrative Skills: like directing effective meetings, preparing time schedule and learning to use new software planning tools to arrange the work effectively.
- 3- Communication Skills: verbal and written skills, to represent the company in an effective way.
- 4- Time management: With increasing the number of responsibilities as a manager; managers they need to manage their time effectively.

- 5- Prioritization skills: being able to arrange the task according to its priority, and focus on the most important tasks and accomplish them.
- 6- Delegation skills: is a very important skill, since managers accomplish the work through others, delegating skills are important to get the job done properly.

Thamhain (1991) studied the essential characteristics for an effective engineering manager. Based on a previous survey by Thamhain 85% of managers in the engineering field emphasize on the importance for improving new managerial skills in order for them to survive in their business. “Not all effective engineers make effective managers” (Thamhain, 1991, p.66) based on this states Thamhain study aims to set guidance for organizations in their promoting system for engineers to the management positions. Five personal aptitudes were identified based on a questionnaire and personal interview for 450 researchers, developments and engineering managers. These aptitudes are:

- (1) Personal desire to be a manager
- (2) People skills
- (3) Technical knowledge
- (4) Administrative skills
- (5) Business Acumen

These 5 aptitudes were verified by a survey in 55 technology-oriented companies, respondents were 210 executives and 640 of their subordinate. Each aptitudes were given a related statements, participants were requested to rate these statements according to their level of agreement using 10-points scale. The study concludes that engineers who are well rated in these five characteristics are more likely to be successful as engineering managers. These characteristics are very helpful for organizations; they can use it as an instrument to evaluate engineers' potentially for management position.

Although people skills consider a very important skill for engineers it is the most difficult skill to be improved for them in the management level (Visser, Naudé & Schepers, 2004; Halliday, 1996). According to El-Sabaa (2001) human skills is shown in the way the manager observes and perceives the attitudes of the subordinates and the way he reacts and behaves to it. An effective manager improves his human skills by: (1) being aware of the feelings and opinions that he carries into a situation (2) having a sentiment about his

experience and being able to reassess and learn from it (3) improve a skills of understanding and evaluating what others, through the way that they communicate, actions and words (4) the ability to communicate successfully and transferring ideas and attitudes to others.

Communication is a very critical skill for engineers; a weak communication skill can hinder an engineer from progression in their career (Koontz, O'Donnell & Weihrich, 1984 cited in Visser, Naudé & Schepers, 2004). Researches over the years unanimously agreed on the importance of communication skills for managers (Souder, 1983; Hunsaker, 1984; Hood, 1990; Holliday, 1996; Romano & Nunamaker, 2001; Howard 2003; Dainty, Moore and Murray, 2006; Wilde, 2009; Mouchi, Rotimi, & Ramachandra, 2011). Communication considers very important skill for engineering managers. According to Hunsaker (1984) find that managers consume 50 % to 90% from their time communicating, Romano & Nunamaker (2001) study reveal that meetings are an important part in managers daily work life, wherein managers spend 25%- 80% of their time in meetings. Negotiation and persuasive are communication arts that managers need to be proficient in using them, managers need to persuade subordinate, clients, and other stockholders with their view (Mouchi, Rotimi, & Ramachandra, 2011).

2.4.2 Manager Roles

According to Souder (1983) many engineers are being good managers; however engineers need to learn how to be effective managers. In order for an engineer to be effectively successful manager Souder listed seven functions an engineer should be able to perform competently, five of them are crucial for effective management which are: (1) planning, (2) organizing, (3) staffing, (4) directing and (5) controlling, if any of these five roles are missing the management system cannot be effectively done. In addition, managing people and getting things done through others required (6) motivating & (7) leading skills to be efficient. It is important to note that the seven function necessities are varying with the management level. Wherein “planning, organizing and controlling” are important for the success in top management level, “staffing, directing and leading” skills are more important for the middle management level, and “motivating and leading” skills

are more required in the lower management levels to get the job done effectively. Table (1) shows each function task.

The functions of management

Planning	= setting goals and objectives and deciding in advance what actions are to be taken; Planning is a process of realistically anticipating future problems, analyzing them, estimating their likely impacts and determining actions that will lead to the desired outcomes, objectives or goals.
Organizing	= establishing interrelationships between people and things, in such a way that human and material resources are effectively focused toward achieving the goals of the enterprise; Organizing involves grouping activities and people, defining jobs, delegating the appropriate authority to each job, specifying the reporting structure and interrelationships between these jobs, and providing the policies or other means for coordinating these jobs with each other.
Staffing	= manning the various jobs and positions that have been defined by the organizing function; Staffing involves appraising and selecting candidates, setting the compensations and rewards structure for each job, training personnel, conducting performance appraisals and performing salary administration.
Directing	= guiding and supervising subordinates, and commanding the direction of human and non-human resources toward the goals of the enterprise; Directing involves explaining, providing instructions, pointing out proper directions for the future, clarifying assignments, orienting personnel in the most effective directions and focusing resources.
Motivating	= energizing people to show an inner-directness and enthusiasm in pursuing the goals of the enterprise; Motivating refers to the interpersonal skill to encourage outstanding human performance in others, and to instill in them an inner drive and a zeal to pursue the goals and objectives of various tasks that may be assigned to them.
Leading	= encouraging others to follow the example set for them, with great commitment and conviction; Leading involves setting examples for others, establishing a sense of group pride and spirit, and instilling allegiance.
Controlling	= checking deviations from the plans and taking corrective actions; Controlling involves monitoring achievements and progress against the plans, measuring the degree of compliance with the plans, deciding when a deviation is significant, and taking actions to realign operations with the plans.

Table 1: The functions of management (Souder, 1983, p. 251)

Hood (1999) studied engineers' transition issues to management position. The study list five main issues engineers deal with during their transition into management, which are: planning, organizing, staffing, directing, controlling.

Planning

Being a productive planner includes: being able to solve various issues, carry out unknown and uncertain issues effectively, quick and accurate job estimating, deal with emergency plans and know when to use them, and learning new business principles and new computer software to help in managing activities. Also complexity caused by human cooperation needs inductive and qualitative way of thinking to be applied.

Organizing

Organizing mean sorting things in an orderly manner or creating an integrated and coherent relationship between the whole things. Projects must be segregated in to separated tasks. Planning and organizing have many tasks in common. Additionally, engineering manager must be able to optimally organize the inception of the projects, process and development procedure. And he must know how to perform several tasks at the same time.

Staffing

Staffing divided into two tasks, first employing new staff in the organization, second find the suitable person to achieve a specific task. The second issue consider as a daily operation, and it had been classified as challenging task for managers by many researches (Wilde, 2009; Howard, 2003). Engineering managers must know how to delegate properly. For example, if a responsibility needs to be done frequently, a manager has to spend some time and make an effort to delegate for it. Then the delegated person should be trained so that he can represent the organization properly in any matter related to that specific responsibility. Engineering managers need to inherit new staff from time to time and there must be a respectful and trustful relation between him and his staff.

Directing

Directing includes many tasks overseeing, delegating, encouraging, staffing, counselling, coaching and coordinating. Productive Directing include several issues. Engineers who transit into management need to know how to define the key principles required for making a decision and identify the relevant information associate with it. They also need to be keen on selecting the proper management style that fit each situation and lead the effort of others properly. They also need to be persevering to learn everything and become more multidiscipline. As managers they have a lot of responsibilities to take care of, they cannot handle every detail they need a specialists to handle many of the detail tasks. Their contribution needs to be less tangible and visible. Their achievement can be seen in each engineer and team achievement in the organization. Engineering managers should feel the respect and appreciation for their managerial skills as well as their technical skills. They need to be capable of adjust and deal with different kind of challenges. Engineering managers need to learn to employ collaborative management

practices and need to have skilful communication skills to direct the organization effectively and efficiently.

Controlling

Controlling includes three stage processes, first measuring the progression toward a target, second determine what left to be done, then take the required action toward it. Controlling the organizational effort productively required the engineers who transit into management to solve some more issues. They need to balance the quality and the perfectionist of their engineers' work with time and resources limitation, create a proper metrics, and follow up the progress carefully. Understanding the external and internal related politics, and deal carefully with the administration duties and the conflicts between engineers and management. Engineering managers must learn to arrange performance appraisals and determine when to realize achievements and by what resources.

2.4.2 Experience and age

Engineers in their career pass through several stages; from their junior level to the management level; different responsibilities, skills and personal characteristics are required in each stage. For instance, Mouchi, Rotimi, & Ramachandra (2011) state that one of the essential skills for construction a project manager is people skills, since their work nature required them to deal with different kind of people, in addition they also required to use some leadership skills like persuade, negotiate, self-confidence, and decision making skills. Many of these skills are in common with the skills that are required in the senior management level. As a consequence, engineers acquire skills and get influenced by their experience and as they move from position to another they are shaping their characteristics and refining their management skills, however reaching a senior management level require a lot of passion and ambitions to continue the process of learning and the self-development enhancing, so they can be an effective and efficient managers.

There are a number of different arguments that could be made on the number of years that an engineer needs to be ready for a management position, however engineers need to expect management responsibilities in their mid-career level, yet it might occur in an earlier stage for some others (Johnston, 1987; cited in Visser, Naudé & Schepers, 2004). Lyons, Anselmo, and Kuller (1993) argued that many engineers follow a managerial path after 3 to 5 years from their graduation year. On the other hand, Howard (2003) study finds that managers spend an average of over 17 years as an engineer and 3 years in the transition stage to the management position.

