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THE UNIVERSITY OF HONG KONG

COMPETENCIES OF PROJECT MANAGERS IN HONG KONG

A DISSERTATION SUBMITTED TO
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BACHELOR OF SCIENCE IN SURVEYING

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY

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HONG KONG
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Declaration

I declare that this dissertation represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

Signed: _____

Name: _____

Date: _____

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Abstract

This paper establishes competencies needed for a project manager practicing in Hong Kong, and investigates which areas should be focused upon and what measures should be used.

A solid theoretical background for the use of competency models was found by an extensive literature review in the field of general management. It is postulated that the use of such a framework should incorporate a multimethod-oriented approach where both generic and specific competencies are included. Rather than investigating competencies for today or in the past, the framework should be able to identify those of tomorrow.

A questionnaire is designed to collect the views of practicing project managers on 55 competencies. They were asked to give their opinions on each competency with respect to their level of importance to current project managers, level of evidence shown by project managers and level of importance to future project managers.

It was found that there are significant differences between the level of importance and the level of evidence. Project managers in Hong Kong are not performing up to the level they expected. There will also be changes in the requirement of competencies in the future. It was concluded that although technical and managerial skills are still important, more training in business related areas should be provided.

Project managers in Hong Kong have the same view with project managers in the UK that experience contributes more in certain areas in developing and maintaining competencies. Thus, in terms of method of narrowing the gap between level of future importance and level of evident, CPD should be used for all categories of skills while opportunities of application and mentorship programme should also be provided for financial skills, IT skills, legal skills and communication skills.

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1 Introduction

With the growing complexity of projects, increasing international collaboration within the building industry and growing concern of clients' satisfaction, management of construction projects become more and more an important issue. One factor contributing to successful project management is the effort spent by a good project manager.

Character needed for a project manager is quite diverse (Kuprenas et al. 2000). As the duties and responsibilities of project managers are a lot, many different attributes are required in performing the tasks. These attributes range from technical to managerial. Surely, with a project manager competent in all of these areas, the project will have a higher chance of success.

Given such a diverse set of skills that have to be possessed by a project manager, this research is going to focus on which of these competencies are regarded as the most important by project managers in Hong Kong. This list of competencies can help human resources personnel to select a competent project manager. It is also hoped that the list can be the guidance to those who want to be part of the profession.

It is also expected that there will be differences between the level of importance perceived and the level of evidence actually shown for some competencies. If some of these competencies are viewed as important in the future as well, then it should be the areas of focus. Whether CPD is the best solution in narrowing the gap will be another question to be solved in the research.

In all, as Nkado and Meyer (2001) state at the beginning of their research on the competencies of professional quantity surveyors in South Africa, it is believed that a competency-based review of project managers is important for service excellence and has continuing relevance in the built environment. It will provide a new perspective on the relative importance of competencies required for current project managers in Hong Kong.

1.1 Objectives

1. To identify competencies needed for a project manager from literature.
2. To investigate current and future competencies needed for a project manager from their own views.
3. To investigate competencies exhibited by project managers in Hong Kong.
4. To investigate and suggest the necessary training needed for a project manager in Hong Kong.
5. To suggest method of training.

1.2 Structure

The research will start by reviewing relevant theories concerning the use of competency models from general management literature. Project management theory will also be visited. This will provide a sound theoretical base for the research detailed in the methodology section. The survey results will then be analyzed and discussed. Lastly, conclusion will be drawn.

2 Competency

2.1 Introduction

Many literatures suggest an increasing use in competency models. A survey by Cranfield University of Limerick (1999) revealed a significant increase in use in Europe. As reported by Garavan and McGuire (2001, p. 144), “competency movement has taken hold in a number of countries” including Australia (Cornford and Athanasou 1995), the UK (Newton and Wilkenson 1995), the Scandinavian countries (Mabon 1995) and Israel (Reichel 1996).

For May (1999), management competencies are used to build a framework for analysing the resources available to achieve business strategies and forecast areas of control risk. They are also the components of development programmes to supply shortfalls in management competencies for the future. 217 companies, participated in a survey conducted by the American Compensation Association (1996 cited Birdir and Pearson 2000), said that they use competency for staffing, training and development, performance management and compensation. McLagan (1996) suggests that competency models can be used as criteria for the training curriculum design; recruitment, selection and assessment; coaching, counselling and mentoring; career development and succession planning; and as a central point for organizational development. Antonacopoulou and FitzGerald (1996, p. 26) believe that competencies have the following purposes and to be capable of being:

1. A device for looking at organisational performance and ways to improve competitiveness, i.e. a tool in the pursuit of quality, cost reduction and profitability through excellence;
2. A communication tool and a key mechanism which helps energise corporate vision and translate it into reality;
3. A key to engineering, creating and shaping organisational change and, in particular, a lever for establishing and managing cultural change;
4. A basis for developing and operating an integrated human resources management system that would cover recruitment and selection, training and development, manpower and succession planning and remuneration and reward. A system which draws input from organisational plans and delivers outputs in the form of concomitant performance in staff.

At a simplistic level, competency models seek to identify the ideal combination of skills, knowledge, attitudes and experience. The possession of this combination enables employees to become high performers with the potential to add value to the organisation (Gorsline 1996).

2.2 Definitions

Despite of its increase in use, there is disagreement in the definitions of the term “competency”. Gale and Pol (1975, p. 20) say that, “Competency is a molar concept similar to the concept of intelligence. Both terms imply that they are composed of a complex of important interrelated elements.” They go on argue that “it will be conceptually unsound to speak of competency as a plural term unless two or more different roles or positions are intended”. Boyatzis (1982, p. 21) in his seminal work

defines job competency as “an underlying characteristic of a person which results in effective and/or superior performance in a job.” Albanese (1989) describes managerial competency as a skill and/or personal characteristic. Following the above definitions, Birdir and Pearson (2000) define competency as skills, ability, knowledge and other attributes that make one successful in his job. Spencer and Spencer (1993, p. 9) share a similar meaning with Boyatzis by defining competency as “an underlying characteristic of an individual that is casually related to criterion-referenced effective and/or superior performance in a job or situation”. Bratton (1998, p. 17) suggests that, “A core competency is defined as any knowledge, skill, trait, motive, attitude, value, or other personal characteristic essential to perform a job”. From the above, it can be seen that the term include a range of the characteristics, behaviours and traits necessary for successful job performance. Abraham et al. (2001) thus concluded that one of the advantages to use the word competency is that one does not have to distinguish among these three areas. On the other hand, Nordhaug and Gronhaug (1994, cited Currie and Darby 1995, p. 11) define competency as “work related knowledge, skills and abilities”. Woodruffe (1991) has the same output-oriented view by defining competencies in terms of the sets of behaviours that a person must display in order to be competent.

The result of such a diverged definition in literature is reflected in the implementation of competency-based management in organizations. Antonacopoulou and FitzGerald (1996, p. 36) carried out a case study on the implementation of competency-based management in three banks. The definition of the term competency for bank A was related to “a relatively stable set of behaviours”. In bank B, it referred to “the performance standards identified for a particular job role presently... and the

competencies needed to achieve superior performance”. In bank C, competency was “a description of the application of managerial skills, job-related knowledge and attitudes which result in effective actions and can lead to the achievement of objectives”. Antonacopoulou and FitzGerald (1996, p. 29) argue that “the lack of clear understanding as to what competency means leads to further disorientation and misinterpretation”.

Why there is such a diverged definition? The answer lies in the development of competency models.

2.3 The competency movement

As points out by Sandberg (2000, p. 9), “the problem of identifying what constitutes competency at work is not new”. The competency movement found its roots (Garavan and McGuire 2001) in the writing of Taylor (1911). “When working as an engineer, he noticed a large difference between the least and most competent workers’ ways of accomplishing their work... to enable the identification of what constituted competency among the most competent workers, Taylor argued for leadership based on scientific principles from the rationalistic tradition” (Sandberg 2000, p. 9). In other words, we could study management as a science just like other familiar disciplines within the physical sciences (Raelin and Cooledge 1995). In the world of science, scientists break down their subject into smaller components for ease of analysis. Then they will examine how these parts might be interconnected and integrated. When this apply to a manager, his job will become one of pulling together the various motions in a job, or the various elements of enterprise, in order to make

both jobs and enterprises run at their maximum efficiency (Raelin and Cooledge 1995). This is the “time and motion studies”. Taylor proposed that by using these studies, managers should be able to identify what constitutes workers’ competency by classifying, tabulating and reducing it to rules, laws and formulas. Using these descriptions of competency as a starting point, Taylor demonstrated that managers could set up systematic training and development activities that yielded improvements in workers’ competency and consequently, increased effectiveness in organizations (Sandberg 2000, p. 10).

2.3.1 The American movement

Competency movement was mainly lead by the US and the UK government (Horton 2000; Garavan and McGuire 2001). The force behind such movement was changing technology, increasing competition, declining profitability, the search for competitive advantage and improved performance in production. As reported by Horton (2000, p. 307), there were two strands to the US government’s policy on increasing economic competitiveness. The first strand focused on education and general skills. Both business and individual found that the quality of education was poor and thus there was a move to raise the standard. Taxpayers’ money funded demonstration projects so as to identify specific behaviours, competencies and learning outcomes that matched the needs of society and the economy. A number of states started to assess teachers’ performance and eventually, “minimum standards of performance were set down and minimum levels of competency were established for teacher accreditation throughout the country” (Horton 2000, p. 307).

The US administration then turned its attention to setting down national standards across all occupations. This was in fact influenced by a similar practice in the UK and the National Skill Standards Board (NSSB) was introduced in 1994 to encourage the development of a voluntary national system of skill standards that could be assessed and certified. In the summer of 2003, a successor structure comprised of two separate but inter-related elements was created. The National Skill Standards Board Institute (NSSBI) represents communities of interest related to the development and use of industry skills requirements, skills assessment for learning or selection, and certifications. The communities of interest include certifiers, industry and professional associations, education and training providers, policy makers, and certification holders. The NSSBI is responsible for the convening of industry leaders and the oversight for the development and maintenance of macro-level industry-wide skill standards. On the other hand, the NSSB Education and Research Institute (NSSBE&RI) is responsible for information storage and dissemination around issues of quality assurance and system integrity (NSSBI 2003).

The second strand was the investigation of competency in the employment context. “Here, the emphasis was on seeking to understand the basis of excellence” (Horton 2000, pp. 307-308). The American Management Association commissioned McBer Associates to undertake research into successful managers to identify their attributes and features and the responsible consultant was Mr. Richard Boyatzis. He concluded from his research that there was not a single factor but a range of factors that differentiated successful from less successful managers. As a result, he adopted the term “competency” which he defined as “an underlying characteristic of a person which results in effective and/or superior performance in a job” (Boyatzis 1982, p. 21).

He went on to develop a generic model of management competencies and concluded that there were 19 generic competencies that outstanding managers tend to have. Although he termed it as “generic”, Boyatzis (1982) recognised that not every job require the 19 competencies identified while some jobs may require more. Whether competencies should be generic or specific is another area of disagreement which shall be discussed in the latter section.

Apart from the above mentioned movement of individual competency, there was also movement in organisational competency. During the 1970s and early 1980s, US academics turned their attention to strategic management as the key to competitive success (Horton 2000). Systems thinking led to the concept of corporate environment and external factors affecting organisational strategy and success. Hayes (1985 cited Horton 2000, p. 308) on the other hand focused on internal competencies and questioned whether focusing on ends before considering means was the best approach to business strategy. Other researchers pointed to the need to identify and mobilise invisible assets, including human capital, and to build on strengths (Itami and Roehl 1987; Peters 1987). This thinking led to the emergence of resource-based school of economics during the 1980s. This school focuses on firms’ internal characteristics to explain why they pursue different strategies with different outcomes.

In 1990, Prahalad and Hamel proposed a different approach to the strategic planning process which started with an internal analysis or inventory followed by an examination of the external environment. They suggested that in order to exploit their resources successfully, organisations need to understand fully their “core competencies”. Prahalad and Hamel (1990, p. 82) explained that “core competencies

are the collective learning in the organization... it is also about the organization of work and delivery of value... [it] is communication, involvement, and a deep commitment to working across organizational boundaries... [it] does not diminish are enhanced as they are applied and shared". In other words, core competencies are the company's characteristic areas of expertise and consist of the synergy of resources such as motivation, employees' effort, technological and professional expertise, and ideas about collaboration and management (Bergenhengouwen et al. 1996). Bergenhengouwen et al. (1996) further elaborate that working systematically and structurally with core competencies gives organizations considerable strategic power. Core competencies are difficult for competitors to duplicate because they are distinctive and specific to each individual organization. Concentrate on the core competencies makes organizations very effective and therefore results in a competitive advantage.

It can be seen that "competency" and "core competency" are two different concepts. The former relates to individual while the latter concerns organizations. Although different, they are not unrelated. Bergenhengouwen et al. (1996, p. 30) view core competencies as the result of a joint learning process in organizations and it forms products in which internal and external business strategies, production logistics and individual competencies "find their expression". Figure 1 demonstrates this relationship. For example, one of the core competencies of a contractor may be its ability in handling large infrastructure project. The reason why the contractor is capable of handling this kind of project may be because it has the right expertise, e.g. a competent project manager. The project manager contributes his or her competencies

in working on the project. Thus, individual competencies contribute to organizations' core competencies.

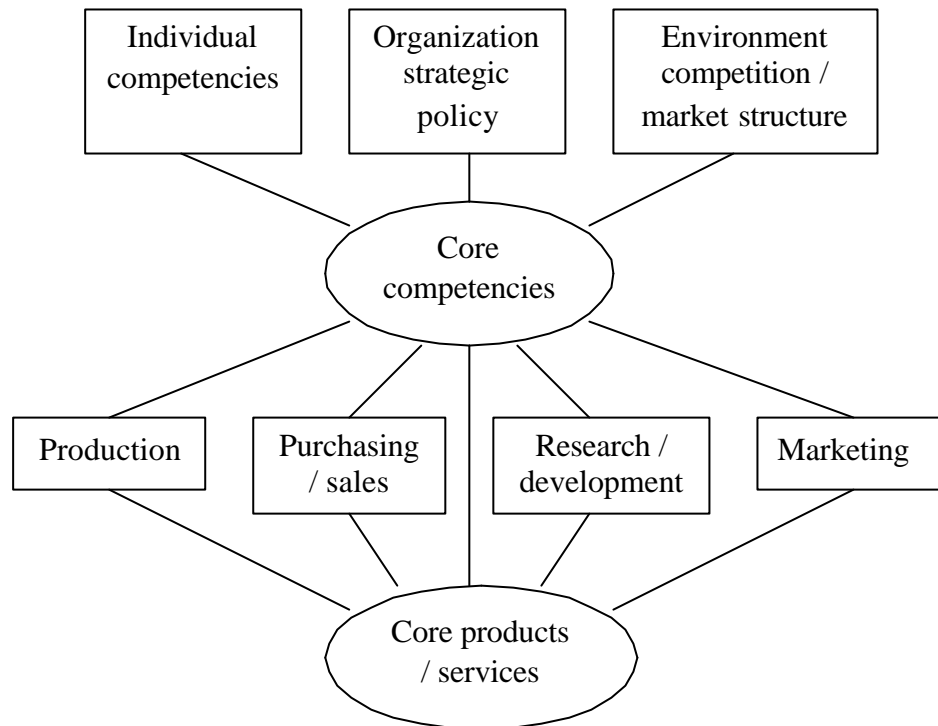


Figure 1 The core competencies of organizations (Source: Bergenhenegouwen et al. 1996)

2.3.2 The British movement

The competency movement in the UK emerged from the same environmental context as in the US. As Horton (2000, p. 310) observed, “it was also a response, especially in the 1990s, to widespread organisational developments including changes in working practices, such as a greater focus on team-working and customer service; flatter organisational structures, which meant less opportunity for traditional staff development through promotion; cultural changes leading to a greater emphasis on

employees taking responsibility for continuous learning and self-development; and the need for increased flexibility in work, requiring employees to develop a wider range of skills over time.” Many ideas, theories and practices developed in the US have been exported to the UK through management consultancy firms, educational institutions and corporations. Nevertheless, movement in the reverse direction was also observed.