Edum-Fotwe and McCaffer (2000) study finds that engineers in project management positions had at-least 10 years working experience before they reached a project management position most of them had worked on 10 projects as an average, however some of the respondents in the study had worked on 10-50 projects before they become project managers. Although this study was done on project managers but there were some respondents with higher management designations. The study shows that the age of most the respondents in the project management position were in the ages between 41 and 50, however a significant number of them were in the age of 51-63, and most of the ages in the higher management positions were between 51-63 ages. This agreed with Sedge(1985) that highlighted on Badawy (1981) study which pointed out that 63% of the engineers in US are in the management position within the age of 65, and 73% of engineers in the age 45-50 are being responsible for an important managerial duties. Even engineers who are in their first 5 years of employment 37% of them are responsible for some managerial duties as well.

According to Lannes (2001) study regarding the career path for engineers toward management position, the career path was divided into three stages: Engineering, Engineering Management, and Management of Technology. The first stage is the “Engineering Phase”, it is during the first 5 years in the engineers’ career, this stage is where engineers enjoy the most in their career path, they apply what they have learned and trained for, and their work is generally done in a mentoring environment. In this stage engineers are not ready to move to a supervisory or managerial position. The second stage is the “Engineering Management Phase” this stage is during the 5-25 years

of the engineer career; this stage represents the transition stage where engineers practice management solving problems that required more holistic and integrative management knowledge. Although this stage includes very significant experience for engineers, many engineers find it difficult. In this stage engineers will be working more in large projects that required multi-disciplinary skills. Technical skills are not sufficient for engineers to success in this stage; additional skills are required like HR management, communication, people skills, marketing, multi-disciplinary skills, and financing. The third stage is the “Management of Technology Phase” and it is during the 25-30 years. This stage required a holistic understanding for the business strategies and related industrial issues, development of executive knowledge and skills is required in this stage. Figure (7) illustrates the career path stages as the study describes it.

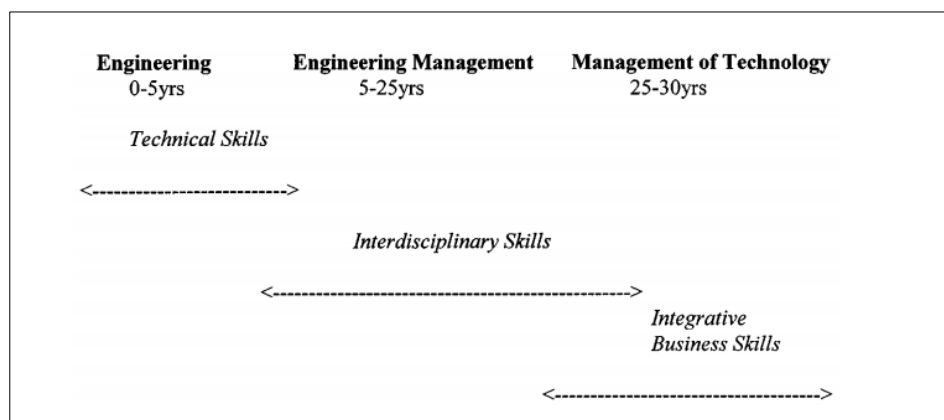


Figure 7: Engineering Career Path Stages (Lannes, 2001, p.109)

2.4.3 Comparison between Engineers & Managers

Management roles are different from the roles required in the technical engineering. Souder (1983) did a comparison between the engineers and the managers roles. He states that, engineers are directly interacts with the work, but managers do modification on the work through other. Engineers can enjoy personal satisfaction in their physical achievements, but managers need to learn to be satisfied through others achievements. Engineering is more about science than art, engineering categorized by its accuracy, verified theories, reproducibility and proven results by experiments. On the other hand, many would realize management to be an “art” rather than science and it is recognized by

its perception, studied judgment, exclusive occasions and one-time events (Souder, 1983).

Engineering is about object; but management is about individuals and objects. Engineering built on physical rules; therefore things occur in a sequence and could be predictable. On the other hand, people are unpredictable they have feelings, emotions and motives. (Souder, 1980; Badawy, 1982; Souder, 1983; cited in Souder, 1983). This summarized in Table 2.

Engineering vs. management	
What engineers do	What managers do
Emphasize accuracy and mathematical precision	Rely heavily on intuition, take educated guesses and try to be "about right"
Exercise care in applying sound scientific methods, on the basis of reproducible data	Exercise leadership in making decisions under widely varying conditions, based on sketchy information
Solve technical problems, based on their own individual skills	Solve techno-people problems, based on skills in integrating the talents and behaviors of others
Work largely through their own abilities to get things done	Work primarily through others to get things done

Table 2: Engineering & Management Roles Comparison (Souder, 1983, p. 252)

According to Hood (1990) the characteristics that define productive engineers are: being well qualified in the technical issues of their job, extremely motivated, mature, involving effectively with others, and having positive career direction. However productive managers are known by their effective outcomes. A strong managers are those who are able to do valuable decision, delegate job properly, and good motivators.

According to Halliday (1996), engineers are characterized with their critical eye for what they see, they used to work with objects, and they are usually defined by their technical achievement in their organization. Engineers used to deal with things like concrete and hard data and being away from the organizational politics. Technical role consider as being safe since it has its boundaries. Some technical professions view managerial decision as hindrance to their technical achievements. On the other hand, Halliday (1996) describes management as a "soft" option where it deepened on assumptions and intuition, without the involvement of scientific evaluation. Skills like: building new relationships, delegating people and building appropriate strategic plan and creating ways to achieving

schedule deadline and budget, all tasks that are “common sense” and “far less mentally demanding” than solving technical problems. For that reason, human skills consider the most difficult skills for engineering managers to develop.

2.5 Transition Challenges and difficulties:

The movement from engineering to management is a great step. Being a successful manager required great effort and time during the job hours and out of the job hours; managers need to acquire new skills, obtain new values and expanding their perceptions. Understanding the difficulties that engineers face in their transition is very important for engineers and firms that seeking to improve their transition process (Howard, 2003).

This section will present three main arguments by three researchers on the issue of transition for engineers form technical position to a managerial position, to help understanding the challenges and the difficulties that engineers face from different perspectives.

2.5.1 Howard (2003):

A qualitative study by Howard (2003) is an important study that investigates the transition issue for engineers extensively; many recent researches relied on this study findings like (Srour et al., 2013; Mahlangu (Kubheka) & Govender, 2015; Wilde, 2009; Dittmann, 2009). The research examined the transition issue for engineers on selected managers in Aerospace Companies in Long Island, New York. The research aims to understand the challenges that engineers face in their transition to management level. The study investigates the issue of transition through answering three questions.

Question 1 (Howard,2003 p.220) :

“What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing

and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?”

According to the interviewed managers results shows that engineers spend an average of seventeen years in engineering before they transit into management, is also point out that this is a significant period where engineers established a well relationship within their organizations. This indicates that engineers are interested about the technical part of their career or they won't spend all of these significant years in it. This long period in the technical field make the transition process more difficult for engineers.

The study indicates that engineers spend approximately three years in the transition stage, two main difficulties engineers face in this stage. The first one is the ability to do both roles; to work as an engineer and manager in the same time. The second issue is the engineers' ability to convert their mid-set from doing the work by them-self into managing people to achieve the work through them. The transition period is a critical period for engineers the study describe it as “sink-or-swim” period. When engineers receive the full promotion for a management position, they need to do their decision, either they “swim” and complete in the management path, or the “sank” and return back to the technical field. The study emphasize that transition is difficult for the engineers, many studies consents on this point (Rynes, 1987; Chudzikowski, 2012; Sullivan & Baruch, 2009; Halliday1996).

Question 2 (Howard, 2003 p.223):

“What are common experiences for engineers who transition to engineering manager?”

This question presents the experience that manager's face during their transition period. The study finds 45 transition experiences identify by the managers, 20 experiences were recognized as common challenges for the managers. Table (3) present these experiences and the frequency number that had recognized by the managers. The remaining experiences were recognized by the one or two managers. The 45 experiences can be checked in Appendix C.

Experience	Frequency
Experience 1.1: Change from a primarily single focus engineer role to a broader, multiple focus managerial role	5
Experience 2.1: On a different organizational level: no longer “one of the guys”, instead perceived as ‘one of them’, the enemy	5
Experience 3.1: Working through others: a mindset change from ‘doing’ to ‘managing’	5
Experience 3.2: Enjoyed the technical work and miss the satisfaction of doing the hands-on work	5
Experience 4.1: Increased responsibility: ownership of something much larger and impact of decisions increased	5
Experience 6.1: Working more hours as a manager	5
Experience 3.3: Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done faster’	4
Experience 4.2: More pressure and stress	4
Experience 5.1: Need better people skills: as a manager a new set of people skills are required	4
Experience 6.2: Difficulty getting the resources to do the job	4
Experience 7.1: Feeling like a novice: as a new manager you have a lot to learn	4
Experience 7.2: Those with a lack of mentoring found it tough: having good organizational support around you is important	4
Experience 7.3: No formal training or preparation: felt unprepared for the manager role	4
Experience 9.1: Making the decision: motivation and questions or concerns about going into management	4
Experience 1.2: Required to balance and prioritize many tasks and roles	3
Experience 1.3: Interruptions frequently occur and require you to drop what you are doing and respond immediately	3
Experience 1.4: Meetings demand much of your time	3
Experience 2.2: Resentment or jealousy by some engineers that you were promoted instead of them	3
Experience 7.4: Desire and attempt to show management how to manage, to get them in touch with the engineer issues	3
Experience 7.5: Managing outside your area of expertise: had to quickly develop new domain knowledge	3

Table 3: Common Transition Experience for the Managers

The 45 experience were combined into nine themes; the related experiences were grouped together and express as a theme. These themes were presented as an answer for this question; the themes as presented in the study are (Howard, 2003, p. 208-209):

Theme 1: “So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role”.

Theme 2: “Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed”.