A series of government investigations and reports were started in the 1980s due to the UK’s poor economic performance, rising unemployment and a growing skill gaps (Horton 2000). This raised the awareness for the need of a flexible and adaptable workforce that could respond to economic change and the need for a comprehensive training programme based on new standards of occupational competency (MSC 1981 cited Horton 2000, p. 310). Because of the poor training record, the government instructed the Manpower Services Commission to put in place a system for setting standards across all sectors of industries. Industry Lead Bodies were created to develop new standards and the National Council for Vocational Qualifications (NCVQ) was appointed to co-ordinate their work into a national framework. NVQs are now conferred on individuals who reach the required standard at each level and are seen as an alternative to the traditional educational qualifications conferred by academic examinations bodies (Horton 2000). The NVQ system aims to provide for the portability of qualifications and the mobility of labour. It is fully comprehensive covering all manual, clerical, technical, administrative, professional and managerial positions.

There were reports in the UK indicating the low standard of management compared to its competitor. With the aim to raise the standard, the Management Charter Initiative (MCI) was launched in 1987 to pave the way for the development of chartered or professional manager (Horton 2000). “This was intended to encourage training and accreditation of recognised management skills that were subsequently developed within a NVQ framework.” (Horton 2000, p. 311)

In the 1990s, the UK government reformed further and higher education (Holloway et al. 1999 cited Horton 2000, p. 311). Policies aimed at establishing and raising standards and quality, and ensuring that universities colleges were developing, amongst their students, the skills that industry and the economy required, were introduced. Established in 1992, the Quality Assurance Agency conducts regular inspections on both programmes of study and the institutions to monitor their standards. “The orientation is very much focused on outputs including degree results and qualifications and employment of students.” (Horton 2000, p. 311)

2.3.3 A comparison between the two movements

As mentioned in the previous section, there are a number of definitions attached to the term “competency” and the source of differences can be found in the definition of the term by the two countries. The Training Standards Agency from the UK defined competency as an action, behaviour or outcome which the person should be able to demonstrate. It is the “ability to perform the activities within an occupation or function to the standard expected in employment” (MCI 1990, p. 1). This “output oriented” approach has been seriously criticized (Wilson 1998) as it seemed to ignore

knowledge and theory in favour of demonstrated skills. NCVQ responded to these criticisms. They revised and widened the definition of competency by saying that “occupational competency is defined as the ability to apply knowledge, understanding, practical and thinking skills to achieve effective performance to the standards required in employment” (NCVQ 1997).

Horton (2000) thinks that none of the definitions above incorporate the “softer” behavioural skills identified by the US, nor the US differentiation between superior and less effective performance. “The US focus is clearly on the “inputs”, the abilities, aptitudes and talents that a person brings to a job, which enables them to perform satisfactorily or exceptionally”. (Horton 2000, p. 312)

The output and input oriented approach of competency can be explained by the following human competency model proposed by Bergenhenegouwen et al. (1996). Bergenhenegouwen et al. (1996, p. 30) hold the view that “competencies are concerned with things like values, standards, views on life and on oneself and others”. They argue that it is the underlying personality aspects that are important for the essential and responsible tasks. It is clear that Bergenhenegouwen et al. take the input approach. His iceberg model provides a clear demonstration.

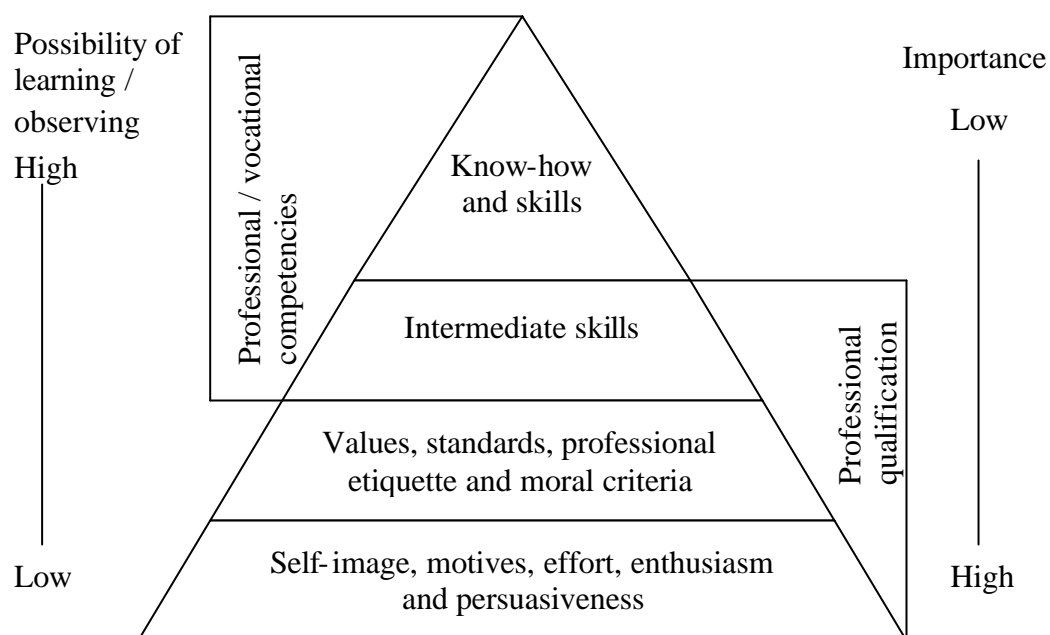


Figure 2 Human competency in the form of an “iceberg” (source: Bergenhenegouwen et al. 1996, p. 31)

The visible top of the iceberg, the first level, is analogy to the output approach adopted in the UK movement. It concerns both the observable knowledge and skills that relate to carrying out work or holding a position, which are necessary for the occupation, job or task to be performed properly. They are learned in professional and vocational training courses and are documented by diplomas and certificates (Bergenhenegouwen et al. 1996). On the job training such as CPD provided by, e.g. Hong Kong Institute of Surveyors, also develops competencies at this level.

The second level relates to intermediate skills that are applicable in various situations. They include items such as social and communicative skills, general technical and vocational insights, organizational qualities and basic approaches to work and situations (Bergenhenegouwen et al. 1996). However, these intermediate skills are more difficult to learn. Individual supervision and feedback are required. An

example would be training or mentorship programs for university graduates offered by some large corporations, such as Swire Properties Limited, Gammon Skanska Limited, etc. They do not only aim at training employee for the necessary skills to perform the job but also shaping the graduates to adapt to the corporate culture so that they can be ready for managerial training. As pointed out by Bergenhenegouwen et al. (1996, p. 31), “they are labour-intensive and are therefore relatively expensive”. Bergenhenegouwen et al. say that level 1 and 2 together can be considered as the professional and vocational competencies.

The third level in the competency structure consists of values, standards, ethics and morals of the person concerned as well as those of the organization and the group to which the employee belongs or reports (Bergenhenegouwen et al. 1996). These values and standards are said to be “internalized” by the employee on the basis of his or her own insights, experiences and education. Bergenhenegouwen et al. (1996, p. 31) further explain that this third level “consists of the personal and professional frame of reference in which values, orientations, standards and criteria are given a specific place and in which the personality marks out its identity”. As the level goes down, it becomes more difficult to learn and these value and standard is an extremely individual and lengthy socialization process. Bergenhenegouwen et al. view the last three levels of the human competency structure as professional qualification of the person.

The fourth level of the human competency structure consists of “deeper-lying personal characteristics”, such as self image, actual motives and the source of the enthusiasm and effort that goes into actions (Bergenhenegouwen et al. 1996). This is

the “underlying characteristics” that have been used by Boyatzis (1982) in his definition of competency. This is the input approach adopted by the US literature. Bergenhengouwen et al. (1996, p. 31) stipulate that “these aspects of human competency determine very much how a person acts in specific situations”. These aspects are not only being practically invisible but also difficult to identify, develop or teach. Bergenhengouwen et al. (1996) thus conclude that it is better to involve these characteristics before the selection process because subsequent training in this area would turn out to be practically impossible.

The above gave a brief history of the competency movement. With the aid of the “iceberg” model, sources of differences in definitions were provided. Other areas of debate in the use of competency models will be discussed in the following sections.

2.4 Rationalistic versus interpretative approach

Differences in definition of competency may also arise from adoption of different approaches. 3 out of 4 approaches in competency models are essentially based on the scientific principles of the rationalistic research tradition (Sandberg 2000). They can be classified as worker-oriented, work-oriented and multimethod-oriented (Sandberg 1994; Veres et al. 1990).

2.4.1 Worker-oriented approach

Within the worker-oriented approach, competency is primarily seen as constituted by attributes possessed by workers, typically represented as knowledge, skills, abilities

(KSAs) and personal traits required for effective work performance (Veres et al. 1990, p. 87). A commonly used example is the job element method (Veres et al.) where the relevant attributes are captured through the use of a group of job incumbents and supervisors. The attributes identified are organized into predefined categories, such as KSAs. The attributes are then rated to allow quantitative measurement of the correlation between success in accomplishing the work and possession of the designated attributes.

Researchers have used the term competency to further stress the importance of attending to worker attributes that are strictly work-related (Sandberg 2000). The seminal work by Boyatzis (1982) has been introduced and he generally subscribes to a worker-oriented approach (Garavan and McGuire 2001) by defining competency as “an underlying characteristic of a person, which results in effective and/or superior performance in a job”. Drawing on Boyatzis’ approach, Spencer and Spencer (1993) provide another worker-oriented definition of “an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation”. The notion of causation differentiates both definitions. Spencer and Spencer require a higher standard of causation. They required a link to be established between a particular competency and superior performance (Garavan and McGuire 2001).

From the history, we knew that these definitions are the products of the US. Dale and Iles (1992 cited Garavan and McGuire 2001, p. 151) summarise the outcomes of the US approach as being primarily behavioural, specifying the skills or qualities that a person will use to do a job. Also, they are often generic, trying to describe as

succinctly as possible the behaviours that high performers may display, though in different proportions according to level, function or context.

2.4.2 Work-oriented approach

In the work-oriented approach, competency is, as worker-oriented approach, also regarded as a specific set of attributes (Sandberg 2000). However, advocates of the work-oriented approach take the work as the point of departure rather than on the worker themselves. They argue that competency notions should be output-based or work-oriented and considers the outputs associated with effective performance (Martin and Staines 1994). They first identify activities that are central for accomplishing specific work and then transform those activities into personal attributes. In this way, they are able to generate more concrete and detailed descriptions of what constitutes competency and therefore largely overcome the problem of having competency description that are too general (Sandberg 2000). For example, the MCI takes work as its point of departure and focuses on occupational areas or activities (Garavan and McGuire 2001).

One criticism of the work-oriented approach is that a list of work activities does not sufficiently indicate the attributes required to accomplish those activities efficiently (Raven 1994 cited Sandberg 2000, p. 10; Garavan and McGuire 2001).

As observed by Garavan and McGuire (2001) European researchers such as Nordhaug and Gronhaug (1994) and Tolley (1987) generally advocate a work-oriented approach. Stuart and Lindsay (1997) summarise that the UK approach is focused more on the

organisations and performance requirements of job positions rather than on the job holders themselves.

2.4.3 Multimethod-oriented approach

Multimethod-oriented approach or multidimensional approach also regards competency as a specific set of attributes. The only difference it has from the other two is their more comprehensive approach to competency (Sandberg 2000). Their advocates attempt to avoid the criticisms raised against the worker- and work-oriented approaches by drawing ideas from both approaches. Veres et al. (1990) adopted a multimethod-oriented approach to identify competency in the work of police lieutenants. Their description consisted of 46 personal attributes and it was expressed in the form of statements of KSAs that corresponded to 23 police attributes. The work activities and the personal attributes were then quantified in percentage terms as they related to police work (Garavan and McGuire 2001).

In summary, all rationalistic approaches regard competency as an attribute-based phenomenon (Sandberg 2000). Human competency is described as constituted by a specific set of attributes that workers used to accomplish their work. Hence, those who perform their particular work more competently than others are regarded as possessing a superior set of attributes (Sandberg 2000).

2.4.4 Interpretative approach

Some researchers criticize rationalistic approach as problematic for identifying and describing competency at work. They criticize that the rationalistic operationalizations of attributes into quantitative measures often result in abstract, overly narrow and simplified descriptions that may not adequately represent the complexity of competency in work performance (Attewell 1990; Norris 1991; Sandberg 1991, 1994). Moreover, the use of KSAs and other general models of competency within the rationalistic approaches tend to predefine what constitutes competency. Sandberg (1994) argued such predefinitions of competency may confirm a researcher's own model of competency, rather than capture workers' competency. Another concern is that the descriptions of competency produced by the rationalistic approaches are indirect. Sandberg (2000) explains that the set of KSAs or competencies do not illuminate what constitutes competency in accomplishing work. Rather, it is just an identified set of attributes specifies central prerequisites for performing particular work competently. Such descriptions, as Sandberg (2000) claim, demonstrate neither whether the workers use these attributes, nor how they use them in accomplishing their work.

Researchers tried to find out why direct descriptions of human competency are not forthcoming in the rationalistic theories and methods. In a general sense, it is because the rationalistic researchers invoke a dualistic ontology, assuming that person and world are distinct entities, and an objectivistic epistemology, assuming the existence of an objective reality independent of and beyond the human mind (Bernstein 1983; Searle 1992; Shotter 1992). Sandberg (2000) explains that the dualistic ontology underlies division of the phenomenon of competency into two separate entities, namely worker and work. On the other hand, the objectivistic epistemology implies

objective, knowable work that is beyond workers and leads to descriptions of work activities that are independent of the workers who accomplish them. The combined effect of these two perspectives turned competency into two independent entities, prerequisite worker attributes and work activities (Sandberg 2000).

Sandberg (2000) views the interpretative research tradition as an alternative to the rationalistic approaches to competency. The main feature of the interpretative research tradition is its phenomenological base, the stipulation that person and world are inextricably related through persons' lived experience of the world. Thus, competency is not seen as consisting of two separate entities. Instead, worker and work form one entity through the lived experience of work. Competency is thus seen as constituted by the meaning the work takes on for the worker in his or her experience of it (Sandberg 2000). Although it seems very promising, this approach is not widely used at the present moment. Field observations and interview with workers to take the conceptions of their works are the main methods of data collection in this approach. Highly trained researchers are required for this process along. The method used during the process of data analysis is by reading the interview scripts over and over again in order to "grasp the key issues". This method is by no means reliable since different researchers may have different interpretation of any statement made by the worker during the interview.