Theme 3: “Delegation: the challenge of leaving the hands on technical behind and learning to work through others”.

Theme 4: “Increased stress and pressure associated with increased responsibility”.

Theme 5: “Developing new skills: discovered the need for a new set of skills as a manager”.

Theme 6: “Resources and getting the work done: finding the time, the staff and other resources to get it done”.

Theme 7: “The new guy in management: change from being a technical expert to being new in management and having a lot to learn”.

Theme 8: “Organizational issues: In a new organizational level with its associated issues”.

Theme 9: “Choosing the management career path: the concerns before deciding and questions experienced during or after the transition”.

The researcher found a link between the themes, mainly three interested relations. First Theme (4) “Increased stress and pressure associated with increased responsibility”, the research indicates that it is linked to Theme (1) “So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role”, wherein it is assume that Theme (1) cause Theme (4), as well as Theme (6) “Resources and getting the work done: finding the time, the staff and other resources to get it done”, the lack in the resources increase Theme (4) “stress and pressure” and effect on Theme (1) workflow. Theme (5) “Developing new skills: discovered the need for a new set of skills as a manager” linked with Theme (7) “The new guy in management: change from being a technical expert to being new in

management and having a lot to learn”, where in being new in the management field required a lot of new skills to be learned.

Presenting the link between the themes helps in understanding the challenges of the management transition. The research findings were similar to a study done by Hill (1993), “Becoming a Manager: How New Managers Master the Challenges of Leadership”.

Question (3) (Howard, 2003 p.233):

“What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?”

This question presents the most difficult challenges for engineers as presented in the study. The previous Theme represents the challenges. These challenging themes based on their difficulty were:

Theme 1: “So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role”.

Theme 2: “Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed”.

Theme 3: “Delegation: the challenge of leaving the hands on technical behind and learning to work through others”.

Theme 1 selected as the most challenging theme since it presents the major change in the individual role; engineers play a different role than the managers. Engineers focus on achieving one or two specific tasks, their assignments are purely technical and they have tangible achievements. On the other side, engineering managers’ responsibilities are different, they need to have a clear attention on many things, they need to set a balance between different elements, and they need to be able to do quick decisions in different circumstances and their achievements are intangible.

Theme 2 was selected as the second most challenging theme in the transition, managers face problems in their social relations with other engineers when they are promoted to the management level, relations are no longer the same; the managers’ relation with the subordinate affects their personal relationships, managers need to do a decision about their previous relations after they become managers.

Theme 3 presents another challenging for engineers; usually engineers that bright in the technical field are the ones promoted for the management level. Lifting the technical work and working through others is challenging for managers. The research indicates that managers are struggling in their new duties and responsibilities, which make them want to go back for their comfort zone to the technical work.

Table (3) show the ranking of all the themes according to the difficulty.

Theme	Avg.	Range	SD
1. So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.	1.6	1 - 3	0.9
2. Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.	2.4	1 - 5	1.5
3. Delegation: The challenge of leaving the hands on technical behind and learning to work through others	3.2	1 - 6	1.8
4. Increased stress and pressure associated with increased responsibility	4.4	2 - 7	1.8
5. Developing new skills: Discovered the need for a new set of skills as a manager	5.6	4 - 8	1.5
6. Resources and getting the work done: Finding the time, the staff and other resources to get it done	5.8	4 - 7	1.6
7. The new guy in management: Change from being a technical expert to being new in management and having a lot to learn	6	3 - 8	2.1
8. Organizational issues: In a new organizational level with its associated issues	8.2	6 - *	1.8
9. Choosing the management career path: The concerns before deciding and questions experienced during or after the transition	9.2	6 - *	1.8

Table 4: Themes Ranking According to the Difficulty (Howard, 2003, p. 238)

The study divide the themes into 3 section, the first section is the “Primary Challenging” themes from 1-3 which consider the most difficult challenges for managers, the second section is the “Secondary Challenges” themes from 4-7, which are the common

challenges that recognized by managers but their level of difficulty is less significant than the first section, the third section is “Possible Challenges” themes from 8-9 are themes that experienced by managers but were not recognized as difficult for all of them.

The study defines some managerial tasks that were not seen as difficult for managers. According to the data gathered in the study through the interviewed managers; the administrative tasks such as budgeting labour hours, projects planning and time schedule and other related duties were not measured as difficult task for the managers; however there are some tasks that managers need to practice like arranging timetables and organizing effective conferences, but it were not recognized as a challenging task for them.

2.5.2 Wilde (2009)

Dissertation studies by Wilde (2009) study the transition of engineers to management and aim to provide an understanding of the difficulties engineers face in their transition to the management positions, to provide a direction for universities and industries to improve the key management skills. The study data collection was based on online survey distributed on large engineering companies. The survey structures build on two studies first Howard (2003) and Thamhain (1991).

The research survey was distributed among 216 engineers only 121 surveys were completed, survey consist of 27 close-ended question and partly open-ended, questions were segregated into 3 section , 12 demographics questions, 3 questions focus on understanding the difficulty of the transition for engineers by using Howard Themes, and 10 question were selected form Thamhain survey to exam if the managerial aptitude affected the transition to management, 3 more question were add out of the section to gain additional evidence about the respondents .

Howard study as was presented earlier, Wilde’s research selects 8 themes out of nine to be re-examining by a larger number of engineers to assure the difficult level for the themes. Theme number 8 was excluded because only two engineers consider it as challenging. In Wildes’ study the “Themes” were given a different expression “Pain Point”. The 8 pain points are:

1. So much going on: the engineering manager role involves balancing many more responsibilities, tasks, and priorities than the engineering role
2. Relationship changes: personal relationships, interaction dynamics and engineer perceptions of you have changed
3. Delegation: the challenge of leaving the hands on technical behind and learning to work through others
4. Increased stress and pressure associated with increased responsibility
5. Developing new skills: discovered the need for a new set of skills as a manager
6. Resources and getting the work done: finding time, the staff and other resources to get it done
7. The new guy in management: change from being a technical expert to being new in management and having a lot to learn
8. Choosing the management career path: the concerns before deciding and questions experienced during or after the transition.

Three ranking systems were selected to exam the “Pain Point”, first was the Likert scale (1-7) from very easy to very difficult, second was asking the managers to rank the “pain points” in ascending order, third was ranking the 20 elements of Howard (Howard had 45 element 20 of them were recognized as common experience for managers) and giving percentage for each theme by calculating the sum of the relevant elements ranked by the engineers.

The three methods in measuring Howard “pain points”, agreed with Howard ranking. The research state that Howard pain points can be used as a guide for the industrial and academic proposes to help managers in their transition.

Thamhain (1999), as was presented previously in section 2.3, the research studied the struggling for engineers in their transition to management position. The research comes out with five characteristics for those engineers who had transit successfully into management, which are:

1. Personal desire to be a manager
2. People skills
3. Technical knowledge
4. Administrative skills

5. Business Acumen

Thamhain (1991) finds positive correlation between these management aptitude and successful managers.

These aptitudes can be used to assisting the process of selecting engineers for management position.

Wilde used the managerial aptitudes to exam the level of difficulty for engineers in their transition to management position, and the effect of these aptitudes on the transition process in linked with Howard pain point. In comparing the study result of Howard pain points and Thamhain managerial aptitude; the study finds strong negative relationship between the level of managerial aptitude and the level of challenges engineers' face in their transition to management. For instant, engineers with high score of managerial aptitude were more luckily to have lower score in the pain points; which indicates less difficulty in their transition.

In addition, the research also tests the reason behind engineers selecting a managerial position with the managerial aptitude and the pain points. It found that engineers who were asked to be move to a management position by their supervisors were facing more difficulty in the transition, with a high score for the pain points and lower management aptitude. On the contrary, engineers who were self-motivated to move into management find it easier, with lower score for the pain points and higher management aptitude. According to the research the reason behind the easy transition for the self-motivated managers go for various extrinsic motivations, wherein engineers in this case have the desire and decision to enter the management position, so they are previously working on improving their managerial skills to help them in the transition. However that both kind of engineers; who are asked to move into management and those who chose to enter management by their desire; are facing the same challenges, but those who have the desire are taking the challenges in more positive manner.

2.5.3 Hood (1990)

A quantitative study by Hood (1990) explores the troubles and trails that engineers experience in their transition into management, the study was establish in the theme of the year 2000. The study states that engineers' transition into management should be fast and efficient, since it was expected that 2000 period will realize a booming in the

technology and it will need special kind of managers. According to the study survey the transition challenges were ranked according to its difficulty, the most difficult issues in order were:

- 1- Delegating properly.
- 2- Communicating skilfully.
- 3- Leading and managing the effort of others.
- 4- Organizing projects.
- 5- Applying participative and cooperative management performs.
- 6- Decision making.
- 7- Carrying on new issues and ambiguity in a successful manner.
- 8- Balance the value and the perfectionist with time and resources limitation.
- 9- Selecting the proper management style according to the situation.

In addition the study also present a list of 12 steps that engineer need to take to be prepared for transition to be a productive engineering manager, 5 steps were selected as the most important steps which are:

- 1- Developing management skills by given a practical assignments.
- 2- Have a leading personality.
- 3- Given tasks that explain the managerial tasks and responsibilities.
- 4- Obtaining official management education course.
- 5- Acquire sufficient technical experience.

Formal technical education was close in ranking to the topmost important steps, the research find out that only few organizations offered a formal training that aimed to train engineers in their transition to management position. In addition, most of the formal trainings were focus on the technical part of management not the management side. The majority of the companies apply the “sink-or- swim” technique in which engineers are assigned for the responsibility and they are expected to learn by doing. This way consider risky for both new mangers and their organizations, where in the case of “sink” engineers will retain back to the technical position and the organization will loss time and effort in assigning people improperly.

Chapter III: Conceptual Framework

3.1 Introduction

This chapter is forming guidance for the research design and focusing on the key points that the research want to investigate, as well as its forming the research problem. The information of the conceptual framework is extracted directly from the literature review to address the research problem.

3.2 Conceptual Framework

As this study is aiming to investigate the senior management level for engineers in the construction industry of UAE, it is important to study the transition stage for engineers where many researches emphasized that it is a very critical phase for engineers in their career path and it is considered as a turning point for them. In addition, it can be clearly noticed from the literature review that many engineers are interested to follow managerial path in their career, so it is important to focus on the transition stage to help engineers override it successfully.

Improving the transition process for engineers associated with understanding the challenges that engineers are facing during the transition process, and understanding the career key factors that helps in override these challenges. Many challenges that engineers might be exposed to during their transition had be clarified in the literature review. Figure (8) illustrates the conceptual framework diagram that was built according to the evidences extracted from the literature review, and was realized as an influences on engineers transition process.



Figure 8: Conceptual Framework Diagram

Figure 9: Conceptual Framework Diagram

The conceptual framework diagram explains the concept that engineers need to achieve a certain milestone. The diagram illustrates that achieving a certain milestone like “Management Position” engineers will face challenges. The “management skills”, “personal characteristics” and “working experience” are the three main factors that engineers need to be able to face the challenges. However what distinguish an engineer from another in terms of how much effort is needed to override a challenge are the personal characteristics, which is considered as the source of self-motivation to overcome the challenges, on the other hand management skills and working experience are also considered as one of the main factors that influence the motivation to overcome the challenges.

3.3 Defining the Conceptual Framework Components

The conceptual framework diagram illustrates the factors that associated with the way that engineers plan for their career towards management. These factors in a way or another have a significant influence on the challenges that engineers face when they turn to a management position. The following paragraphs define each factor to provide better understanding for the conceptual framework.

Personal Characteristics: Each engineer has different personal characteristics which distinguish him from the others; the engineer that got the personal characteristics like self-motivation, independency, hard worker, self-confidence, and persistency will always have the motivation to achieve their target.

Skills: technical skills are different from the skills that require in the management level, several skills had been defined by several researches. Engineers acquire managerial skills through several ways, which increase their motivation that allow them to override the challenges and achieve a higher managerial position.

Experience: engineers gain experience through their career path from several sources such as, the projects they worked on, collage courses, supervisors, etc. Experience considered as an important factor for the engineer to enhance their motivation to help them override the challenges successfully.

The research will examine the challenges that engineers' faces during their transition in the UAE, and how the conceptual framework factors are influencing them to override the challenges successfully. Based on the conceptual framework the research methodology will be developed to examine the relationship between the literature review outcomes and the study findings.

Chapter IV: Methodology

4.1 Introduction

This chapter explains the methodology implemented to answer the research question and achieve the research objectives. Different research methods are represented to provide a comprehensive understanding about research methodologies. A clarification for the selected research method and data collection approach was given, which contains the use of case study and semi structural interview, as well as this section defines the research sample criteria.

4.2 Research Methods Types

Research methods classifies to two main methods: quantitative and qualitative. Selecting the appropriate research method is very important to answer the research questions and test the hypothesis. This section will provide an overview for each research method and the selected research method.

4.2.1 Qualitative

4.2.1.1 Qualitative Information

Qualitative research is defined as being exploratory. It is used when the researcher lack understanding of *how* and *why* an emergency impact on the populations, or when it is not known how the problem can be defined or what to anticipate. Qualitative and quantitative data both are established on empirical investigation and evidence. Nonetheless, qualitative research investigates data from the viewpoint of individuals, groups, case studies and briefs instead of numerical data (Acaps, 2012).

Qualitative data are usually textual observations which describe intentions, insights or way of thinking and behaving. The results shaped from qualitative data gathering, usually take the design of informed statements around the experience and concept of particular subgroups of an afflicted population. The fundamental contribution of qualitative data is providing facts about the human attribute of the issues by recognizing and accepting context to the importance requirements. One considerable dispute for qualitative assessments is discovering the accurate harmony in analysing and gathering qualitative

data to recognize trends and dominant issues for people affected by a disaster and to demonstrate it appropriately (Acaps, 2012).

4.2.1.2 Qualitative Research Methods

Research and analysis using qualitative method added value in recognizing and discovering intangible factors like individual emotional state, gender differences, social prospects, religious and traditional effects. Qualitative research investigates the relationships and observations experienced through affected people and societies (Acaps, 2012).

Collected Data by qualitative methods is usually introduced in a case study manner. Qualitative results can be demonstrated in tables, charts or using different quantitative methods, but that doesn't mean that if qualitative information is represented in quantitative method they become quantitative (Acaps, 2012).

4.2.1.3 Strengths and Weaknesses of Qualitative Research

According to Acaps (2012) the primary strengths of qualitative research that it provides:

- Information that is in depth and rich about affected populace.
- An overview of particular cultural and social contexts (i.e. human voice tone)
- Inclusion of a varied and representative sampling of affected individuals.
- Extensive breakdown of the effect of an emergency.
- A data gathering procedure which demands small numbers of respondents.
- A data gathering procedure which can be accomplished with modest resources.

According to Acaps (2012) the weaknesses rooted in qualitative data consist of:

- Results in data that cannot be verified objectively.
- Requires a profound labour analysis process (classification, recording, etc.)
- Requires expert interviewers to profitably execute the primary data gathering activities.

4.2.2 Quantitative

4.2.2.1 Quantitative Information

Quantitative research approach is defined by the acquisition of data which can be interpreted numerically. The outcome of the quantitative data is usually represented in the form of statistics, tables and charts. Usually the quantitative data needed to feed into this data void will come from the official sources or the authority, established from previous issue facts and populace projections for fields noted to be affected by the issue instead of extrapolation from a limited quantity of surveyed sites (Acaps, 2012).

4.2.2.2 Quantitative Research Methods

The quantitative research objective is to test planned hypotheses and create generalizable outcomes. The outcome of quantitative research can prove or disprove the hypotheses around the influence of an issue and ensuing necessities of the affected populace. In addition, they can assess impact as reported by the humanitarian indicators. The conclusions built from the investigation of quantitative data reveal *how many* are afflicted, *where* the largest region of impact is, and *what* are the fundamental sector requirements.

Scientific measurements are fundamental for quantitative research (Acaps, 2012). The collection and investigation of data from representative sampling is more normally used since quantitative data are numerical. In addition, quantitative data are more likely to be meticulously and present a full image of the issue, when it is generalized to the entire affected populace. Yet, even a representative sample is insignificant; unless the used instruments to collect the data are well designed and plainly clarified to the users. Applying a poor designed questionnaires can result in huge quantity of data, but much of it will end up being worthless considering being too hard to measure and hopeless to generalize for the entire affected regions (Acaps, 2012).

4.2.2.3 Strengths and Weaknesses of Quantitative Research

According to Acaps (2012) the primary strengths of quantitative research that it provides:

- Numeric estimates.
- Opportunity for somewhat simple data analysis.

- Verifiable data.
- Data that can be comparable among diverse societies within diverse locations.
- Data that do not call for analytical judgment outside attention to how the information will be demonstrated in the dissemination development.

According to Acaps (2012) the weaknesses rooted in quantitative data consist of:

- Breaches in information - concerns which are not enclosed in the survey, or the checklist of secondary data.
- Intensive data gathering procedure
- Limited involvement by the affected people in the component of the questions or the way of data gathering process.

4.2.2.4 Data Collection Techniques

Quantitative and qualitative data are both experimental, but collect diverse and contrasting types of information employing various methods. None of the two types is better or preferable more than the other. The important in establishing a precise and holistic image of a problem impact on an affected populace is in make sure that the type and the process of the gathered data are matched together. To achieve valid, reliable and useful assessment information, the researcher should set suitable questions, in appropriate way, time and for the applicable audiences (Acaps, 2012).

According to Acaps (2012) Table (5) shows the qualitative and quantitative data collection methods:

Qualitative	Quantitative
Individual interview	Quick counting estimates
Key Information interview	Surveys
Semi-structured interview	Population movement tracking
Focus group discussion	Registration
Observation	Structured interview

Table 5: Qualitative and Quantitative Data Collection Methods

4.3 Selected Research Method

Selecting the appropriate research methodology is important to provide the suitable answers for the research questions. After examining the differences between research methods and in consideration for the research aim and objectives, as well as the information achieved from the conceptual model, and with respect for the research timing limit, a qualitative approach was selected.

Since the study is aiming to investigate the career path for construction engineers towards the management position and as the research problem is focusing on the transition stage, the qualitative methodology is the appropriate method. Wherein qualitative method is a useful way to find out how people are thinking and behaving towards certain issues, and what they experience (Patton, 1990). Acaps (2012) emphasize that qualitative data is used to provide facts about human attribution in a specific subject.

The problem of engineers' transition from engineering to engineering manager is experienced by those who are already transitioned to a managerial level. The qualitative approach is useful to understand the challenges that engineering managers pass through and how their career path affects the difficulty level of the challenges. Examine these issues required a deep understanding for the individuals perspective, plus knowing their approaches and their experience. Achieving this called for the use of qualitative methodology; wherein a qualitative method allow for a comprehensive understanding about a social phenomenon (Howard, 2003).

According to Flick (2009) the main key point in choosing a research method is its ability to answer the research questions; following a qualitative method allow for open-ended questions that can illustrate the experience of the interviewees, rather than direct short replies taken by a quantitative approach.

4.3.1 Data collection method

The study mainly based on studying the career journey of engineering managers in the UAE and their transition stage. A case study was selected as a qualitative approach to help analysing the research problem. The case study data was collected through a semi-structural interview.