2.5 Generic competency

Raelin and Cooledge (1995) notice that quite a number of writers believe that certain tasks or competencies are required for all managers in any organization.

Competencies labelled generic are thought to be applicable to an entire class of managers across organizations and positions (Powers 1983 cited Raelin and Coolege 1995, p. 25). Dulewicz (1989, p. 58) claims that, “with more research and some unity of purpose, it should be possible to produce a universal model to explain the majority of middle and senior levels.” Schroder (1989) claims that all managers possess a common set of basic competencies and these represent the skills needed to understand and perform the tasks of managing in any organization. In other words, project manager in construction industry, project manager in the field of IT and a functional manager in a multinational corporation share the same basic competencies.

Competencies that might lead to effective behaviour for one job in one company may not translate into effectiveness for that job in a different organization or even for a similar job in the same organization. Hayes et al. (2000) examined the universality of senior management competencies within one large multi-site service organization. They focused on 159 senior managers of whom 125 were unit general managers and the remaining 34 were managers working at an equivalent grade in area offices and at headquarters. They found that different lists of detailed competencies were identified as important for each of the four work environments and there was little support for the view that there is a universal set of competencies required by managers working at this level.

Raelin and Coolege (1995) express that it is not only impossible but also inadvisable to attempt to build a generic competency list applicable to all managers in any kind of managerial position. Burgoyne (1990) shares the same view that while he has little difficulty in defining and defending a straight-forward concept of total managerial

competency, he is less convinced about the utility of attempts to disaggregate this into lists of managerial competencies that may have universal application and which can provide a complete prescription for the delivery of management development. Kotter (1982a) concludes in his work that there is very low transferability of successful general managers from one organization to another. Gratton (1989) criticizes the competencies list developed by “Development Dimensions Incorporated” as too simple and does not provide for sector-specific, level-specific or function-specific competencies.

Boyatzis (1982) states that generic competencies can probably only account for a third of the variance in managerial performance with the other ingredients being organization-specific competencies and day-to-day situational factors. Burgoyne (1990) argues that two managerial jobs are similar at higher level of abstraction but at the level of detail, they are all different. He further argues that competencies are only exercised in discrete and specific situations which mean that each competent act will have its own unique mix of idiosyncratic and shared elements. Woodruffe (1991) acknowledges that different organizations engaged in different activities will require managers to have different competencies. Albanese (1989, p. 67) states that, “No set of competencies can fully capture the mystery of the managerial role and there are many job-specific skills that influence effectiveness in a particular managerial job.” Different organizations have different culture and Antonacopoulou and FitzGerald (1996) argue that small as these differences may seem, it could make all the differences and account for the uniqueness of an organisation and its workforce. In summary, Burgoyne (1990, p. 23 cited Hayes et al. 2000, p. 98) says that, “the paradox is that the more universally true any given list of competencies is, the less

immediately useful it is to any particular choice about how to act and behave in a specific situation.”

Once relevant competencies for a given managerial job can be identified, its applications within management education can be numerous (Raelin and Cooledge 1995). Lawler (1994) claims that competencies rather than jobs should guide the very structure and reward systems of organizations in the future. Woodruffe (1991) notices that competency is thought by some managers as representing the language of their strategic human resource policy allowing the organization to match its available human resources against its strategic needs. This would involve the way by which people will be appraised and developed (Raelin and Cooledge 1995). The question would then be how to identify the competencies which constitute the proper developmental dimensions.

“Many companies have decided that they need to tailor their competencies if they are to become useful for training and development.” (Raelin and Cooledge 1995, p. 27)

The development function in particular benefits from tailoring competencies to the specific environment. Raelin and Cooledge (1995) contend that competencies used for development need to take context into consideration, i.e. they should be “organic”, arising from the specific context of the individual, job, and organization rather than from an artificial list. Organic competencies offer the language for purposes of feedback discussions. Raelin and Cooledge (1995) claim that by preserving the local idiom, managers can recognize identifiable categories of performance. For example, competencies required for project managers will involve many items that are organic

to the industry, e.g. reading and understanding drawings. Project managers can then use this list as a reference for career development.

Hayes et al. (2000) although find it difficult to support the view of a universal competency list, think that it is possible to identify broadly defined, shared competencies if only at a level similar to Boyatzis' basic competency clusters, as well as "competencies" specific to particular circumstances.

McClelland (1973, p. 9) hold the same view that "for some purposes it may be desirable to assess competencies that are more generally useful in clusters of life outcomes, including not only occupational outcomes but social ones as well, such as leadership, interpersonal skills, etc." In fact, Burgoyne (1990) did acknowledge that there may be some competencies that have universal relevance and can provide a framework for management development programmes. These include the basics that are required to operate in any managerial context, although some of which may change over time, e.g. computing skills (Hayes et al. 2000). Burgoyne (1990, p. 23) argues that there should be some overarching competencies to do with "learning, changing, adapting, forecasting, anticipating and creating change". Hayes et al. (2000,

-competencies" are crucial if managers are to develop the capacity to modify their competencies to ensure that they will continue to be competent in performing effectively if transferred to different roles or work environments. They are also crucial to cope with the future changes in job demands. Therefore, while different managers working in different environment needs to develop different sets of organic competencies or idiosyncratic competencies, there will also be some shared competencies that can be usefully developed in the context of generic management development programme (Hayes et al. 2000).

2.6 Management is not an exact science

Raelin and Cooledge (1995) are of the view that management is not a science that can be broken down into a set of definable skills applicable to all managers in all organizations. Just as Freedman (1991, cited Raelin and Cooledge 1995, p. 25) said, “Today’s environment is unpredictable, uncertain and uncontrollable. Post-modern science’s emphasis on chaos and complexity are more appropriate to the behaviour of today’s organization.” Therefore, managers need to look for patterns behind seemingly random behaviour rather than emphasizing on predictability (Raelin and Cooledge 1995).

Vaill (1983) also says that generic competency lists focus too much on the concrete, on action per se. Anthony (1986) expresses that management as a practice is not always rational. Raelin and Cooledge (1995) explain that “occasionally we want the manager to not so much create order but disorder.” Mintzberg (1973) has pointed out long ago that rather than behaving in a clearly defined and planned way, managers’ work was more likely to be fragmented and verbal. In a study of what effective general managers really do, Kotter (1982b, pp. 159-160) found that “the planning and organizing that these people do does not seem very systematically done; it seems rather hit or miss, rather sloppy”. He discovered that what seemed to be unplanned and disorganized behaviours of effective general managers are “derive from their approach taken to agenda setting, others from network building, others from how they tend to use networks to implement agendas, and still others from the approach in general”.

2.7 Social and group interaction

In between individual and organizations, we should not neglect collective or team competency (Burgoyne 1989). Jacobs (1989) notices that the competency approach tends to concentrate on individual competencies and to forget about group dynamics. It is clear that social settings in which people operate undoubtedly have a major influence on their “successful” performance. The success of an individual depends on the level of mutual support and collaboration between colleagues, as means of learning and improving (Antonacopoulou and FitzGerald 1996).

Antonacopoulou and FitzGerald (1996) argue that incorporating the group and group activity into the approach to management development will not create major problem since those competencies can be practised in group settings. However, there will be problem if the situation is reversed, i.e. if the organisation is defining competencies in terms of individual roles. Firstly, a team or group will function more effectively if it has the correct balance of skills, knowledge and attributes (Belbin 1981 cited Antonacopoulou and FitzGerald 1996, p. 32) and this can only be judged when viewing the team as an entity. With only the project manager being competent, the project will not be able to complete on time, within budget and to the quality required. From the client’s view, the design team will be effective only when different parties, such as the architect, the quantity surveyor possesses the appropriate knowledge, skills and attribute. From the contractor’s view, a good project manager also needs a good team involving foremen, sub-contractors, etc. who properly play their roles in the project. In other words, one must have the right mix of people. Secondly,

individually defined competencies do not help the organisation to judge the contribution of one individual to the outcome of a group activity. Hence, individual definition of roles and competencies may be inequitable as a basis for reward (Antonacopoulou and FitzGerald 1996).

2.8 Competency and performance

Another major issue identified from competency literature is the assessment of competency. Antonacopoulou and FitzGerald (1996) argue that the tendency to adopt a positivistic approach has led to a misconception that competency is an observable characteristic which becomes evident by the application of some assessment methods. Causal link between competency and performance is unlikely to hold as there may be multiple causalities (Raelin and Cooledge 1996). Collin (1989) also warns against accepting a tight relationship between competency and performance. He questions the assumption that it is possible to reduce the whole into its constituent parts and that the whole is merely an aggregation of the parts. Hayes et al. (2000) view that even if managers are able to master all elements of a bespoke list of competencies, this mastery will not guarantee overall competency and the ability to perform effectively. The misleading belief of linking competency and performance casually creates a competency model which is narrow and rigid, forgetting that the development of effective managers is essentially an open-ended activity (Antonacopoulou and FitzGerald 1996).

Although some competencies might contribute to effective managerial performance, there will surely be other factors, observable or unobservable, controllable or

uncontrollable, that also contribute to effective management (Raelin and Cooledge 1995). One example would be motivation, which is difficult to measure but greatly affect the performance of a, say, project manager. Two project managers may have the same competencies such as leadership, decision making and strategic planning. Still, one may out perform the other as one may be more motivated to do the job. Changes in a person's self-image as well as changes in a person's perception of his or her abilities can also explain changes in his or her performance (Boyatzis and Renio 1989 cited Antonacopoulou and FitzGerald 1996, p. 32). Pye (1991 cited Hayes et al. 2000, p. 99) reported that CEOs and management development directors who had participated in an earlier study (Pye and Mangham 1987) were unable to offer a full account of what they required of effective managers even though they felt that they would "know" a good manager if they saw one. The missing elements in a competency lists may be critical to effective performance (Hayes et al. 2000). "Just because we can identify and measure some competencies, it does not follow that these competencies along cause effective performance wherever they may be found." (Raelin and Cooledge 1995, p. 25).

Raelin and Colledge (1995) notice that competency assessment tends to fall into the familiar trap of selecting only those competencies observable and hence can be easily measured. The question would then be to what extents does behaviour, in terms of demonstrable performance, becomes the sole or appropriate means of identifying management competency (Antonacopoulou and FitzGerald 1996). Competency defined and assessed in such a way is only a "first order measure", i.e. the top level of the iceberg model (Bergenhengouwen et al. 1996), which fails to recognise "second order measure" (Wolf 1990) and these are the knowledge, skills and understanding

which underpin performance output, i.e. the bottom level of the iceberg model. In Hyland's (1993) word, many competency based strategies are concerned more with measurement, assessment and accreditation and less with learning and education.

As a result, Antonacopoulou and FitzGerald (1996) point out that assessments of what managers are capable of doing may bear limited resemblance to what they are actually willing and able to do. They suggest that instead of providing managers with a narrow set of "competencies" suitable for a narrow set of tasks, it may be more sensible to grow the natural talents and strengths of individuals.

2.9 Concentration in the past

Competency models also suffer the risk of concentrating more on the past or present performance than future performance (Raelin and Coolege 1995). Antonacopoulou and FitzGerald also state that the competency models in its present form are only capable of illuminating and defining the behaviour and skills that are useful in the present circumstances. There is no guarantee that these will also be appropriate to the future needs of the individuals and their organisations. As Raelin and Coolege (1995, p. 27) say, "One wonders whether a competent manager today can continue to be competent tomorrow if he or she continues to behave in the same way".

The solution to this problem would require the employment of the concept, "learning
Antonacopoulou and FitzGerald 1996, p. 33). However, the present competency models value organisational control and fail to allow individual managers to control their own development and learning.

The problem of whether one should measure present or future competencies also highlights the conflict between different uses of a competency model (Antonacopoulou and FitzGerald 1996). Purposes such as recruitment and selection, performance management and reward etc., required the specification of current activity while other purposes, such as management development, “are directed towards managing the organisation both efficiently and effectively with an eye to the future” (Antonacopoulou and FitzGerald 1996, p. 36).

From the perspective of individual and organisational development, competency should not be regarded as the mere ability to perform skills effectively. It needs to embrace a more intangible set of attributes such as those at the third or fourth level of the iceberg model (Bergenhengouwen et al. 1996). Antonacopoulou and FitzGerald (1996) urge that one has to build into the definition of competency and the processes for acquiring competency a dynamic element which includes a continuing search for improvement.

2.10 Summary

From above, it can be seen that there are several contributions that competency models can make to organizations and the construction industry can also be benefited. Such a framework can be the basis for training curriculum design, recruitment, coaching and career development.

Such a framework should be specific to each organization, i.e. different organizations will have different requirements for, say, project managers and projects managers need to have some specific competencies in order to carry out their work in a particular organization. However, it is believed that project managers will share some basic competencies across different organizations. They may also share some basic competencies with other managers from different industries.

Multimethod-oriented approach should be adopted since both worker-oriented and work-oriented approaches have their deficiencies while the interpretative approach is still at its development.

Investigating competencies of today, not to mention that of yesterday, would greatly reduce the usefulness of the result list, especially when it is used to plan for future training and development of managers. Thus, attention should be paid on whether the model incorporates competencies for the future.

Individual may behave differently, whether it is better or worst, when they work with others as a team. Thus, in addition to individual competency, team competency is also important.

Moreover, we have to bear in mind that management is not an exact science. A person with all the necessary skills and knowledge may still perform poorly on any given task. There are some underlying factors difficult to measure but which may affect job performance.

As noted earlier, the use of competency models are increasing. Renowned for its slow evolution, the use of competency models in the construction industry has, nevertheless, also been increased. Nkado and Meyer (2001) adopt use competency models to search for the competencies required of a quantity surveyor in South Africa. They found that the five competencies deployed with greatest proficiency are measurement, procurement and financial management, professional practice, construction contract practice and economics of construction. Fraser (1999) created a “non-results-based” effective index, which was based on competency elements, for construction site managers while Egbu (1999) focused on managers managing construction refurbishment works. It can be seen that most researches targeted people in management level. As project management is one of the most important, fast emerging profession in the construction industry, it is not surprise to see that a number of researches have been carried out to investigate the competency needed of a project manager. However, all of them are carried out overseas and there is a need to investigate the same for their local counterpart. Before looking into how this will be carried out, we shall revisit some important concepts about project management.

3 Project Management

3.1 Introduction

Project management is defined as:

“The planning, co-ordination and control of a project from conception to completion on behalf of a client requiring the identification of the client’s objectives in terms of utility, function, quality, time and cost and the establishment of relationships between resources, integrating, monitoring and controlling the contributors to the project and their output, and evaluating and selecting alternatives in pursuit of the client’s satisfaction with the project

Project manager is the usual title attached to the person carrying out project management process. However, the appointment of project manager should not be viewed as an instant solution to all problems (Walker 2002). Nevertheless, effective project management is seen to be dependent upon the project manager (Jaselskis and Ashley 1991). However, why do we need project management in the first place?