4.3.1.1 Case Study, Semi-Structural Interview

Case study is the most common method used in the qualitative researches. The case study considers a suitable method for the descriptive studies, which allow for a deep investigation for a specific issue with various sources of information (Rose, Spinks & Canhoto, 2015). Yin (1994) stated that a case study is useful in investigating an existing phenomenon complexity within real-life perspective, especially when there is a little control on the case. Case study research method supports in creating direct observations and collecting data from original situations (Yin, 2004).

Case study is best used when the researcher have a clear defined issue with boundaries and looking for allowing a deep understanding for the issue. There are three types of case studies: single instrumental case study, the multiple case studies, and the intrinsic case study (Creswell, 2007). This study is following a multiple case studies procedure that provides a multiple case to prove one specific issue. Yin (2003) stated that multiple case studies strength the research data, wherein gathering data from several sources helps in identifying the similarities and differences of the gathered knowledge. This research is seeking to compare different engineers' career journeys; to provide the best procedures that successful engineering managers can follow to stand in the management position effectively.

Case study data can be collected through several sources of evidence, such as observations, interviews, official papers, or audio-visuals materials (Creswell, 2007). The expert interview is the selected procedure to collect data, the interviews is conducted with the engineering managers who had a successful transition to management position; according to Flick (2009) experts in the expert interview are a specific group with certain occupation, science and experience. Meuser and Nagel (2002) state semi-structured interview are suitable form for experts' interviews more than biographical interview were the study is interested about the expert field activities and not about their entire personal life (cited in Flick, 2009). Therefore, semi-structural interviews were organized with the engineering managers to allow for open discussions and open-ended questions. Semi-structural interview is somehow a conversational style, where it allows the interviewees to talk freely and openly, and it is usually conducted in one meeting with the selected candidate using a set of questions that are prepared previously by the interviewer (Flick,

2009). Semi-Structural interview allow for in-depth understanding through the provided answers in the interview (Harrell & Bradley, 2009).

The semi structural interview selected as a qualitative research tool in order to allow answers for the research questions and examines the conceptual framework that was built according to the literature review findings, the interview responses were presented in a form of case study.

Based on the assumption from the conceptual framework, most of the engineers are facing challenges in transitioning to the management level, and overriding these challenges is depending on some factors like milestones, motivation, personal characteristic, skills and experience. Therefore, the focus of the interview questions was about the transition process and how these factors can influence it. What was difficult about transition? What are the milestones that the engineer passes through before the transition? What did motivate them to be in the management position? What are the skills that they needed in the management level? What is the experience that helps them in the transition process?

4.3.1.2 Sample Selection

Sampling strategies were carefully selected through Criterion sampling and Typical Case sampling that were used to select the interviewees for this study. According to Suri (2011) Criterion sampling is implemented to build a comprehensive perspective about all cases that match certain criteria. Criterion sampling specifies features points or qualifiers to be used as guidance for selecting the interviewees. The Typical Case sampling is used when there are common criterions for a case, Patton (1990, p. 182) state that typical cases sampling is “Illustrates or highlights what is typical, normal, average”. Using such strategies to select the sample added strength and value to the quality of the study (Marshall and Rossman, 1999; cited in Howard, 2003). In addition, having specific criteria to select the participants based on increase from the reliability of participants and the validity of the answers and consequently the results analysis.

The selected criteria were set to fit engineering managers who had experienced the transition to management level; four criterions were applied to identify the individuals who are appropriate for the study:

- 1- They should have an engineering bachelor degree that is related to the construction industry (e.g. Civil engineer, Structural engineer, Mechanical engineer, Electrical engineers, Chemical engineer)
- 2- They should have at least 3 to 5 experience years in the technical field before they became managers (as the milestones suggested by the literature review).
- 3- They should have at least 5 years' experience in the management position.
- 4- They must have their experience in the UAE as an engineer then a manager.

The first criteria specifies the construction engineers because the study concern about the construction engineers in the UAE, so participants should have an engineering degree that is related to the construction industry. The second criteria was set according to the milestones suggested by the literature review; Lannes (2001) study specify 3 milestones for engineers career path, where the first five years were the years that engineers spent in the technical field before they transit to the management level. The third criteria determine 5 years as minimum in management for the selected participants to assure that the participant have enough experience and pass through challenges as much as possible. As well as, the 5 years in management were enough to make sure that this manager was successful in the transition and won't retain to the technical field. The fourth criteria that concerns those engineers who had experience in the UAE, as the scope of the study specify a certain region "The UAE" selected engineers should had enough experience in the UAE and they should have experienced the transition process in the UAE.

4.3.1.3 Invitation Process:

The criteria specified previously were taken as guidance in selecting the engineers. Those who were selected they were contacted through email or personally, and they were given details about the study purpose and the methodology, and they were asked if they are interested to participate in the study.

Those who satisfy the criteria and were interested they were contacted through email along with a phone call to check on their availability for the meeting date and timing. Based on that, all the required materials were prepared ahead of time to avoid any missed materials or delay.

4.3.1.4 Sampling size:

Patton (1990, p. 184) suggested that “There are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, the purpose of the inquiry, what's at stake, what will be useful, what will have credibility, and what can be done with available time and resources” (cited in Anderson and Arsenault, 1998).

Based on Patton's statement the study suggested a range of five case studies to be presented. However after getting in contact with more than ten different engineering managers, only two agreed to participate in the study. This result of having only two engineers to be interviewed was considered as a good sampling size with respect to the heavy time schedule of the managers, wherein the interview required 3 hours to take in place, as well as the limited time of the study, the specified region and criteria, acted as the obstacles for getting five case studies.

4.3.1.5 Pilot Test:

4.3.1.5.1 Questionnaire:

A pilot study was conducted with 5 engineering in their mid-career level where the questionnaire was sent for them to give their feedback on the questionnaire. The questionnaire was improved base on the feedback of the engineers, wherein the result of the feedback indicated that the questionnaire was consuming time; therefore questionnaire was simplified from 20 questions to 10 questions.

4.3.1.5.2 Interview:

The first interview was taken as a pilot test to help in improving the interview process, and it was edited according to the participants' feedbacks and suggestions. In which it had been found that 2 hour was not enough timing for the interview, wherein the interview took 3 hours to finish all the question and discussion.

As well as the pilot test helps in testing the notes taking process, where it was suggested by the interviewee that tape recorder might not be accepted by some of the managers and it might stop them from talking freely about all their challenges and career problems that they faced during their younger ages, however managers honesty and truthfulness are important for the research reliability and validity, therefore, recoding process was avoided. As well as the interview conversation kept nameless to build a trust atmosphere

and allow the interviewee to be comfortable and open during the conversation. Flick (2009) emphasis on the confident issue with the expert interviews, he states that “Furthermore the problem of confidentiality comes up here—often, delicate issues for an organization, also in competition with other players in the market, are mentioned. This may lead to answers being refused or to reservations about tape recording.” (p.168). Thus called for more effective listening and transcribed notes process, during the interview it was important to focus and pay attention while listening to the ideas and facts given by the interviewee. The transcribed note includes the main points, dates, and some graphs that can help in analyzing the notes later. Notes were summarized immediately after the interview to avoid missing points.

Generally interviewee was satisfied with the overall conversation and questions style. Pilot test help in enhancing the questions process, it was noticed that being flexible and open during the interview and adding question according to the conversation was useful in clarifying idea and allowing negotiation so the communication process could be more interesting.

4.3.1.6 Question design and interview structure

Questions were structured based on the conceptual framework, to allow for more understanding for all aspects of the transition process that the participant experience.

Data collecting method includes two phases; in the first phase the engineers were sent closed-ended questionnaire consist of two parts the first part was general information about the participant such as: age, years of professional experience, job position, and education. In addition, a question about the first time that the participants joined the management role and a question about the motivations that pushed them towards a management position. The second part of the questionnaire concentrated on the challenges experienced by the engineers in their transition from professional level to management level, the 20 common challenges observed by Howard (2003) were listed and engineers were asked to select the challenges that they faced during the transition, and they had the opportunity to add extra challenges if there is any. Sample of questionnaire can be seen in Appendix A.

The second stage was the face to face interview, which includes open-ended question that were prepared before the interview; according to Patton (1990) Open-ended questions allow more flexibility in the interview. Question style attempted to encourage the interviewees to talk descriptively and interpretatively about their transition experience. Both interviewees were asked the same questions in addition to some follow up question to allow for more clarifications and understanding. Interviews took place in the working organization of the participant, which gave the researcher ability to understand the work environment and the managers' characteristics in their daily work; in addition interviewees could feel more comfortable in their working place since they are familiar with it. Howard (2003) study had a similar approach, therefore some of the interview questions were taken from Howard (2003), and additional questions were added according to the conceptual framework of the study. The interview started by providing the interviewee with an introduction about the research topic and thanking him for his accepting to participate in the study; then starting with the first question about the current role of the managers and the milestones that lead them to their current position and the motivations behind following a management ranking. According to Howard (2003) starting with a historical question prepared the interviewee for the research topic. Then question focused on the transition process when did it occur, what did they feel about it and what were the main difficulties about it. Following by questions about the skills and the experience those managers finds them important for the management level and whether or not it was difficult for them to learn new management skills. Sample of the interview questions can be seen in Appendix B.

Splitting the data collection into two phases had several advantages, wherein the first part helps the researcher in building an initial idea about the participant characteristics and career perspective. It also helps the interviewee to get a stronger idea about the study and allow them to be more prepared for the face to face interview. In addition, it supports the researcher to get more information since the interview time was tight.

Chapter VI: Findings and Results

5.1 Introduction

This chapter presents discussion and finding for the case studies of the engineers in the management level, each case is presented and analyzed separately. Then these findings were linked to the literature review to compare the previous studies with the case studies analysis.