3.2 The need of project management

Consultants are persons involved in a construction project to assist the employer and include, e.g. architect, quantity surveyor, structural engineer, etc. Each of them has their part to play. For the architect, his major input was on design aspect. He has to

carry out studies of user requirements, site conditions, planning, etc. during feasibility stage. He then needs to develop the brief further to a greater detail as the work progress. He also has to prepare production information such as drawings and schedules (Lupton 2001). As for quantity surveyor, he is an expert in costs, values, labour and material prices, finance, contractual arrangements and legal matters. From the outset, he will give practical advice on the likely cost of a project. Then he will develop a detailed cost plan as the design proceeds. He will also be responsible for preparation of tender documents such as bills of quantity. (Hong Kong Institute of Surveyors 2004) On the other hand, the structural engineer designs structures for both building and infrastructure work

As there are so many different parties involved in a single project to produce a single product for the employer, there will certainly be some form of coordinating problems. These problems arise from the fact that the construction of a building needs collaborated effort from different professions, which, in most cases, come from different organizations. This implies that the problem of coordination will be less severed if the entire project is to be carried out by a single, multi-disciplinary firm, who will be responsible for both design and construction. This type of organization, however, is rare as the cost of monitoring every worker's performance as well as the cost of planning the construction activities to minimise workers' idle times are very high (Chau and Walker 1994). Thus, it is common that a number of parties will contribute to a single project and these parties will work together until the project is finished. Coordinating problems will occur between them as, simply, they come from different organizations. Each organization has their own structure and culture, which shape the way of how their employee carrying out the tasks. Employee from a small

company may be more flexible in handling problems or emergent situations than that from a large company, who may used to work with a set of standardized practice and procedure. Apart from the size, there are other factors which may affect the structure and culture of an organization, hence the way in which its employees performing the duties, such as, types of organization, origin of organization, etc.

At the individual level, the coordinating problem is further complicated by the fact that different parties may have been assigned with different degree of authorities from their companies. It is not unusual for, say, the Associate of a medium-sized architectural firm to work with a technician from a large fire services consultant. They are not only come from different organizations but there may also be a power mismatch. One may be able to make a decision on behalf of his organization while the other may need to seek further instruction from his or her boss.

Thus, there will always be the problem of coordination. This problem can also be illustrated by management theory.

3.3 Management theory

The evolution of management theory is as complicated as the construction process. First, there was the classical approach which place emphasis on specialization of workforce. This is partly the case in the lowest level of the construction industry, e.g. welder, bricklayer, concreter, etc. The classical approach also said that sub-goals add up to overall goal. This, however, is rare in the construction industry since different parties will have different objectives and which may not be able to be added together.

Rather than looking at the relationship between work and worker, the behavioural approach focuses on interpersonal relations. It recognizes the problem of goal complexity. However, it has been criticized as a study on human behaviour rather than a study on management (Walker 2002).

The socio-technical approach identifies the technical systems of construction industry as interdependent and uncertain while the social system as a mismatch between design and production (Walker 2002). It was the first theory to identify the need for someone in a separate role for project management. Taking it a step further, the systems approach focuses on how the parts of a process depend upon each other. Construction process itself can be viewed as a system and different parties and different tasks can be viewed as different parts of the system. This is an open system rather than a closed one as it adapts to events and occurrences outside the system. For example, a change in the building regulations (an event outside the system) may affect the application of approval (part of a system) for the construction of an office (the system).

Both empirical observations and theoretical studies identify the important tasks of coordination between different activities. This role is traditionally filled up by the project architect. He or she usually acts as a team leader and administrator of the building contract. This may well be sufficed in a small project but in a large project, such as the construction of a university, the architect alone cannot possibly oversee all management issues while at the same time, carries out his design work.

As a result, a specialist is required to look after and manage the project and coordinating efforts from different parties, with a single aim of achieving the

employer's objectives. This function is project management and the specialist is the project manager. In terms of systems approach, the project management process should (Walker 2002):

1. identify, communicate and adapt the system's objectives,
2. ensure that the parts of the system work effectively,
3. ensure that appropriate connections are established between the parts,
4. activate the system so that the connections that have been established work effectively, and
5. relate the total system to its environment and adapt the system as required in response to changes in its environment.

Contingency theory, while it can be seen as one of the examples of the systems approach, is closer to real life situation. It says that different environments, which generate different levels of uncertainty, require varying degrees of separation of organisational units and hence they require different degrees of integration. Thus, there require the existence of an integrating unit and conflict-resolution practices, i.e. project manager in the case of construction project, as contributing to the quality of integration and in turn to overall performance.

3.4 Project management and competency theory

The importance of project managers leads to the concern of their training and development. As the first step, people need to know what constitutes a good project manager. Then proper training and development programs can be developed to provide the necessary training to those who want to become project managers.

Performance measurement of existing project managers should also be developed in order to provide insight into the effectiveness of training program, as well as areas that may need further development in the form of CPD. All of this can be embraced by the competency models.

Edum-Fotwe and McCaffer (2000) state that professional competency in project management is attained by the combination of knowledge acquired during training, its subsequent application and other skills developed in the course of practice. They notice that although academic programmes cover a significant proportion of knowledge area, what required in practice by project manager is much wider in context. Thus, they suggest that modern project management demands other general and management knowledge, together with skills that extend beyond the technical aspects of traditional engineering areas. They think that the following areas which are the additional knowledge required for a project manager overlap with that required for managing organization since a project form part of a functional organization (Edum-Fotwe and McCaffer 2000, p. 113):

- Finance and accounting
- Sales and marketing
- Strategic planning
- Tactical planning
- Operational planning
- Organisational behaviour
- Personnel administration
- Conflict management
- Personal time management

- Stress management.

The above knowledge areas are viewed as generic both to managing project and managing organisation. At the skills level, Edum-Fotwe and McCaffer (2000) argue that project managers need to have both specific and generic skills. Specific skills are those skills that relate to construction projects and in particular, the areas that reflect their speciality in, e.g. managing civil engineering or infrastructure project. General skills are those skills that are transferable from the construction industry to other industry, such as aerospace industry. Skills are also viewed as general if they can be transferred from one area of construction to another, e.g. from civil engineering to infrastructure project. Their view on these two types of skills should be considered in two different levels. At a higher level or within a wider context, generic skills are those needed across different industries while specific skills are those needed in the construction industry. However, those skills that are viewed as specific in a wider context will become generic when they are considered in the local context since they can be applied across different areas within construction industry. Those skills that are needed only in a particular area, such as tunnel construction, will now become specific. In their research, Edum-Fotwe and McCaffer (2000) combine these two levels into one where generic means generic across different industries as well as across different areas in the construction industry. Their research focus on general skills with headings such as leading, communicating, negotiating and problem solving and they found that knowledge and skills necessary for project managers to maintain their competency are largely acquired from their experiences.

Three years later, Dainty et al. (2003), who also came from the Department of Civil and Building Engineering, Loughborough University, redefine traditional success parameters to consider the knowledge, skills and behavioural inputs which contribute to superior performance. They focus on defining one set of project success factors. Rather than the traditional measures of outturn performance, they aim to identify the management inputs that lead to the overall project success (Dainty et al. 2003). After interviews with only 20 persons in different organizations, they come up with 43 performance criteria, summarized by nine factors, namely, team building, leadership, decision making, mutuality and approachability, honesty and integrity, communication, understanding and application, self-motivation and external relations. They found that traditional outturn performance measures of time, cost and quality were not defined as key criteria by the focus group. Instead, there was a clear emphasis on the importance of building and managing teams effectively. They further postulate that this may represent the most fundamentally important competency for the construction project manager.

What about competencies needed for a project manager in Hong Kong? Are there any areas that need improvement and what should be the measures?

4 Methodology

Questionnaire is used to collect the opinion from practicing project managers. As declared by Oppenheim (1966), a questionnaire is not just a list of questions or a form to be filled out but is a scientific instrument for measurement and collection of particular kinds of data. He also warns that “fact gathering can be an exciting and tempting activity to which a questionnaire opens a quick and seemingly easy avenue, with the weaknesses in the design not realized until the results have to be interpreted” (Oppenheim 1996, p. 3). With the above in mind, a self-administered questionnaire was specifically designed for the research and is attached in Appendix II.

There are 14 questions in the first section with the aim to collect some basic information. Although the target group of the research is project managers, they may have different titles while performing more or less the same duties. Thus question 3 is asked. Statistical test can also be performed to find out if there is any correlation that exists between the age of project managers and their designation. Questions 5 to 8 ask for their background of training and their attitude of training. Questions 5 and 6 reveal the types and depth of formal training project managers received. Questions 7 to 8 reveal their commitment to professional development in different areas, such as managerial studies, business related studies, etc. Results from the above can also be related to Section II to find out if project managers are acquiring skills and knowledge for the future or for today. Questions 9 to 14 give us an idea of the career path of project managers.

Section II asks the opinion of project managers on 55 competencies. For each competency, they are asked to express their views on its level of importance to project managers currently practicing in Hong Kong (level of current importance), its level of evidence as shown by project managers in Hong Kong during the course of their practice (level of evidence) and its level of importance to be perceived by future project managers (level of future importance). Differences, if any, which exist between level of current importance and level of evidence would suggest that although a particular competency may be seen as important, project managers are not performing it well. This may reflect that training received by project managers in the past was not enough. On the other hand, differences between level of evidence and level of future importance would imply that some competencies are not being performed up to a certain standard while their importance is growing everyday. These competencies should then be the focus of CPD. Differences between level of current importance and level of future importance would indicate changes in competencies required for project managers.

Technical skills	Managerial skills
Basic Technical Knowledge	Leadership
Design activities and background	Time management
Planning and scheduling	Decision making
Forecasting techniques	Negotiation
Estimating and tendering	Delegation
Site layout and mobilisation	Strategic planning
Material procurement	Human behaviour
Plant hire and management	Motivation and promotion
Construction management activities	Recruitment
Reading, understanding drawings	Team working
Productivity and cost control	Top management relations
Quality control	Sub-contractors relations
Operation research	
	Financial skills
Legal skills	Reporting systems

General legal background Drafting contracts Industrial relations Health and safety issues Preparation of claims and litigation Trade unions and public authorities	Project finance arrangement Investment appraisal Taxation Stock control and evaluation Establishing cash flows Establishing budgets
Communication skills	IT skills
Presentation Report writing General / business correspondence Public speaking	Operating systems Programming languages Special applications Spreadsheet Database Network systems CAD Project management software Information systems and IT tools
General skills	
Marketing and sales Public relations Understanding of organization Chairing meetings	

Table 1 The 55 competencies

The 55 competencies (table 1) are mainly adopted from Edum-Fotwe and McCaffer (2000) with some modifications to suit local conditions. For example, the item VAT in the original competencies list was deleted. The 55 competencies are divided into 7 categories, namely, technical, managerial, financial, IT, legal, communication and general skills. The reasons for choosing the competency list from Edum-Fotwe and McCaffer (2000) are two folds. Firstly, restrictions in time and resources do not allow a focus group to be formed so as to establish a local list of competencies.

Secondly, the existing list already served the purpose of this research well as it avoids areas which may be overlooked and addresses the problems usually found in researches using competency models. As it is believed that both generic and specific competencies are required for a project manager, opinions on these two types of competencies were asked at the same time. For example, under the part of technical skills, “site layout and mobilisation” is specific to construction industry while “quality competency required for all managers across different industries. Here,

the level of differentiation is at a higher level, i.e. generic competencies are those applicable across industries while specific are those only applicable in the construction industry regardless of areas of application. Table 2 shows which competencies are generic and which are specific to the construction industry. For the generic competencies, references is made to Boyatzis (1982), McCredie and Shackleton (2000), Karns and Mena (1998) and May (1999).

Generic competencies	Specific competencies
<p>Technical skills</p> <ul style="list-style-type: none"> • Planning and scheduling • Forecasting techniques • Productivity and cost control • Quality control • Operation research <p>Managerial skills</p> <ul style="list-style-type: none"> • Leadership • Time management • Decision making • Negotiation • Delegation • Strategic planning • Human behaviour • Motivation and promotion • Recruitment • Team working • Top management relations <p>Financial skills</p> <ul style="list-style-type: none"> • Reporting systems • Investment appraisal • Taxation • Stock control and evaluation • Establishing cash flows • Establishing budgets <p>IT skills</p> <ul style="list-style-type: none"> • Operating systems • Programming languages • Spreadsheet • Database • Network systems • Information systems and IT tools <p>Legal skills</p>	<p>Technical skills</p> <ul style="list-style-type: none"> • Basic Technical Knowledge • Design activities and background • Estimating and tendering • Site layout and mobilisation • Material procurement • Plant hire and management • Construction management activities • Reading, understanding drawings <p>Managerial skills</p> <ul style="list-style-type: none"> • Sub-contractors relations <p>Financial skills</p> <ul style="list-style-type: none"> • Project finance arrangement <p>IT skills</p> <ul style="list-style-type: none"> • Special applications • CAD • Project management software <p>Legal skills</p> <ul style="list-style-type: none"> • Drafting contracts • Preparation of claims and litigation

<ul style="list-style-type: none"> • General legal background • Industrial relations • Health and safety issues • Trade unions and public authorities <p>Communication skills</p> <ul style="list-style-type: none"> • Presentation • Report writing • General / business correspondence • Public speaking <p>General skills</p> <ul style="list-style-type: none"> • Marketing and sales • Public relations • Understanding of organization • Chairing meetings 	
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Table 2 Generic and specific competencies

Multimethod-oriented approach, as shown in table 3, was adopted in this competency model to avoid criticisms when either worker- or work-oriented approach is used alone. For example, in the part of managerial skills, “leadership” is based on a worker-oriented approach while “recruitment” is based on a work-oriented approach. Social and group interactions are also dealt with in this questionnaire by competencies such as “team working” and “understanding of organization”.

Worker-oriented competencies	Work-oriented competencies
<p>Managerial skills</p> <ul style="list-style-type: none"> • Leadership • Decision making • Negotiation • Delegation • Human behaviour • Motivation and promotion • Team working <p>Communication skills</p> <ul style="list-style-type: none"> • Presentation • Public speaking 	<p>Technical skills</p> <ul style="list-style-type: none"> • Basic Technical Knowledge • Design activities and background • Planning and scheduling • Forecasting techniques • Estimating and tendering • Site layout and mobilisation • Material procurement • Plant hire and management • Construction management activities • Reading, understanding drawings • Productivity and cost control

	<ul style="list-style-type: none"> • Quality control • Operation research <p>Managerial skills</p> <ul style="list-style-type: none"> • Time management • Strategic planning • Recruitment • Top management relations • Sub-contractors relations <p>Financial skills</p> <ul style="list-style-type: none"> • Reporting systems • Project finance arrangement • Investment appraisal • Taxation • Stock control and evaluation • Establishing cash flows • Establishing budgets <p>IT skills</p> <ul style="list-style-type: none"> • Operating systems • Programming languages • Special applications • Spreadsheet • Database • Network systems • CAD • Project management software • Information systems and IT tools <p>Legal skills</p> <ul style="list-style-type: none"> • General legal background • Drafting contracts • Industrial relations • Health and safety issues • Preparation of claims and litigation • Trade unions and public authorities <p>Communication skills</p> <ul style="list-style-type: none"> • Report writing • General / business correspondence <p>General skills</p> <ul style="list-style-type: none"> • Marketing and sales • Public relations • Understanding of organization • Chairing meetings
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Table 3 The multimethod-oriented approach

A pilot study was carried out in November 2003. The objectives of the research were explained and questionnaires were sent to two project managers. Some amendments were made to the questionnaire in terms of wording and grammar.

Project managers can be found in developers, consultants and contractors. They represent different interests of different parties. There will also be some differences in their daily work. Even for those tasks that are the same for project managers from different parties, different approaches may be used in accomplishing it. As a result, project managers from different parties will have different views towards competencies needed for a successful project manager. In order to reduce and minimize possible variation, opinions are only obtained from project managers working for contractors.

Thus, after the pilot study, 2 main contractors and 2 professional bodies were contacted. The 2 main contractors were randomly selected from the List of Approved Contractors (Group C) for Public Works for the categories of Buildings maintained by Hong Kong Housing Authority and they are Gammon Skanska Limited (GS) and China State Construction Engineering (Hong Kong) Limited (CSCE). The 2 professional bodies are Association for Project Management Hong Kong Branch (APMHK) and Project Management Institute Hong Kong Chapter (PMIHK), which are the only two professional organizations representing the interest of project managers.

Questionnaires were distributed to project managers working in GS through email with the endorsement of a senior quantity surveyor. There are about 60 project

managers and senior project managers, and 15 contract managers in GS. The response rate is about 27%. An interview has also been conducted with a project manager from the company to collect his further opinions. For CSCE, telephone calls were made prior to sending questionnaires to project managers. This may be one of the reasons contributing to the high response rate of about 50%. Questionnaires were distributed by email to all members of the APMHK, with the endorsement of the Chairman of the association. It has also been distributed at the venue of an event organized by the association on 18th February 2004. Since some members of the association may come from developers or consultants as well, an additional question has been added to the questionnaire to identify the business nature of their organizations. APMHK has 247 members and the response rate is about 5%. The President of PMIHK has also been contacted and they were reluctant to participate in the research. The number of completed questionnaires received was 44 and the overall response rate is 13%.

Descriptive statistics are used to analyse the data in Section I. Tests will be conducted to look for any correlation that exists between respondents' age and designation. For results of Section II, Paired-samples t-test will be carried out to see if there is any significant difference between level of current importance and level of evidence, between level of current importance and level of future importance and between level of future importance and level of evidence. A t-test is a procedure used for comparing sample means to see if there is sufficient evidence to infer that the means of the corresponding population distribution also differ. The two samples are measured on some variable of interest. A t-test will determine if the means of the two sample distributions differ significantly from each other (George and Mallery 2001).

Another area requiring special attention during a questionnaire research is the issues of reliability and validity. Reliability is a measure of the extent to which the results of an indicator or test are consistent over time. (Aldridge and Levine 2001) In other words, reliability concerns with whether or not the same results can be obtained again (Oppenheim 1966). Instruments used in the social sciences are generally considered reliable if they produce similar results regardless of which person administers them and regardless of which forms are used (George and Mallery 2001). On the other hand, validity tells us whether the question or item are really measuring what they intended (Oppenheim 1966). It raises the question of whether a measuring device is actually connected adequately to the theoretical mechanism, process or construct it was intended to capture (Aldridge and Levine 2001). The classic example by Oppenheim (1966, p. 70) gives the best and simplest distinguish between the two concepts. A clock that is precisely 18 minutes faster consistently gives a very reliable timing of poor validity. The time is always wrong and invalid, although we know that it will always be 18 minutes fast, i.e. the same result is obtained again and again.

The reliability can be measured in the form of a statistical coefficient of reproducibility, often Cronbach's alpha, which is similar to a correlation coefficient. Cronbach's alpha is designed as a measure of internal consistency (George and Mallery 2001). Alpha is measured on the same scale as a Pearson r and typically varies between 0 and 1. A negative value is possible which indicate that some items measure the opposite of what other items measure. The closer the alpha is to 1.00, the greater the internal consistency of items in the instrument being assessed (George and Mallery 2001). The formula that gives alpha is:

$$\hat{\alpha} = \frac{kr}{1 + (k-1)r} \quad (1)$$

where k is the number of items in the scale and r is the average correlation between pairs of items. George and Mallery (2001) say that there is no set interpretation as to what is an acceptable alpha value. Nevertheless, they suggest the following rule of thumb (George and Mallery 2001, p. 217):

$\hat{\alpha} > 0.9$	=	Excellent
$\hat{\alpha} > 0.8$	=	Good
$\hat{\alpha} > 0.7$	=	Acceptable
$\hat{\alpha} > 0.6$	=	Questionable
$\hat{\alpha} > 0.5$	=	Poor
$\hat{\alpha} < 0.5$	=	Unacceptable

Aldridge and Levine (2001) warn that such rule of thumb is precise but arbitrary.

Validity, on the other hand, is frequently determined by non-statistical means (George and Mallery 2001). Content validity is decided by a panel of experts who review whether a measure does everything it should. Concurrent validity measures a construct's validity against an unimpeachable standard, another form of measurement which has itself demonstrable validity but which may be complex, expensive or have other restrictions on its use (Aldridge and Levine 2001). Predictive validity, on the other hand, is often hard to establish with certainty. Construct validity looks back at the performance of a measure over time, preferably covering a wide range of studies, to see if it has produced fruitful findings. Although it is sometimes assessed by factor analysis and discriminant analysis can assist in creating an instrument that measures well what the researcher is attempting to measure, face validity is established by

observational procedures and construct validity is often theory based (George and Mallery 2001).

As notice by Aldridge and Levine (2001), one of the significant advantages of using established measuring instruments is that the burden of establishing reliability and validity had already fallen on another's shoulders. Nevertheless, test of reliability using Chronbach's alpha will be carried out for each types of skills under each category. For example, the reliability analysis for communication skills will review whether presentation, report writing, general / business correspondence and public speaking will consistently measures communication skills as current importance, as current evidence and as future importance respectively.

All statistical tests performed used the statistical software SPSS 11.5 for Windows.

Score will also be computed for each competency using the following equation adopted from Edum-Fotwe and McCaffer (2000), where they called it knowledge and skills (k-s) factor:

$$\text{k-s factor} = 100 * \sum x_i f_i / (5 * n) \quad (2)$$

where: i takes on a value between 1 and 5 based on the adopted nominal scale; x_i represents discrete categories of scaled respondents attitudes; f_i represents the frequency for each category of x_i ; n represents sample size. Score of competencies under level of current importance will indicate which competencies are perceived to be important by project managers. Score under level of evidence will show in which

area project managers in Hong Kong are performing well. Difference in score between these two will indicate the competencies that are perceived to be important while not being performed up to standard. Score of competencies under level of future importance will give us an idea of changes of competencies needed for project managers. Competencies having scores that are significantly different between level of evidence and level of future importance indicate a gap, where some competencies may be performed badly while their importance is growing.

The next question will then be how should the gap be narrowed? Edum-Fotwe and McCaffer (2000) discover that on the job training or even acquisition by experience may be a more suitable way perceived by project managers in closing these gaps. In determining what kind of method to be used, we need to know the pattern of project managers who perceived that there is such a gap. For example, for those who think that there is a gap in technical skills, is the gap perceived by project managers with higher level of education attained smaller than that perceived by those with lower level of education? Do project managers with more experience perceived a smaller gap in financial skills than project managers with lesser experience? Do younger project managers perceived a larger gap in IT than older project managers?

One-way analysis of variance (ANOVA) will be performed for this purpose. ANOVA is a procedure used for comparing sample means to see if there is sufficient evidence to infer that means of the corresponding population distributions also differ (George and Mallery 2001). Whereas t -tests compare only two distributions, i.e. between level of current importance and level of evident, or between level of current importance and level of future importance, or between level of future importance and

level of evident, ANOVA is able to compare many. Thus, it is able to know if any of the four age groups differed significantly from each other on the level of gap in, e.g. IT skills.

After established from the reliability analysis that competencies within a category consistently measure the same thing, it is safe to calculate the mean value of that category to represent the overall level of current importance, level of evident and level of future importance respectively for that category. Then, the difference of value for the same category between level of future importance and level of evident will be calculated. One-way analysis of variance (ANOVA) will then be performed on this 7 values with one of the demographic variable obtained in Section I to see which of these variable contributes most to the perceived level of gaps.

From the gap identified and pattern of demographic characteristic of project managers, focus area and methods of narrowing the gap can be suggested.

5 Analysis

5.1 Section I

Among the 44 respondents, most of them came from the age group of 31-40 followed by 41-50 (figure 4). Most of them bear the title, “project manager” (figure 5). Of the 44 respondents, there were only two senior project managers and they were all above 41 years old (figure 6). Number of employees was used as a proxy for size of organisation and figure 7 shows that respondents came from organizations of different sizes. This implies the applicability of the result to the whole industry.

Figure 8 gives a very interesting picture of the training received by respondents. 22 respondents hold a bachelor degree, 14 hold a master degree, 6 respondents hold a higher diploma or certificate, one of them graduated from secondary school while one of them hold a doctor degree. When we take a closer look at the level of education attained by age (figure 9), those who had a lower formal training were of a higher age. The respondent graduated from form 5 was above 51 while all 6 persons graduated with higher diplomas or certificates were above 41. Most of the respondents that hold a bachelor degree aged between 31 and 50 while most respondents with a master degree have the age between 31 and 40.

The relationship between age and level of education received is further proved by correlation test. Table 4 shows the correlation matrix between the elements of age, job title, size of organization and highest level of education. The negative and

significant correlation between age and highest level of education indicate that larger the age, lower the level of education attained.

		age	job title	size of organization	highest level of education
age	Pearson Correlation	1	-.372(*)	-.236	-.331(*)
	Sig. (2-tailed)	.000	.013	.122	.028
job title	Pearson Correlation	-.372(*)	1	-.059	.148
	Sig. (2-tailed)	.013	.000	.703	.339
size of organization	Pearson Correlation	-.236	-.059	1	-.071
	Sig. (2-tailed)	.122	.703	.000	.649
highest level of education	Pearson Correlation	-.331(*)	.148	-.071	1
	Sig. (2-tailed)	.028	.339	.649	.000

* Correlation is significant at the 0.05 level (2-tailed).

Table 4 Correlation matrix

From figure 10, it can be seen that most respondents received training in technical and management areas. This reveals much of the nature of work of a project manager, which concerns technical aspects, such as construction technology, on one hand and management aspects, such as leadership, on the other. The emphasis currently placed on knowledge required in project management are still technical knowledge and management skills, as most respondents are receiving training in these two areas (figure 11). Concerning future training that they would like to receive, there is a greater variety as shown in figure 12. Management and human resources related training still top the list while business studies comes in second.

Most respondents accumulated 6 to 10 years of experience before becoming project managers (figure 13). There are 8 respondents who had more than 21 years of

experience before practicing as a project manager. Of those 8, half of them completed their education at higher diploma or higher certificate level. This means that the fewer the formal training received, the longer the time it needs to accumulate relevant knowledge through experience. The usual number of posts taken by respondents before attaining the status of project manager is 1-5 (figure 14). For example, the career path in GS starts from assistant engineer, engineer, project engineer, senior project engineer, assistant project manager and finally project manager (Gammon Skanska 2002). 50% of the respondents experienced 1-10 projects during those training period (figure 15). Given the usual duration of 2 to 3 years per project and the fact that most respondents accumulate 6 to 10 years of experience before becoming a project manager, it is very doubtful that they could participate in every project from beginning to end.

Most respondents are experienced project managers since most of them have 10 to 15 years of experience in project management (figure 16). 7 respondents have over 16 years of experience and they are all attaining at a senior level. 3 of them are senior project managers, 3 of them are project directors while the other is the company director. This prove the validity of the result since most respondents are experienced project managers who have a clear understanding of what competencies should a project manager possessed. It is interesting to note that 2 respondents managed more than 51 projects since becoming project managers (figure 17). It is believed that the size of these projects were small to medium while its duration were short. After working as a project manager, most respondents managed up to 10 projects. Given the normal duration of a project and the usual years of experience they attained, many project managers have to manage several projects at the same time. This is confirmed

by the research since 61% of respondents are currently managing more than 2 projects (figure 18).

5.2 Section II

In this section, respondents were asked to indicate the level of current importance, level of evidence and level of future importance on 55 competencies. First of all, reliability analysis is carried out for each type of skills under each situation and their results are as follow.

	Level of Current importance	Level of evidence	Level of Future importance
Technical skills	0.8672	0.8802	0.7941
Managerial skills	0.9080	0.9025	0.9019
Financial skills	0.8787	0.8605	0.8619
IT skills	0.9043	0.9027	0.9190
Legal skills	0.8131	0.8133	0.7650
Communication skills	0.9075	0.9026	0.8744
General skills	0.8644	0.7892	0.8181
Overall	0.9616	0.9597	0.9594

Table 5 Reliability analysis

The Chronbach's alpha for each types of skills under different situations ranges from 0.7650 (future importance of legal skills) to 0.9190 (future importance of IT skills). This gives a clear picture to the high reliability of the test. In other words, all the competencies within each type of skills are measuring the same thing.

Scores were then calculated using equation 2 for each competency under each situation.

	Level of current importance	Level of evidence	Level of future importance
Technical skills			
1.1 Basic technical knowledge	85.45	70.00	89.09

1.2	Design activities and background	64.09	53.18	78.18
1.3	Planning and scheduling	85.91	70.00	90.91
1.4	Forecasting techniques	75.00	60.45	85.91
1.5	Estimating and tendering	72.27	63.64	79.55
1.6	Site layout and mobilisation	75.00	67.73	80.45
1.7	Material procurement	67.27	61.36	73.64
1.8	Plant hire and management	61.36	60.91	70.00
1.9	Construction management activities	83.18	71.82	90.45
1.10	Reading, understanding drawings	76.36	72.73	80.00
1.11	Productivity and cost control	83.64	69.09	93.64
1.12	Quality control	78.64	65.00	88.18
1.13	Operation research	58.18	51.36	73.64
Managerial skills				
2.1	Leadership	87.73	71.36	93.64
2.2	Time management	85.00	68.18	90.45
2.3	Decision making	86.82	70.91	92.73
2.4	Negotiation	83.18	68.18	86.36
2.5	Delegation	83.18	70.91	85.45
2.6	Strategic planning	79.09	61.82	87.27
2.7	Human behaviour	70.91	61.36	78.64
2.8	Motivation and promotion	78.18	63.64	80.45
2.9	Recruitment	64.09	58.18	70.91
2.10	Team working	85.00	72.27	92.27
2.11	Top management relations	80.45	69.55	82.27
2.12	Sub-contractors relations	80.45	71.82	83.64
Financial skills				
3.1	Reporting systems	74.09	65.45	82.27
3.2	Project finance arrangement	67.73	54.09	79.09
3.3	Investment appraisal	55.45	50.45	66.82
3.4	Taxation	47.73	43.64	56.82
3.5	Stock control and evaluation	60.00	51.82	67.73
3.6	Establishing cash flows	73.18	61.36	83.18
3.7	Establishing budgets	77.73	66.82	86.82
IT skills				
4.1	Operating systems	55.91	50.91	65.91
4.2	Programming languages	45.91	42.27	53.64
4.3	Special applications	50.45	44.55	59.09
4.4	Spreadsheet	61.82	55.00	65.91
4.5	Database	59.09	51.82	68.18
4.6	Network systems	58.64	52.73	70.00
4.7	CAD	52.27	45.91	58.64
4.8	Project management software	62.27	53.18	74.09
4.9	Information systems and IT tools	61.36	53.18	71.36
Legal skills				
5.1	General legal background	71.36	59.09	80.00
5.2	Drafting contracts	61.82	50.00	67.73
5.3	Industrial relations	64.55	57.73	70.91
5.4	Health and safety issues	79.09	69.09	89.09

5.5	Preparation of claims and litigation	72.73	63.18	79.09
5.6	Trade unions and public authorities	59.09	51.36	67.27
Communication skills				
6.1	Presentation	76.82	63.18	85.91
6.2	Report writing	73.64	61.36	81.82
6.3	General / business correspondence	74.55	64.55	81.82
6.4	Public speaking	69.09	58.18	76.82
General skills				
7.1	Marketing and sales	60.00	53.18	69.55
7.2	Public relations	71.82	63.18	82.27
7.3	Understanding of organization	75.45	66.82	83.18
7.4	Chairing meetings	76.36	67.27	84.09

Table 6 Score of each competency under each situation

Following the definition by Edum-Fotwe and McCaffer (2000), those competencies with score above 80 are termed primary competencies while those between 50 and 80 are termed secondary competencies. Competencies with score less than 50 were discarded as these did not provide strong enough evidence of perceived impact on developing and maintaining project management competency. We should first look at the score for current competencies.