5.2 Case Studies analysis

The following case studies are for engineers in the management level who were successfully transit from a technical engineering position to a management level. Semi-structural interviews were conducted with those engineers to provide a deep understanding about their career journey and the challenges that they faced in transiting from engineering to management.

5.2.1 Case A:

KMH is an architectural engineer in his mid-40s, graduated in 1988 from one of the universities in Syria, as he were recognized with his excellent grades his first job was a part-time teacher assistant, along with that he had a permanent job as a Design Engineer in one of the construction companies, where he had the chance to work in large and complex projects, he was in charge for the design and design development phases, where this job position lasted for two years.

After that **KMH** moved to Saudi Arabia to occupy a Technical Office Engineer position in one of the largest construction organizations, **KMH** in the beginning was responsible of the design development, construction drawing, site coordination and design sit implementation. However, in a short period of time he was recognized for his active and effective work in the organization, therefore the organization assigned him for all Jeddah projects site execution, coordination and supervision, in that period **KMH** was responsible for a team consists of four draftsman, structural engineer, and MEP

engineers. KMH after two year in Saudi Arabia, he transferred to UAE to continue his successful career pattern.

KMH first job in UAE was in a local construction company where he worked in it for 10 years. In the first two years he was assigned for a Design Engineer position, in the third year KMH was promoted for a Senior Design Engineer and he was responsible for 2 draftsman and 3 engineers, as well as he was participating in the marketing and advertisements activities of the company. As soon as KMH started the fourth year he was promoted to Head of Design Department position, with 11 subordinates includes 3 engineers, 2 quantity surveyors and 6 draftsmen, in addition he had a direct coordination with the marketing and sales department. In the end of the fifth year KMH was promoted to Design and Marketing Mangers position, where he remained in this position until he left the organization, he was responsible for projects and design management, quality control, sub-contractors management; technical engineers follow up, meetings and project budgeting. In addition, he was responsible for the marketing and strategic planning of the organization and had a direct responsibility for the entire exhibition that the organization was participating in world wide. In these five years KMH responsibilities increased, and the organization size was expanding, where the organization at that time was consisting of 2500 employees which mean five times the number of employees when KMH started with the company. KMH had a great influence in the enlargement and development of the organization; he played a significant role in building the organization name and reputation through the successful projects that worked in and through the marketing strategies that he planned. Later, KMH got a better offer for a management position in a larger construction organization, where he joined them for two years and now he is an owner of a contracting company.

KMH transition process to management position occurred gradually after 10 years working experience as a technical engineer, specifically during his working years with the local company in the UAE. The company decision in promoting KMH to management position was based on several aspects, first of all KMH was recognized for his excellent and efficient technical work in many projects, KMH were assigned for a several managerial tasks before he was promoted officially, he had the initiative to be

involved in management position, as well as the trustful relationship that KMH built with the organization through several situation, where KMH was able to stand stably and take the right decision in many critical cases, one of the cases that KMH reported was during one of the huge and important projects for the organization where several subcontractor were involved in this project, one of the subcontractor offer KMH a good amount of money to accept his bid in the project, KMH inform the organization director and they decided to accept the money as a discounted amount from the bid after they informed the subcontractor, that enhanced his position in front of the organization members. On the top of all of that, KMH had the courage to climb the management ladder; he was highly motivated though his desires for self-development and career progression, as well as, KMH had a strong personality, and a leader characteristic. All of that helps in promoting KMH to the management levels in his career.

Even though KMH had the desire to be in the management level, he passes over some challenges. Through asking KMH about Howard' challenges, the following challenges were selected and ranked in ascending order according to their difficulty by KMH:

- 1- The amount of pressure and stress
- 2- The need to work through others: a mindset change from “doing” to “managing”
- 3- Spending a lot of time in meeting
- 4- The number of hours required to work

Pressure and stress realized to be the most challenging issue for KMH, where he said that “pressure and stress was a negative challenging, where it had a negative effect on the work process and it hinder it from going smoothly”. KMH define pressure and stress as a consequence for all other challenges and problems.

The second challenge was in changing the way of thinking from “doing” to “managing”. KMH even in the highest management positions that he occupied, he didn't leave the technical work completely. The number of KMH subordinates was increasing with the increasing of the responsibilities and with the progression in the job positions; recruitment was one of KMH responsibilities in the management level, KMH said that “My expectations about people's abilities in accomplishing the work was usually higher

than what they give”. It was hard for KMH to achieve the image that he had in his mind about the project through other’s mindset.

The third difficulty was spending a lot of time in meetings, in the management level KMH was attending a lot of meetings, which was hindering him from accomplishing all the work that he was planning to accomplish during his day.

The fourth challenge was the number of hours required to work. KMH was surprised with the amount of work and the number of responsibilities required in the management level, wherein in addition to the management responsibilities KMH didn’t leave the technical work completely, which increased the pressure on him.

According to KMH there were other challenges in addition to Howard list, KMH in the management level he had new task like financial and cash flow management of the projects, where he was responsible to manage the projects profitability with the laborers productivity. However it was a new task but KMH as a successful manger he was able to manage it properly, which he benefits from this in motivating the staff through allowing for bonus if the projects achieved high profits.

KMH emphasized on the importance of the all management skills suggested by Howard, through asking KMH about the difficulty to acquire those skills, he highlighted on the effective time management and delegation skills, where as much as they were important they were challenging. In addition, KMH added to the human skills the ability of building a good team and create a harmony between them. KMH said that “harmony between working teams creates miracles in success of any project, and because of that harmony we were successful in accomplish project with half of the time required for it and we were able to achieve great results”. KMH acquire management skills mainly through working experience, and some course related to business administration that he registered for, as well as KMH stated that he like reading and he read a lot about different subjects and that benefit him a lot.

Finally KMH pointed out that engineers are capable to become successful managers, management is unavoidable skill for engineers from their elementary career stages. Engineers need management skills in the technical and management positions in order to

them to succeed in their career. KMH highlighted that management skills can be acquired through training and academic degrees but the most significant way that can benefit the engineers is through real working experience.

5.2.2 Case B:

KAA is a mechanical engineer with more than 30 years working experience, KAA worked in the water desalination and water supply for cities, which is considered one of the most important infrastructure sectors in the UAE. KAA at the beginning of his career he worked as a technical engineer in different countries like Iraq and Libya, but he was soon a lot to transfer to the UAE to work in the Ministry of Electrical and Water in Dubai in the position of Maintenance and Coordinating Engineer, KAA remained in this position for five years, then he shifted to work in a different emirate in one of the water desalination and water supply plants that was under the authority of the Municipality, where he worked for 25 years, his first position was Senior Maintenance Engineer, where he was responsible for about 15 members of staff includes engineers, operators, and maintenance technicians, as soon as KAA started in the plant the operational manager who was responsible for all the plant recognized his active and effective work, KAA was acting as a deputy manager, where the manager was depending on KAA in many management duties, however KAA was not officially promoted for the management position at that time. After 10 years KAA's the operational manager was retired, and the top management needs to assign a manager for the plant, the top management was in a different workplace where this top management was responsible for many sectors and this plant is one of these sectors. There was another engineer in the plant competing with KAA to occupy the manager position, however he was not qualified enough. The top management office did a meeting with the subordinates of both engineers to take the right decision, then KAA was assigned as a manager for the plant and he was responsible for 32 staff member, as well as KAA was responsible for the final design and the material and equipment selection of the projects, in addition he was submitting a monthly and yearly reports for the top management office. After another 8 years and since the UAE was witnessing an evolution in various fields and especially in the construction and the infrastructure sectors, the Municipality recognized the need to expand the plant and open an extension for the water production and distribution in the city. Consequently, KAA

was promoted to a Chief Engineer / Engineering Manager position, the expanding with the departments and section of the plant demands for a new structural chart with new set of positions, Chief Engineer position was a new position to allow an overall management for the water production and distribution of the plant. KAA in this position was responsible for all water departments in the both plants, which include 70-100 staff member, in this position KAA role also include: administrative responsibilities, final projects designs, tendering preparations and documentation, subcontractor selection, cash flow management, meetings, technical engineers follow up, and staff recruitment. Later, KAA took the decision to establish his own business in water desalination.

KAA transition process to management occurred in two phases, an unofficial transition where he was acting like a manager assistant under a technical designation and an official transition when the top management office promoted him officially. KAA was recognized for his successful technical and managerial involvements since the starting years in the plant, KAA was involved in an important technical and managerial decision, where he was able to manage a multi tasks, and he was concerned about work process to be done properly. KAA was motivated through self-development; KAA reported about motivation that “motivating for growth and upgrade is it the nature of human beings”. KAA believed that other benefits like financial reward and prestigious position are normal results for the self-development. KAA had a vision for his life from a young age; he was looking forward to reach an important position in his career. According to KAA reaching management position defines success for engineers; KAA added that engineers are leaders in their nature.

KAA challenges in transition was dictated by the working environment, according to Howard list the following challenges were selected and ranked in ascending order according to their difficulty by KAA:

- 1- Resentment or jealousy from some engineers that you were promoted instead of them.
- 2- Change from a primarily single focus engineer role to a broader, multiple focus managerial role.

- 3- Letting engineers do their own design: Overcoming the feeling that 'my way is better' or 'I'd get it done faster'
- 4- The number of hours required to work.

The first challenging that KAA pointed was the jealousy from other engineers, where this was causing a real problem for KAA, where that engineer who was competing him to be in the management position did not accepted KAA promotion smoothly. This caused a problem and uncomfortable working environment at the beginning. However KAA was well respected from all other staff, which helped him to manage the work properly.