		Score
Technical skills		
1.1	Basic technical knowledge	85.45
1.3	Planning and scheduling	85.91
1.9	Construction management activities	83.18
1.11	Productivity and cost control	83.64
Managerial skills		
2.1	Leadership	87.73
2.2	Time management	85.00
2.3	Decision making	86.82
2.4	Negotiation	83.18
2.5	Delegation	83.18
2.10	Team working	85.00
2.11	Top management relations	80.45
2.12	Sub-contractors relations	80.45

Table 7 Primary current competencies

	Score
Technical skills	
1.2	Design activities and background 64.09
1.4	Forecasting techniques 75.00
1.5	Estimating and tendering 72.27
1.6	Site layout and mobilisation 75.00
1.7	Material procurement 67.27
1.8	Plant hire and management 61.36
1.10	Reading, understanding drawings 76.36
1.12	Quality control 78.64
1.13	Operation research 58.18
Managerial skills	
2.6	Strategic planning 79.09
2.7	Human behaviour 70.91
2.8	Motivation and promotion 78.18
2.9	Recruitment 64.09
Financial skills	
3.1	Reporting systems 74.09
3.2	Project finance arrangement 67.73
3.3	Investment appraisal 55.45
3.5	Stock control and evaluation 60.00
3.6	Establishing cash flows 73.18
3.7	Establishing budgets 77.73
IT skills	
4.1	Operating systems 55.91
4.3	Special applications 50.45
4.4	Spreadsheet 61.82
4.5	Database 59.09
4.6	Network systems 58.64
4.7	CAD 52.27
4.8	Project management software 62.27
4.9	Information systems and IT tools 61.36
Legal skills	
5.1	General legal background 71.36
5.2	Drafting contracts 61.82
5.3	Industrial relations 64.55
5.4	Health and safety issues 79.09
5.5	Preparation of claims and litigation 72.73
5.6	Trade unions and public authorities 59.09
Communication skills	
6.1	Presentation 76.82
6.2	Report writing 73.64
6.3	General / business correspondence 74.55
6.4	Public speaking 69.09
General skills	
7.1	Marketing and sales 60.00
7.2	Public relations 71.82
7.3	Understanding of organization 75.45

7.4	Chairing meetings	76.36
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Table 8 Secondary current competencies

The result is consistent with that in the previous section. Most respondents indicate that they had received or were receiving training in technical or managerial areas and indeed, all the primary competencies were either technical or managerial in nature. Despite of the growing importance in managerial competencies, it is still very important for project manager to be competent in technical knowledge. The highest score in technical skills is 85.91 for “planning and scheduling” while “leadership” (87.73) from managerial skills has the highest score within the category. All the other competencies are viewed as secondary competencies with the exception of only two competencies as their score are below 50. They are taxation (47.73) in financial skills and programming languages (45.91) in IT skills.

When it comes to level of evidence, it is quite astonishing to note that not a single competency is scored above 80. By mere observation of the scores, all competencies are within the range of 50 to 80 with the exception of taxation, programming languages, special applications and CAD. Paired-samples *t*-tests are performed to further investigate the difference between level of current importance and level of evidence. It can be seen that the differences between most of them are significant except 5 competencies, namely plant hire and management, reading, understanding drawings, taxation, operating systems, and programming languages. All mean values of paired differences are positive indicating the level of evidence exhibited by project managers in Hong Kong are lower than the level of importance they perceived for that

competency. In other words, the performances of project managers are poorer than it should be.

		Paired Differences		Sig. (2-tailed)	
		Mean	S.D.		
Technical skills					
1.1	Basic technical knowledge	.77	.961	.000	**
1.2	Design activities and background	.55	1.088	.002	**
1.3	Planning and scheduling	.80	.765	.000	**
1.4	Forecasting techniques	.73	.997	.000	**
1.5	Estimating and tendering	.43	.900	.003	**
1.6	Site layout and mobilisation	.36	.810	.005	**
1.7	Material procurement	.30	.765	.014	*
1.8	Plant hire and management	.02	.762	.844	
1.9	Construction management activities	.57	1.043	.001	**
1.10	Reading, understanding drawings	.18	.691	.088	
1.11	Productivity and cost control	.73	1.107	.000	**
1.12	Quality control	.68	1.177	.000	**
1.13	Operation research	.34	1.010	.030	*
Managerial skills					
2.1	Leadership	.82	.786	.000	**
2.2	Time management	.84	.939	.000	**
2.3	Decision making	.80	.930	.000	**
2.4	Negotiation	.75	.811	.000	**
2.5	Delegation	.61	.841	.000	**
2.6	Strategic planning	.86	1.112	.000	**
2.7	Human behaviour	.48	1.248	.015	*
2.8	Motivation and promotion	.73	.949	.000	**
2.9	Recruitment	.30	.734	.011	*
2.10	Team working	.64	.780	.000	**
2.11	Top management relations	.55	.730	.000	**
2.12	Sub-contractors relations	.43	.759	.000	**
Financial skills					
3.1	Reporting systems	.43	1.169	.018	*
3.2	Project finance arrangement	.68	1.095	.000	**
3.3	Investment appraisal	.25	.811	.047	*
3.4	Taxation	.20	.701	.060	
3.5	Stock control and evaluation	.41	.871	.003	**
3.6	Establishing cash flows	.59	1.019	.000	**
3.7	Establishing budgets	.55	.901	.000	**
IT skills					
4.1	Operating systems	.25	.866	.062	
4.2	Programming languages	.18	.756	.118	
4.3	Special applications	.30	.734	.011	*
4.4	Spreadsheet	.34	.713	.003	**

4.5	Database	.36	.838	.006	**
4.6	Network systems	.30	.954	.046	*
4.7	CAD	.32	.771	.009	**
4.8	Project management software	.45	.999	.004	**
4.9	Information systems and IT tools	.41	.693	.000	**
Legal skills					
5.1	General legal background	.61	.754	.000	**
5.2	Drafting contracts	.59	.787	.000	**
5.3	Industrial relations	.34	.776	.006	**
5.4	Health and safety issues	.50	1.045	.003	**
5.5	Preparation of claims and litigation	.48	.849	.001	**
5.6	Trade unions and public authorities	.39	.689	.001	**
Communication skills					
6.1	Presentation	.68	.983	.000	**
6.2	Report writing	.61	.920	.000	**
6.3	General / business correspondence	.50	.849	.000	**
6.4	Public speaking	.55	.901	.000	**
General skills					
7.1	Marketing and sales	.34	.834	.010	**
7.2	Public relations	.43	1.043	.009	**
7.3	Understanding of organization	.43	.925	.003	**
7.4	Chairing meetings	.45	.791	.000	**
*	Significant at the 0.05 level (2-tailed)				
**	Significant at the 0.01 level (2-tailed)				

Table 9 Paired-samples t-test between level of current importance and level of evidence

The range of differences that are significant is between 0.25 (investment appraisal) and 0.86 (strategic planning). The five most significant differences are strategic planning (0.86), time management (0.84), leadership (0.82), planning and scheduling (0.80) and decision making (0.80). Performance of project managers in Hong Kong in these areas may not be the worst among the 55 competencies, but their differences with expected performance are the greatest.

However, this should not form the basis of CPD since competencies required from project managers may already be changed by the time they finished their training in these areas. Thus, the next step is to investigate changes in the requirement of

competencies. Using the score of 80 as the boundary between primary and secondary future competencies, the following tables are produced.

	Score	
Technical skills		
1.1	Basic technical knowledge	89.09
1.3	Planning and scheduling	90.91
1.4	Forecasting techniques	85.91
1.6	Site layout and mobilisation	80.45
1.9	Construction management activities	90.45
1.10	Reading, understanding drawings	80.00
1.11	Productivity and cost control	93.64
1.12	Quality control	88.18
Managerial skills		
2.1	Leadership	93.64
2.2	Time management	90.45
2.3	Decision making	92.73
2.4	Negotiation	86.36
2.5	Delegation	85.45
2.6	Strategic planning	87.27
2.8	Motivation and promotion	80.45
2.10	Team working	92.27
2.11	Top management relations	82.27
2.12	Sub-contractors relations	83.64
Financial skills		
3.1	Reporting systems	82.27
3.6	Establishing cash flows	83.18
3.7	Establishing budgets	86.82
Legal skills		
5.1	General legal background	80.00
5.4	Health and safety issues	89.09
Communication skills		
6.1	Presentation	85.91
6.2	Report writing	81.82
6.3	General / business correspondence	81.82
General skills		
7.2	Public relations	82.27
7.3	Understanding of organization	83.18
7.4	Chairing meetings	84.09

Table 10 Primary future competencies

	Score
Technical skills	

1.2	Design activities and background	78.18
1.5	Estimating and tendering	79.55
1.7	Material procurement	73.64
1.8	Plant hire and management	70.00
1.13	Operation research	73.64
Managerial skills		
2.7	Human behaviour	78.64
2.9	Recruitment	70.91
Financial skills		
3.2	Project finance arrangement	79.09
3.3	Investment appraisal	66.82
3.4	Taxation	56.82
3.5	Stock control and evaluation	67.73
IT skills		
4.1	Operating systems	65.91
4.2	Programming languages	53.64
4.3	Special applications	59.09
4.4	Spreadsheet	65.91
4.5	Database	68.18
4.6	Network systems	70.00
4.7	CAD	58.64
4.8	Project management software	74.09
4.9	Information systems and IT tools	71.36
Legal skills		
5.2	Drafting contracts	67.73
5.3	Industrial relations	70.91
5.5	Preparation of claims and litigation	79.09
5.6	Trade unions and public authorities	67.27
Communication skills		
6.4	Public speaking	76.82
General skills		
7.1	Marketing and sales	69.55

Table 11 Secondary future competencies

Primary future competencies include all primary current competencies which mean that those perceived to be important today will continue to be important tomorrow. There are 17 new future primary competencies and they are forecasting techniques, site layout and mobilisation, reading, understanding drawings, quality control, strategic planning, motivation and promotion, reporting systems, establishing cash flows, establishing budgets, general legal background, health and safety issues,

presentation, report writing, general / business correspondence, public relations, understanding of organization and chairing meetings.

These competencies come from all categories except the category IT skills. 11 of them come from business related areas such as financial, legal, communication and general skills. This is consistent with the result in Section I where most respondents would like to receive training in business related areas in the future.

All the other competencies are secondary future competencies which mean that not a single competency was discarded. Although not even a single competency under IT skills is regarded as primary, they are still considered important in the future by project managers. One thing to note is that of all the IT skills, project management software scores the highest in both current and future competencies.

To further investigate the relationship between current and future competencies, pair-samples t-tests were carried out.

		Paired Differences		Sig. (2-tailed)	
		Mean	S.D.		
Technical skills					
1.1	Basic technical knowledge	-.18	.582	.044	*
1.2	Design activities and background	-.70	.795	.000	**
1.3	Planning and scheduling	-.25	.686	.020	*
1.4	Forecasting techniques	-.55	.848	.000	**
1.5	Estimating and tendering	-.36	.750	.002	**
1.6	Site layout and mobilisation	-.27	.899	.050	*
1.7	Material procurement	-.32	.857	.018	*
1.8	Plant hire and management	-.43	.925	.003	**
1.9	Construction management activities	-.36	.780	.003	**
1.10	Reading, understanding drawings	-.18	.657	.073	
1.11	Productivity and cost control	-.50	.928	.001	**
1.12	Quality control	-.48	1.248	.015	*

1.13	Operation research	-.77	1.075	.000	**
Managerial skills					
2.1	Leadership	-.30	.765	.014	*
2.2	Time management	-.27	.788	.027	*
2.3	Decision making	-.30	.851	.026	*
2.4	Negotiation	-.16	.645	.109	
2.5	Delegation	-.11	.538	.168	
2.6	Strategic planning	-.41	.897	.004	**
2.7	Human behaviour	-.39	1.061	.020	*
2.8	Motivation and promotion	-.11	.813	.359	
2.9	Recruitment	-.34	.861	.012	*
2.10	Team working	-.36	.810	.005	**
2.11	Top management relations	-.09	.772	.439	
2.12	Sub-contractors relations	-.16	.713	.146	
Financial skills					
3.1	Reporting systems	-.41	.844	.002	**
3.2	Project finance arrangement	-.57	.873	.000	**
3.3	Investment appraisal	-.57	.974	.000	**
3.4	Taxation	-.45	.730	.000	**
3.5	Stock control and evaluation	-.39	.754	.001	**
3.6	Establishing cash flows	-.50	.731	.000	**
3.7	Establishing budgets	-.45	.761	.000	**
IT skills					
4.1	Operating systems	-.50	.731	.000	**
4.2	Programming languages	-.39	.754	.001	**
4.3	Special applications	-.43	.759	.000	**
4.4	Spreadsheet	-.20	.594	.027	*
4.5	Database	-.45	.791	.000	**
4.6	Network systems	-.57	.818	.000	**
4.7	CAD	-.32	.800	.012	*
4.8	Project management software	-.59	.757	.000	**
4.9	Information systems and IT tools	-.50	.762	.000	**
Legal skills					
5.1	General legal background	-.43	.661	.000	**
5.2	Drafting contracts	-.30	.734	.011	*
5.3	Industrial relations	-.32	.674	.003	**
5.4	Health and safety issues	-.50	.876	.000	**
5.5	Preparation of claims and litigation	-.32	.800	.012	*
5.6	Trade unions and public authorities	-.41	.622	.000	**
Communication skills					
6.1	Presentation	-.45	.697	.000	**
6.2	Report writing	-.41	.658	.000	**
6.3	General / business correspondence	-.36	.574	.000	**
6.4	Public speaking	-.39	.618	.000	**
General skills					
7.1	Marketing and sales	-.48	.849	.001	**
7.2	Public relations	-.52	.976	.001	**

7.3	Understanding of organization	-.39	.841	.004	**
7.4	Chairing meetings	-.39	.813	.003	**
*	Significant at the 0.05 level (2-tailed)				
**	Significant at the 0.01 level (2-tailed)				

Table 12 Paired-samples t-test between level of current importance and level of future importance

The negative signs for all means of pair differences indicate a growing importance. All future competencies are significantly different from current competencies except reading, understanding drawings, negotiation, delegation, motivation and promotion, top management relations and sub-contractor relations. It should be noted that the level of future importance for financial skills, communication skills and general skills are significantly different from its current importance at the 0.01 level, indicating an increase in importance in these areas.

Having established that there will be changes in the level of competencies required from project managers, we shall see if the level of evidence currently exhibited by project managers in Hong Kong is significantly different from the level of future importance.

		Paired Differences		Sig. (2-tailed)	
		Mean	S.D.		
Technical skills					
1.1	Basic technical knowledge	.95	.963	.000	**
1.2	Design activities and background	1.25	1.081	.000	**
1.3	Planning and scheduling	1.05	.645	.000	**
1.4	Forecasting techniques	1.27	.872	.000	**
1.5	Estimating and tendering	.80	.795	.000	**
1.6	Site layout and mobilisation	.64	.942	.000	**
1.7	Material procurement	.61	1.017	.000	**
1.8	Plant hire and management	.45	.820	.001	**
1.9	Construction management activities	.93	.873	.000	**
1.10	Reading, understanding drawings	.36	.810	.005	**
1.11	Productivity and cost control	1.23	.886	.000	**

1.12	Quality control	1.16	1.098	.000	**
1.13	Operation research	1.11	1.039	.000	**
Managerial skills					
2.1	Leadership	1.11	.868	.000	**
2.2	Time management	1.11	.993	.000	**
2.3	Decision making	1.09	.802	.000	**
2.4	Negotiation	.91	.772	.000	**
2.5	Delegation	.73	.758	.000	**
2.6	Strategic planning	1.27	1.020	.000	**
2.7	Human behaviour	.86	1.268	.000	**
2.8	Motivation and promotion	.84	1.033	.000	**
2.9	Recruitment	.64	.865	.000	**
2.10	Team working	1.00	.915	.000	**
2.11	Top management relations	.64	.917	.000	**
2.12	Sub-contractors relations	.59	.923	.000	**
Financial skills					
3.1	Reporting systems	.84	.987	.000	**
3.2	Project finance arrangement	1.25	.991	.000	**
3.3	Investment appraisal	.82	.870	.000	**
3.4	Taxation	.66	.939	.000	**
3.5	Stock control and evaluation	.80	.823	.000	**
3.6	Establishing cash flows	1.09	.936	.000	**
3.7	Establishing budgets	1.00	.835	.000	**
IT skills					
4.1	Operating systems	.75	.866	.000	**
4.2	Programming languages	.57	.925	.000	**
4.3	Special applications	.73	.899	.000	**
4.4	Spreadsheet	.55	.589	.000	**
4.5	Database	.82	.896	.000	**
4.6	Network systems	.86	.905	.000	**
4.7	CAD	.64	.838	.000	**
4.8	Project management software	1.05	1.056	.000	**
4.9	Information systems and IT tools	.91	.772	.000	**
Legal skills					
5.1	General legal background	1.05	.914	.000	**
5.2	Drafting contracts	.89	1.061	.000	**
5.3	Industrial relations	.66	.914	.000	**
5.4	Health and safety issues	1.00	1.057	.000	**
5.5	Preparation of claims and litigation	.80	1.112	.000	**
5.6	Trade unions and public authorities	.80	.795	.000	**
Communication skills					
6.1	Presentation	1.14	1.025	.000	**
6.2	Report writing	1.02	.902	.000	**
6.3	General / business correspondence	.86	.905	.000	**
6.4	Public speaking	.93	.974	.000	**
General skills					
7.1	Marketing and sales	.82	.995	.000	**

7.2	Public relations	.95	.939	.000	**
7.3	Understanding of organization	.82	.756	.000	**
7.4	Chairing meetings	.84	1.010	.000	**

** Significant at the 0.01 level (2-tailed)

Table 13 Paired-samples t-test between level of future importance and level of evidence

All competencies are significantly different between their level of future importance and level of evidence. If project managers in Hong Kong continue to perform at their existing level, they will not be able to meet even the standard they set for themselves. The range of differences are between 0.36 (reading, understanding drawings) and 1.27 (forecasting techniques and strategic planning).

Combining results from the above, areas of focus should on those competencies that are perceived to be important for future project managers while the difference between that and level of evidence shown by project managers is significant. They are listed out in the table below.

Technical skills	
1.1	Basic technical knowledge
1.3	Planning and scheduling
1.4	Forecasting techniques
1.6	Site layout and mobilisation
1.9	Construction management activities
1.10	Reading, understanding drawings
1.11	Productivity and cost control
1.12	Quality control
Managerial skills	
2.1	Leadership
2.2	Time management
2.3	Decision making
2.4	Negotiation
2.5	Delegation
2.6	Strategic planning
2.8	Motivation and promotion
2.10	Team working
2.11	Top management relations

2.12	Sub-contractors relations
Financial skills	
3.1	Reporting systems
3.6	Establishing cash flows
3.7	Establishing budgets
Legal skills	
5.1	General legal background
5.4	Health and safety issues
Communication skills	
6.1	Presentation
6.2	Report writing
6.3	General / business correspondence
General skills	
7.2	Public relations
7.3	Understanding of organization
7.4	Chairing meetings

Table 14 Areas of focus

After computing the means for each category of skills under level of future importance and level of evident, the different between these two values is calculated. One-way ANOVA was performed on these 7 values with each demographic variable obtained in Section I. Those results that are shown to be significant are listed below.

(I)	(J)	Mean difference (I-J)	Sig.
For different age (question 2)			
Technical skills			
31-40	41-50	-0.4852	0.010
41-50	51-60	0.5237	0.021
For different years of working experience (question 9)			
Financial skills			
11-20	21 or more	0.6195	0.042
IT skills			
11-20	21 or more	0.6613	0.026
Legal skills			
6-10	11-20	-0.5457	0.031
11-20	21 or more	0.6186	0.042
Communication skills			
1-5	6-10	0.7545	0.038
1-5	21 or more	0.9107	0.029
For different years of working experience in project management (question 12)			
Financial skills			

1-3	10-15	-0.6667	0.042
For different number of project currently responsible (question 14)			
IT skills			
1	2-3	-0.6133	0.013

Table 15 Results of one-way ANOVA

Age factor only contribute to differences in level of gap in technical skills, where project managers from the age group of 41-50 perceived the biggest gap, followed by those from the age 31-40 and 51-60. Number of projects currently responsible also contributes to only differences in gap in IT skills. The more the number of project responsible, the largest gap in IT skills is perceived.

Working experience, on the other hand, contribute to differences in level of gap for four out of seven categories. They are financial skills, IT skills, legal skills and communication skills. Generally, project managers with fewer working experience perceived a larger gap than project manager with more working experience.

6 Discussion

Change is the key word to explain the above analysis. The work of project managers has been described as change management (Voropajev 1997). There are changes in the industry because there are changes in society. Changes in education system, changes in economic environment and changes in technology are the three major changes that drive the changes in the society and in turn drive changes in the construction industry.

6.1 Changes in education system

In the past, one's high intellectual ability did not guarantee entry to a local university. There are other factors in determining whether one can study at the university, other than his or her own ability. One such factor would be financial strength of his or her family. Moreover, the government had not put the same amount of resources in the past as now in tertiary education (figure 3). Thus, there were fewer places in the university in the past. This made entry to the university even more difficult. This explains why project managers of a higher age are having a lower academic qualification.

Percentage of recurrent expenditure in education to gross expenditure

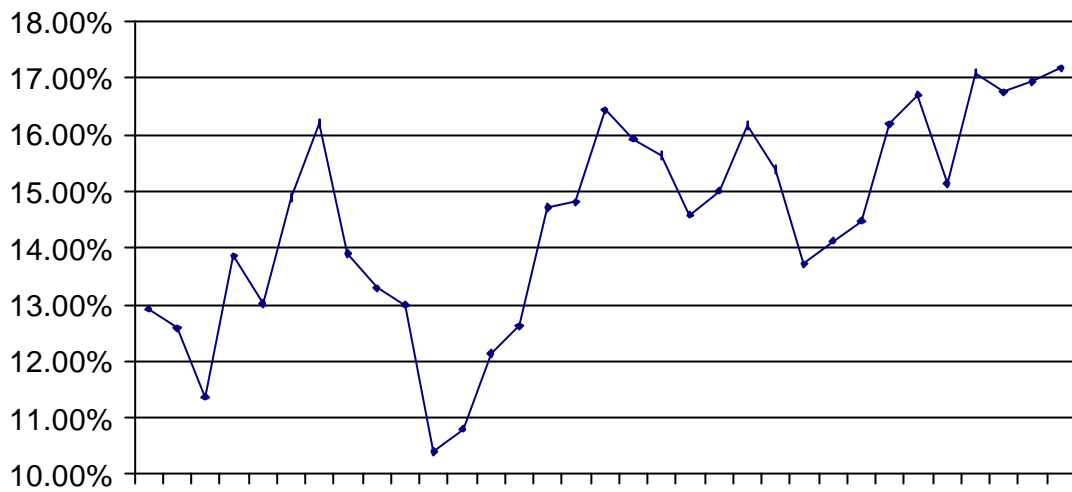


Figure 3 Percentage of recurrent expenditure in education to gross expenditure
(Source: Census and Statistics Department)

One has also to bear in mind that the nature of the construction industry is labour-intensive. Workers do not need to have a high qualification before they can be competent at their work. As they accumulate the necessary skills and knowledge through experience, they naturally got promoted and became project managers.

Today, the situation is quite different. Firstly, the chance for secondary students to receive tertiary education is much higher today than before. This is mainly due to the change in government policy. More chance to get a place to study in a local university means that more and more university graduates will be produced every year. When the market is abundant with the supply of university graduates, employer will prefer them over workforce having lower education, not to mention at a lower wage. Secondly, with the advancement of human resources management, project managers

are specifically trained from the middle level, rather than promoted from the bottom level. Thirdly, improvement in education systems will affect other parties as well such as the developers who would like to employ universities' graduates as well. Thus, when they pay a large sum of money in return for a product, i.e. the building, and services, from various parties, they want to make sure that the project is handled by someone at least as good as themselves. Pressure is thus also from the client to have someone in certain qualification to be employed in certain capacity. As a result, more and more project managers are graduated from university.

Nevertheless, there are still gaps between level of future importance and level of evident. While most project managers had already been well educated before entering the field, should education be the solution once more in narrowing the gap? While the importance of CPD is well known, some other areas from which training can be received should not be neglected. The study of Edum-Fotwe and McCaffer (2000) shows that the contribution of academic programmes to the competency of project managers is rated lower than that of formal industry training they attend while on the job. Formal training, on the other hand, rated lower than job experience. Nevertheless, they claim that a sound academic background is needed in order for experience to be relevant in maintaining competency (Edum-Fotwe and McCaffer 2000). They also view education and experience complimenting to each other since education, for people with different background, gives broader perspective while experience, for people in the same field, focuses on specific outlook.

Views of project managers in Hong Kong are not much different from that of the UK. From the results of ANOVA, experience, rather than level of education attained, is the

biggest contributing factor to the level of gap perceived by project managers. Project managers with fewer experience perceived a larger gap in financial skills, IT skills, legal skills and communication skills than those with more experience. Hence, experience did contribute to narrowing the gap. While education provides the necessary knowledge, it is by practice that this knowledge becomes something real for project managers. Otherwise, it is just theory to them. Also, the problem with education itself is that what being delivered is usually not the latest information. Not only that students can only acquired the knowledge without knowing its application in his or her daily work, what he thinks he knew was actually some outdated information.

Thus, companies should provide more opportunities to their employees in working in certain areas where that kind of knowledge is most needed by the project manager. Moreover, project managers should maintain a close contact with someone having more experience in the field. In this way, not only they can acquire knowledge through practice, guidance can also be provided by the senior in their way of continuous development.

Taking the Engineering Staff Development Programme (ESDP) of GS (Gammon Skanska 2002) for example, one of the elements of the program is the tutor system. This is a programme which prepares the participants to become project managers and throughout the programme, a person in the capacity of senior project managers or above is assigned to each participant as tutor to provide personal guidance and advice. They have to review and verify the logbook submitted by the participants; monitor their development progress; recommend necessary training; report to the appropriate

parties for the necessary job rotation and cooperate and discuss with others on the participants' job performance and career performance.

6.2 Changes in economic environment

The effect of changes in economic environment is enormous to the construction industry. In the past when the economy was good, there were a lot of demands for every types of building, whether they it was commercial, industrial or residential. There was still a large room for infrastructure projects. Thus, sites for construction of buildings or infrastructures such as bridges, roads, railways, etc. were seen everywhere. As the market is booming, job could be bid with a higher profit margin. The large number of projects also meant that contractors could actually choose which projects they would like to bid. During construction phrase, the project could made progress relatively smooth under good economic environment. In financial aspect, cash flow of different parties is not as tight as now. Employers had the ability to award payment certificate on time and subsequently, main contractors could pay to their sub-contractors on times. In terms of time constraint, projects could be carried on at a faster pace by simply paying project participants to work overtime. The profit of early completion could cover the cost in wages. The ease of management of project under these situation means that focus was mainly placed on the technical competency of project managers. It does not mean that project manager in the past did not need to deal with management issues. It simply means that project managers with management skills not as good as their colleagues could also survive.

Today, we are undergoing a painful economic restructuring process. There were fewer large scale projects in Hong Kong since most areas have already been developed, whether it is residential, commercial or infrastructure development. Fewer jobs and lesser budget mean tighter constraint when carrying out project. The profit margin is lower than before and deadline cannot be met simply by paying workers to work overtime since that sum of money is not easily available. Project cannot be bid easily in the first place due to the decrease in number of project and decrease in profit margin. Once a project is won, it is not easy to finish the project smoothly due to tighter constraint. As the manager of the project, project managers' role is not simply to ensure that the projects are technically feasible but also to ensure that a project is financially feasible. A higher degree of management skills are also needed to ensure that profit can still be made under tight constraint.

In management term, as one of the open systems in the society, the construction industry cannot be immunized from changes. Interactions across the boundary result in inflow and outflow of information. In order to adapt to the changing environment, the industry itself must also be changed, not to mention its participants. Thus, during the past years, we witness changes from technical to managerial in nature in the competencies required from project managers. This change is well documented in literature. The present study also gives a clear picture that most project managers received or are receiving training in technical and managerial areas.

Another change that results from the combined effect of changes in education system and changes in the economy, is changes in people's awareness of the effect of construction activities has to their own living environment. Construction sites had

always been breeding grounds for mosquito and mice. In the old day, people can hardly earn a living and they simply could not spare any time to focus on something that will not affect their livelihood. Thus, the public did not care much about the hygiene of construction sites. As people can earn a better living, they started to pay more attention to their living environment. At the same time, the world is under a constant and escalating threat from deadly diseases. Dengue fever, scrub typhus, Japanese encephalitis, etc, all use either mosquito or mice as their vectors (Food and Environmental Hygiene Department 2004). SARS outbreak during the first half of 2003 added to the people's awareness of health and hygiene. Apart from the possible spread of diseases, air and noise pollution produced during construction also attracted much attention. One result is enactment of new legislation which restricts the use of certain types of machineries during certain hours of the day. For example, as of 17 August 1989, the carrying out of general construction work using powered mechanical equipment between 7 p.m. and 7 a.m. or at any time on a general holiday, including Sunday, is prohibited under the Noise Control Ordinance (Cap. 400) unless a valid Construction Noise Permit is in force (Environmental Protection Department 2002). Another result is that the public take a more active role in monitoring the construction activities in their neighbourhood. Construction sites today are more prone to complaint than in the past. Heavier burden is placed on the shoulders of project managers to ensure that activities being carried out within the sites will not cause any nuisance to the public. This, again, points toward better management.