The second challenging was in the multiple focus tasks; being concerned about many things at one time like: the technical work process, the technical people, and the top management office.

The third challenging was in accepting others' methods in doing the work even though that KAA had better experience and can do the work much better and faster, he discover that he can't be involved in all the technical details with the new responsibilities in the management level.

The forth challenging was about the working hours; since the work expanded and the responsibilities increased that required a lot more working hours. As well as, the work nature of the plant which it was operated 24/7; KAA was receiving calls even outside his working hours to keep the work running properly.

KAA add to Howard challenges list the: Restrictions from top management; e.g. the process of asking for funds for new materials were taking time, which was hindering and delaying the work process.

KAA agreed on the importance for all the management skills suggested by Howard, wherein time management, delegation, and human skills were seen as the most important skills for KAA in the management level. Moreover, KAA added leadership skills and decision making skills. KAA developed his management skills through several ways, first of all KAA mentioned that during his bachelor degree for mechanical engineering there was one course about management where it was very useful for him, Secondly KAA was

a diligent and active person he was reading a lot about management and science, in addition KAA traveled to visit other plants in other countries to understand their technology in water to benefit from them, he was keen on being up to date with the technology and enhancing the work management process, KAA stated that technical information and technology are very important for engineering managers, KAA said that “a manager who manage technical engineers work, need to be an expert in their work, so he can manage it successfully and prevent errors from occur ” . Thirdly was the working experience KAA pointed that he learned a lot from the real life working experience and that helped him a lot in being a successful manager

Finally, KAA pointed that management was challenging as a new job, however it was approachable for him, where he was insisting on success. KAA believes that successful engineers are capable for being successful managers, and he said that “Engineers in there career life needs to expect management”, where it is unavoidable for any successful engineer, at least if an engineer won’t be a purely administrative manager he must to become a technical manager and both need for management skills. KAA in the interview mentioned some examples for engineers who become successful managers that he read about one of them is Othman Ahmed Othman and Egyptian engineer who establish many companies in Egypt.

5.3 Cases summery and analysis:

Two interesting cases studies were represented in the previous section for two engineers who were successfully transiting from technical engineering field to a management position. Each engineer had his unique career journey and experience; however there are common features between both engineers.

Milestone:

Case 1: KMH



Figure 10: KMH Career Milestones

Case 2: KAA

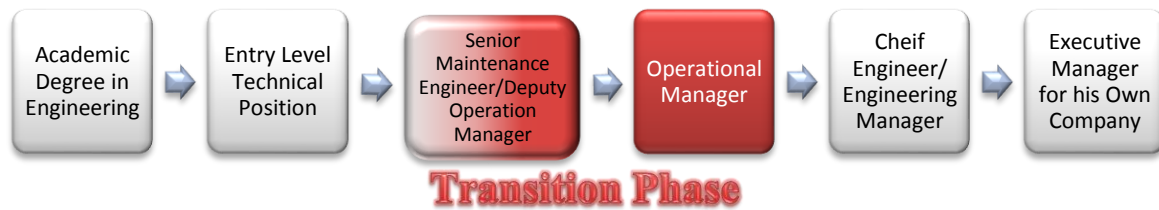


Figure 11: KAA Career Milestones

Career progression for both managers was almost similar; both of them started in a technical position, after that the transition phases occurred in a gradual manner, where both of the engineers were assigned for a managerial position under their technical titles before they were promoted officially. The transition occurred in the mid-career level for both engineers, which confirm Johnston (1987) findings that engineers need to expect transition to managerial position in a mid-career level. However KMH spent 10 years in the technical positions before he was promoted to a managerial position in a local private organization, but KAA spent 15 years before his official promotion in a public organization. This agreed with Edum-Fotwe and McCaffer (2000) study that engineers acquired at-least 10 years working experience before they reached a management position.

The career path was not clearly defined for both managers in the starting stages of their career; managers as they were progressing in their career they were able to define the possible career paths and the preferred path that they want to follow. This support the Schein (1996) strategy for career anchor, which indicate that managerial and technical anchors are discovered by time as individuals get more experiences in their work.

It was clear that both managers had a massive amount of responsibilities in their management level comparing with their duties in the technical positions. Both managers had similar job functions in the managerial position like: administrative responsibilities, meetings, staffing, technical engineers follow up financial responsibilities, and tenders. Both of the engineers even in their highest management levels they had a technical involvements.

Motivation and Characteristic

KMH and KAA both managers selected the management path toward self-development and career progression, which explains the success for both engineers in their career, and that emphasize on Wilde, (2009) and Tremblay, Wils, and Proulx (2002) findings about self-development motivation, and its positive impact on career progression.

Most of the researches presented in the literature review stated that usually engineers are promoted to management position based on their technical work. The cases showed that even though both engineers were recognized for their excellent technical work, there were other features that support the promotion for both engineers like: the trustful relationship built between the engineer and the top management; taking the initiative in solving problems, taking new responsibilities, and adopt and implement new strategies; being concern about the whole organization success and development; moreover the personal characteristics that distinction both engineers from their colleagues like: leadership characteristic, ambitions, persistent, self- confidence, brave, innovative, self-vision and effective decision makers.

In addition, both managers fulfill the self-actualization dimensions suggested by Ladenberger (1970): (1) intellectual curiosity and ambition for challenges and improvement, (2) security, independence, and self-confidence, (3) self-vision for the future, and (4) realistic ambition or plans for non-stop progression and development.

Skills and Experience

Both engineers agreed on the importance of all the managerial skills suggested by Howard (2003), and they added some other skills according to their experience:

- 1- Human Skills: like build team and motivating skills.
- 2- Administrative Skills: like directing effective meetings, preparing time schedule and learning to use new software planning tools to arrange the work effectively.
- 3- Communication Skills: verbal and written skills, to represent the company in an effective way.
- 4- Time management: With increasing the number of responsibilities as a manager; managers they need to manage their time effectively.

- 5- Prioritization skills: being able to arrange the task according to its priority, and focus on the most important tasks and accomplish them.
- 6- Delegation skills: is one of the most important skills, since managers accomplish the work through others, delegating skills are important to get the job done properly.
- 7- KMH suggest: creating harmony between working team and he emphasized on the positive effect that harmony have on work process.
- 8- KAA suggest: leadership skills helps in guiding subordinate properly.
- 9- KAA suggest: decision making skills.

Both managers believe that working experience is the best way to learn and acquire new skills, however there were some other factors that helped both managers to gain management skills and overcome the managerial ladder successfully, both engineers highlight on the benefit of having a management course, wherein KAA had some management courses within his bachelor degree which it was included in the curriculum of the engineering from the university, on the other hand, KMH had registered for business course during his working years. In addition both engineers prove that reading and being up-to-date are very important elements for success, wherein learning is a non-stop process.

It is worth mentioned that the number of years that engineers spent in their organizations helps in promoting them for a management position, like KMH he spent 10 years in one organization which helped him in building a strong relationship with the top management office. As well as, it helped the manager in their management role, since they were familiar with all the organizational policies. KAA spent 25 years in one organization and that supported him a lot in his promotion, where the evaluation done from the subordinates agreed on his effective and efficient competences.

Challenges

Both managers were facing challenges in their transition from technical to management position, according to Howard 20 common challenges the managers was selecting the following challenges:

KMH:

- 1- The amount of pressure and stress
- 2- The need to work through others: a mindset change from “doing” to “managing”
- 3- Spending a lot of time in meeting
- 4- The number of hours required to work
- 5- Added: new management roles like financial and cash flow management.

KAA:

- 1- Resentment or jealousy from some engineers that you were promoted instead of them.
- 2- Change from a primarily single focus engineer role to a broader, multiple focus managerial role.
- 3- Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done faster’
- 4- The number of hours required to work.
- 5- Added : Restrictions from top management organizations, which was delaying the work process

As explained in the literature review that Howard married all the challenges to a main nine themes, therefore the challenges faced by the managers’ in the cases study was checked with the main 9 themes as shown in table (5)

Howard Themes	KMH Challenges	KAA Challenges
Theme (1): So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.	Spending a lot of time in meeting.	Change from a primarily single focus engineer role to a broader, multiple focus managerial role.
Theme (2): Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.		Resentment or jealousy from some engineers that you were promoted instead of them.
Theme (3): Delegation: The challenge of leaving the hands on technical behind and learning to work through others.	The need to work through others: a mindset change from “doing” to “managing”.	Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done

		faster'
Theme (4): Increased stress and pressure associated with increased responsibility.	The amount of pressure and stress.	
Theme (5): Developing new skills: Discovered the need for a new set of skills as a manager.	Learning new management skills like financial and cash flow management.	
Theme (6): Resources and getting the work done: Finding the time, the staff and other resources to get it done.	The number of hours required to work.	The number of hours required to work.
Theme (7): The new guy in management: Change from being a technical expert to being new in management and having a lot to learn.		
Theme (8): Organizational issues: In a new organizational level with its associated issues.		Restrictions from top management; e.g. the process of asking for funds for new materials were taking time, which was hindering and delaying the work process.
Theme (9): Choosing the management career path: The concerns before deciding and questions experienced during or after the transition.		

Table 6: Matching cases challenges with Howard themes

According to table (5) the following themes are discovered to be challenges themes for the managers in their transition process:

Theme (1): So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.

Theme (2): Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.

Theme (3): Delegation: The challenge of leaving the hands on technical behind and learning to work through others.

Theme (4): Increased stress and pressure associated with increased responsibility.

Theme (5): Developing new skills: Discovered the need for a new set of skills as a manager.

Theme (6): Resources and getting the work done: Finding the time, the staff and other resources to get it done.

Theme (8): Organizational issues: In a new organizational level with its associated issues.

Chapter 6 – Conclusions and Recommendations

6.1 Conclusion

The research investigates the engineering managers' career path and the challenges that they faced in the transition from a technical engineering to engineering manager position, in the UAE. This investigation was done through a comprehensive literature review that provides an overview for the study components, which led to the structured conceptual frameworks in Figure (8), which presents the factors that contribute in engineers' transition to management and their influence on the engineers in accepting and override the challenges. This conceptual framework was examined based on a qualitative research approach through case studies and semi-structured interviewees that was organized with two engineers who had been successfully transitioned to managerial level. Both managers were invited for the interview because they satisfied the specified criteria. Before the interview the managers were sent a questionnaire with open-ended question, these question and other question were discussed in the face to face interview. The result of the interview presented in a cases study format, these cases were analyzed and compared with the literature review findings.

The findings show a strong agreement with the literature review theories; and the data from the analysis noted the following:

- Engineers spend many years as technical engineers before they transition to a management position, according to the conducted cases an average of ten to fifteen years, these years include different positions and roles that prepare the engineers for the management position.
- The suggested conceptual model was supported by the case studies, wherein the three factors that were suggested in the conceptual framework shows an influence for the engineers in overriding the challenges, these factors are skill, personal characteristics and working experience.
- Usually an organization promotes engineers to the management level from within the organization, and so before the transition process engineers usually establish a strong relationship with the organization includes trust, respect and transparency.

- The “personal development” was a strong motivation that has a strong influence on achieving a management role and helps in overriding the challenges smoothly, wherein personal development push the individual to learn and acquire new skills.
- The study emphasized in the important of all the management skills suggested by Howard in addition to some other skills, these skills are: Human Skills (2) Administrative Skills (3) Communication Skills (4) Time management (5) Prioritization skills (6) Delegation skills (7) Harmony working environment between the team (8) leadership skills and (9) decision making skills.
- Engineers can learn management skills through several way, however cases indicate that working experience is the best instrument for engineer to learn new skills, in addition the cases indicates on the benefit of management course, and the continuance of development.
- The assumption that managers are facing difficulties during their transition from the technical field to the management level had been proven from the cases. The cases confirm on the challenges themes suggested by Howard, however only seven themes out of nine themes, where mentioned by the cases, these challenges are:
 - Theme (1): So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.
 - Theme (2): Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.
 - Theme (3): Delegation: The challenge of leaving the hands on technical behind and learning to work through others.
 - Theme (4): Increased stress and pressure associated with increased responsibility.
 - Theme (5): Developing new skills: Discovered the need for a new set of skills as a manager.
 - Theme (6): Resources and getting the work done: Finding the time, the staff and other resources to get it done.

- Theme (8): Organizational issues: In a new organizational level with its associated issues.

Finally the research confirm that engineers are capable to become a successful managers, as well as managerial role is unavoidable for engineers and engineer need to expect management duties in their career path, even though for those who are not interested in the management path they need to expect a managerial duties in their career path.

6.2 Recommendations

The research analysis and findings uniform the following recommendations to support engineer in their transition from a technical position to a managerial position:

- (1) It is highly recommended for engineers to benefit from others experience and challenges in the transition, in order for them to be prepared for the transition phases and draw an insight for what they might face.
- (2) Being familiar with the skills required for management position and being prepared for the changing of the mid set from doing the work by themselves to achieve it through others.
- (3) Provide training for those engineers who are on the management borders, to prepare them for the amount of responsibilities they will face in the management position and train them on the management duties and skills.
- (4) It is highly recommended that academic curriculums for bachelor engineer degree should include management courses to prepare engineers for the management role in their path; in addition it should present the possible career paths that engineers can select after their academic degree.
- (5) An advanced academic degree in management could be very useful for those engineers who are planning to be in a management ranking.

6.3 Further Researches

This research can be taken as a basis for further studies, that can be examine in a larger sampling using a quantitative approaches to generate an extensive results and provide a clear ranking for the challenges. This study is focusing on the Management Path; a further study can be conducted on the Entrepreneurial Path where both cases in the study show interests in this path after the management path. This study is focusing on the transition phase for engineers in their career path toward management position, a more extensive study could be done on the entire career phases that engineers passes through in their career path.

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Appendix A

Questionnaire:

What is your age?

- ☐ 25 to 34 years
- ☐ 35 to 44 years
- ☐ 45 to 54 years
- ☐ 55 to 64 years
- ☐ 65 to 74 years
- ☐ Age 75 or older

In what year did you complete your undergraduate degree?

Have you complete any advanced degree like MSc or PhD?

- ☐ Yes
- ☐ No

How many years of experience do you have?

- ☐ 0–5
- ☐ 6–10
- ☐ 11–15
- ☐ 16–20
- ☐ 21–25
- ☐ 26–30
- ☐ More than 30

What is your current position?

- ☐ Executive Level (CEO, Vice-president)
- ☐ Senior Management Level (Director, Senior Director)

- ☐ Manager Level (Manager, Senior Manager, Head of Department)
- ☐ Senior Profession (Senior Engineer, Senior Project Manager)
- ☐ Technical Profession (Engineer, Project Manager)

After How many year of experience as a technical engineer did you transfer to the management position?

- ☐ In the first working year
- ☐ After 1 year of experience
- ☐ After 2 years of experience
- ☐ After 3 years of experience
- ☐ After 4 years of experience
- ☐ After 5 years of experience
- ☐ After 6 years of experience
- ☐ After 7 years of experience
- ☐ After 8 years of experience
- ☐ After 9 years of experience
- ☒ After 10 years of experience
- ☐ After 11 years of experience
- ☐ After 12 years of experience
- ☐ After 13 years of experience
- ☐ After 14 years of experience
- ☐ After 15 years of experience
- ☐ After 16 years of experience
- ☐ After 17 years of experience
- ☐ After 18 years of experience
- ☐ After 19 years of experience
- ☐ After 20 years of experience
- ☐ After more than 20 years of experience

What did motivate you to enter the management ranking?

- ☐ Not my decision/Organizational decision
- ☐ Personal development
- ☐ Controlling & Authority
- ☐ Financial rewards
- ☐ Prestigious position
- ☐ Other

Which of the following, if any, caused you difficulty during your transition from technical/individual contributor to a manager?, Please select all the applicable points.

- ☐
The increased responsibility: ownership of something much larger and impact of decisions increased
- ☐
No longer being a technical problem solver
- ☐
The need to develop new domain knowledge
- ☐
The requirement to balance and prioritize many tasks and roles
- ☐
The lack of a willing and able mentor
- ☐
The number of hours required to work
- ☐
Allowing engineers to do their own design: learning that your way is not the only way (or the best way)
- ☐
A lack of training or preparation for the new role
- ☐
Making the final decision to enter the management role

☐

The firefighting necessary to keep a project moving

☐

Resentments or jealousy from some engineers that you were promoted instead of them

☐

The need to adapt management theories developed as an engineer

☐

The amount of pressure and stress

☐

The new relationship with former peers; Rather than a friend, being the adversary

☐

The need to work through others: a mindset change from 'doing' to 'managing'

☐

An inability to secure sufficient resources to complete projects on time

☐

Underdeveloped people skills

☐

A shift from being focused on just technical work to being responsible for several functions related to a project

☐

The move from technical expert to management novice

☐

Having to spend a lot more time in meetings

☐

None of these caused me any difficulty

☐

Other

According to your experience, Which of the following skills consider important in the

management position?

- ☐ Human Skills: like build team and motivating skills.
- ☐ Administrative Skills: like directing effective meetings, preparing time schedule and learning to use new software planning tools to arrange the work effectively.
- ☐ Communication and Listening Skills: include verbal and written skills, negotiation and persuasive.
- ☐ Effective time management.
- ☐ Prioritization skills: being able to arrange the task according to its priority, and focus on the most important tasks and accomplish them.
- ☐ Delegation skills: select the suitable person to handle a certain mission.
- ☐ All the above
- ☐ Other

Appendix B

Interview Questions:

1. Tell me about your current job responsibilities. What are you responsible for and what activities are you involved in at work?
 - a. Given the activities you have mentioned, what percentage of your time is spent in each activity?
 - b. How many people report to you? Has that number changed over time and if so, how? (do the number of your subordinate increased by time)?

2. Tell me about how your career has progressed. Begin with when you began as an engineer and progress up to the present. What steps or phases were involved, what were your responsibilities during each step or phase, and how long each lasted?
 - a. How would you describe or label each of the steps or phases?

3. What did motivations to follow management position? Are there any other motivations that you would like to mission? In your opinion what was the most important motive that kept you encouraged toward management?
 - a. Why your organization promoted you to a management position? Is it because you were recognized in the technical work only, or there were any other reasons or qualifications that distinguish you from your colleagues?
 - b. In your opinion, does management position define success for engineers; in other word is it necessary for engineers to become managers?

4. When did the transition occur for you and how would you define the transition?
 - a. Please recount to me what happened during the transition and describe what you were doing, what you were thinking, and what you were feeling during the chain of events leading from engineer to engineering manager.

- b. Please provide me details about how the transition process was difficult? Do you remember any situation that was difficult during that phase? What you were surprised with? What did like or dislike about being an engineer, manager and the transition phase?

5. According to the challenges list what was the most difficult point during the transition? It may have been something you found challenging, a barrier you faced or a situation or experience you had. It could be a single event or perhaps a new responsibility that was particularly difficult to adjust to. Please provide as much detail as you can regard this single most difficult thing about your transition.

- a. As you considered the single most difficult things, what other things came to mind that we did not discuss?

6. According to the skills list what was the most difficult skill to acquire as an engineer? And what are the skills that you are deal with in your current position?

7. Do you think that engineers are capable to be successful managers? Did your experience as an engineer support you in your transition process? If yes, how did it?