The HSE report by GS can be seen as one of the resulting products under this change. HSE stands for health, safety and environment. In *Thistle – The Magazine of Jardine Matheson*, a newsletter of the Jardine Matheson Group (2003), GS claimed to be the

first construction company in Hong Kong to publish such a report. The report details GS performance in HSE during the past year with examples of case studies, and outlines its targets for that year. The following statement made by Martin Hadaway, Group Managing Director, linked growing concern in HSE with business opportunity together. “In a competitive commercial world, to excel in these areas is good business. We place increasing emphasis on leveraging our excellent record in HSE when seeking new business opportunities, both in Hong Kong and elsewhere in the region.” This statement sheds light in the future trend of ensuring business opportunities within the construction industry.

The present study shows that business related studies are viewed as primary future competencies and project managers are willing to receive training in these areas apart from technical or managerial aspects. This view is also echo by large construction firm. One key element of GS’s five year plan is to ensure that the right people are in the right job. In achieving this goal, Gammon Skanska Academy (GSA) was set up as a training forum for staff primarily in built environment, project management and business enhancement and innovation (Jardine Matheson Limited 2003). The third area was viewed as particularly important for their future success, as explained by Philco Wong, Executive Director of GS. “We need training in business development and innovation to trigger our staff to think further ahead about how GS can prosper years into the future.” There are currently 3 faculties in GSA and it is planned to open 3 more faculties this year. Courses will also be provided to staff stationed in mainland China. (Chan, interview, Jan 10 2004)

6.3 Changes in technology

Although the effect of changes in technology is very obvious in many industries, there has been little impact in terms of how a building is constructed in Hong Kong. This shows the typical response to information technology within the traditional construction field.

This may not be very surprising since our counterparts in the west also have the same observation. Australia, renowned for its advancement in the field, also shows the same phenomenon. The survey done by Australian Bureau of Statistics in 1999 has shown that in the area of effective use of IT data, the Australian construction industry lags well behind other industries in its uptake of key IT processes (Australian Bureau of Statistics 1999). Summarizing the findings of others, Duyshart et al. (2003) observed that factors contributing to slow uptake of IT relate to the industry norm of one-off projects, industry fragmentation, lack of client leadership, low levels of technology awareness and training, required up-front investment, ongoing maintenance costs and resistance to change.

Slow as it may be, the construction industry starts to realize the benefit of using IT during construction process. Although not even one competency under IT skills is primary future competency, they are all nevertheless considered important in the future by project managers. Moreover, the results from one-way ANOVA shows that project managers with fewer working experience perceived the gap in IT to be greater. This may be due to the fact that project managers with fewer working experience are usually younger. The younger generation is more used to IT than older generation

and thus, they are more aware of the inadequate use of IT in the construction industry today. Nevertheless, not all aspects of IT are areas of concern. Programming languages for example was one of two competencies with score below 50 in level of current importance, as construction industry concerns with application of certain programmes rather than the development of these programmes.

As revealed by the research, of all the IT skills, project management software scores the highest in both current and future level of importance. Experience in the west proved this type of software a very effective tool in information management of a construction project. The use of Bovis Lend ProjectWeb system in the construction of National Museum of Australia demonstrated that innovative use of IT minimises procedural delay of interaction, reduces the transaction costs among project parties and encourages the business relationship to be more efficient (Duyshart et al. 2003). As the ANOVA suggests, the above benefit of using project management software cannot be more treasure by project managers with more than one project at hand.

However, everything has a price to pay and the use of such an advanced tool is no exception. The adversarial nature between employer and contractor has to be addressed first before any innovative measures can be implemented.

Local company also recognizes the importance of IT. GS acknowledged that technology will play a major part in many sectors of its business. Thomas Ho, Executive Director, GS, said, "Technology is a major benchmark by which our clients measure us against our competitors. We must transform ourselves completely into a

knowledge-based industry leader by adopting paperless project management.” (Jardine Matheson Limited 2003).

In all, participants in the construction industry must keep improving and upgrading themselves in order to meet changes in the environment. Chan (interview, Dec 31 2003) view the business of project management as risk management. He believed that risk is the term to describe the biggest challenge faced by project managers nowadays. “The contract sum you received was the risk premium paid by the employer. Once you receive, you have to bear the risk for them.”

In view of all the changes, project managers must be well equipped. Since changes will not stop and there are infinite numbers of skills and knowledge that can be acquired, learning cannot be done in a one-off goal but rather at a continuous pace. Different companies will have different strategies to suit their particular situation. This paper sought to help them to establish a direction in training project managers as presented in table 14. The list, however, should be subject to rigorous review since, what required for the future project managers at this point in time may not be the same as that perceived 5 years later.

The importance of technical and managerial skills cannot be emphasized more. Changes as there may be, they are still the core services that are going to be provided by project managers. With the growing awareness of the construction process as an integrated part of the organization as well as the increasing pressure from all stakeholders to the project managers, business related studies are growing in importance. Project managers in Hong Kong should be well prepared in these areas

in order to meet the challenges of tomorrow. With the advancement of information technology, the construction industry started to realize the benefit that can be brought by IT. One area of application of IT can be found in the field of project management. Project managers participated in the research were found to be aware of the growing importance and this may well be the focus in the future trend of CPD.

7 Conclusions

Our society are kept evolving and so must any systems operating in the society. Whether changes will become risks or opportunities depend on how well equipped are the participants in the systems. This study tries to help project managers in the construction industry to have a better focus in the way of preparing themselves for future challenges.

The first implication of changes was reflected in the qualification of project managers. The results show that the larger the age of project managers, the lower the level of formal training they received. As a result, longer period of time is needed for them to accumulate experience in the field before becoming project managers. Also, most respondents are either receiving or had received training in technical and management aspects. For the trainings they would like to receive in the future, the choice is more diverse but the majority would choose business related studies.

Analysis in the section followed shows that project managers in Hong Kong viewed technical skills and managerial skills with prime importance. In particular, basic technical knowledge, planning and scheduling, construction management activities, productivity and cost control, leadership, time management, decision making, negotiation, delegation, team working, top management relations and sub-contractors relation are placed with exceptional emphasis.

However, it is also shown that project managers in Hong Kong are not performing to the standard they expected for themselves. The five most significantly low

performance are strategic planning, time management, leadership, planning and scheduling, decision making and basic technical knowledge.

Concerning competencies for the future project managers, all competencies show a growing importance. Consistent with the result in the analysis of Section I, business related areas become primary future competencies. The joint and individual effect of changes in education system and economic environment made construction projects more difficult to manage than before. Apart from increasing technical complexity, where most project managers were well trained to handle, management and business related aspects had also grown in importance. As a result, project managers have to be an all-rounder in order to be sustained in the industry.

IT skills, though not viewed as the primary future competencies as expected, are viewed as the second most important future competencies. This partly reflects the slow reaction to new technology in construction industry in Hong Kong. Nevertheless, continuous advancement of technology together with examples of successful application outside Hong Kong have captured the attention of local project managers, in particular those project managers that are younger or having more than one project at hand.

Areas of focus are listed in table 14. They are those areas that are perceived to be important for future project managers while the difference between that and level of evidence shown by project managers are significant. However, these gaps cannot only be narrowed by CPD, which came under the spot light in recent years.

Results of ANOVA shows that experience is a contributing factor to the difference in level of gaps for four out of seven competency areas, namely financial skills, IT skills, legal skills and communication skills, while age of respondents contribute to technical skills. Learning by doing is a more effective way in acquiring and adhering to knowledge. Thus, while CPD can provide a sound continuous base for acquiring knowledge in all categories of competencies, project managers should be given more opportunities in working in certain area where financial skills, IT skills, legal skills and communication skills can be acquired. Mentor should also be provided to give proper guidance and first hand experience.

Resources are limited for this research which results in several limitations. Firstly, it will be more representative if local focus groups can be formed at the beginning so as to establish a list of competencies. In this way, competencies that are viewed as important by local project managers due to the local context may also be uncovered and included in the list. Secondly, the sample size could have been larger if resources allow. The present situation does not allow a full scale survey to be carried out to all practicing project managers in Hong Kong. The result from the latter would certainly provide a better picture. Differences in perception of competencies required can also be investigated between project managers from different parties, such as employers, consultants, etc, from different size of organisations and from different sectors, i.e. public and private. Another advantage of large sample size is that it allows factor analysis to be carried out.

Despite of all the limitations, it is believed that this study provides a very useful example in the application of competency models to the construction industry.

Project managers is only one of the many parties involved and the same research can be carried out to other parties such as architects, quantity surveyors, structural engineers, building services engineers, etc. The use of the competency list produced can be numerous and its contribution to human resources management can be huge.

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Appendix 1 Cover letter of questionnaire

Kwok Chor Wo
Department of Real Estate and Construction
5/F Knowles Building
The University of Hong Kong
Pokfulam, Hong Kong.

5th January, 2004.

Dear Sir / Madam,

Survey on the Competencies of Project Managers in Hong Kong

I am a final year (BSc(Surv)) student from the Department of Real Estate and Construction of the University of Hong Kong.

I am now carrying out research to investigate the Competencies of Project Managers in Hong Kong, under the supervision of Professor S.M. Rowlinson. The aim is **to investigate any divergence that exists between the level of importance of competencies and the level that is exhibited by Project Managers in Hong Kong.** It is hoped that this study can **reveal areas which should be the focus of continuous professional development** of Project Managers in Hong Kong.

Enclosed is the questionnaire designed to investigate the captioned. I would be grateful if you could complete and return by fax to **27755172**.

All the information collected is for academic purposes only and personal data will be kept strictly confidential. Please feel free to contact the undersigned at 92729225 for further information.

Thank you for your attention.

Yours faithfully,

Kwok Chor Wo

Appendix 2 The questionnaire

The University of Hong Kong Faculty of Architecture Department of Real Estate and Construction

Survey on the Competencies of Project Managers in Hong Kong

SECTION I

- | | |
|---|--|
| <p>1 What is your gender?</p> <p><input type="checkbox"/> Male</p> <p><input type="checkbox"/> Female</p> | <p>6 Which types of knowledge had you been acquired?</p> <p><input type="checkbox"/> Technical</p> <p><input type="checkbox"/> Management</p> <p><input type="checkbox"/> Science</p> <p><input type="checkbox"/> Accounting and finance</p> <p><input type="checkbox"/> Computing and IT</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> |
| <p>2 What is your age?</p> <p><input type="checkbox"/> 21-30</p> <p><input type="checkbox"/> 31-40</p> <p><input type="checkbox"/> 41-50</p> <p><input type="checkbox"/> 51-60</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> | <p>7 Which types of training are you currently taking?</p> <p><input type="checkbox"/> Advanced technology in own field</p> <p><input type="checkbox"/> Management and human resources</p> <p><input type="checkbox"/> Business studies</p> <p><input type="checkbox"/> Marketing and sales</p> <p><input type="checkbox"/> IT</p> <p><input type="checkbox"/> Languages</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> |
| <p>3 What is your job title / description?</p> <p><input type="checkbox"/> Project Manager</p> <p><input type="checkbox"/> Project Director</p> <p><input type="checkbox"/> General Manager</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> | <p>8 Which types of training are you willing to take in the future?</p> <p><input type="checkbox"/> Advanced technology in own field</p> <p><input type="checkbox"/> Management and human resources</p> <p><input type="checkbox"/> Business studies</p> <p><input type="checkbox"/> Marketing and sales</p> <p><input type="checkbox"/> IT</p> <p><input type="checkbox"/> Languages</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> |
| <p>4 What is the size of your organization in terms of number of employees?</p> <p><input type="checkbox"/> 500 or below</p> <p><input type="checkbox"/> 500 to 1500</p> <p><input type="checkbox"/> 1500 or above</p> | |
| <p>5 What is your highest education attained?</p> <p><input type="checkbox"/> HKCEE</p> <p><input type="checkbox"/> HKALE</p> <p><input type="checkbox"/> Higher diploma</p> <p><input type="checkbox"/> Bachelor degree</p> <p><input type="checkbox"/> Master degree</p> <p><input type="checkbox"/> Other (please specify)</p> <hr/> | |

- 9 How many years of experience did you have prior to attaining your current status?
- 1-5
 - 6-10
 - 11-20
 - 21 or more
- 10 How many posts have you held prior to attaining your current status?
- 1-5
 - 6-10
 - 11-20
 - 21 or more
- 11 How many projects did you have experience of prior to attaining your current status?
- 1-10
 - 11-20
 - 21-50
 - 51 or more
- 12 How many years of experience have you had in project management?
- 1-3
 - 4-6
 - 7-9
 - 10-15
 - 16 or more
- 13 How many projects were you responsible since you became a project manager?
- 1-10
 - 11-20
 - 21-50
 - 51 or more
- 14 How many projects are you currently responsible?
- 1
 - 2-3
 - 4-5
 - 6 or more

SECTION II

		Level of importance to current PM in Hong Kong					Level of evidence as shown by PM in HK					Level of importance to future PM in Hong Kong				
		Not important				Very important	Poor				Excellent	Not important				Very important
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Technical skill																
1.1	Basic technical knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	Design activities and background	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3	Planning and scheduling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4	Forecasting techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5	Estimating and tendering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6	Site layout and mobilisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.7	Material procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.8	Plant hire and management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.9	Construction management activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.10	Reading, understanding drawings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.11	Productivity and cost control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.12	Quality control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.13	Operation research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Managerial skill																
2.1	Leadership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2	Time management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3	Decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4	Negotiation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5	Delegation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6	Strategic planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7	Human behaviour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8	Motivation and promotion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.9	Recruitment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.10	Team working	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.11	Top management relations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.12	Sub-contractors relations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Financial skills																
3.1	Reporting systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	Project finance arrangement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3	Investment appraisal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4	Taxation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5	Stock control and evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6	Establishing cash flows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.7	Establishing budgets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Level of importance to current PM in Hong Kong					Level of evidence as shown by PM in HK					Level of importance to future PM in Hong Kong				
		Not important				Very important	Poor				Excellent	Not important				Very important
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
IT skills																
4.1	Operating systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	Programming languages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3	Special applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4	Spreadsheet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5	Database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6	Network systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.7	CAD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.8	Project management software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.9	Information systems and IT tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Legal skills																
5.1	General legal background	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2	Drafting contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3	Industrial relations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4	Health and safety issues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.5	Preparation of claims and litigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.6	Trade unions and public authorities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication skills																
6.1	Presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2	Report writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3	General / business correspondence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4	Public speaking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General skills																
7.1	Marketing and sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2	Public relations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3	Understanding of organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.4	Chairing meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

You have now completed the survey.

I sincerely appreciate your time and cooperation.

Please fax to 27755172, email to h0170489@hkusua.hku.hk, or contact Kwok Chor Wo, Leo at 92729225.

Thank you!!

Appendix 3 Analysis of results for Section I

Age of respondents

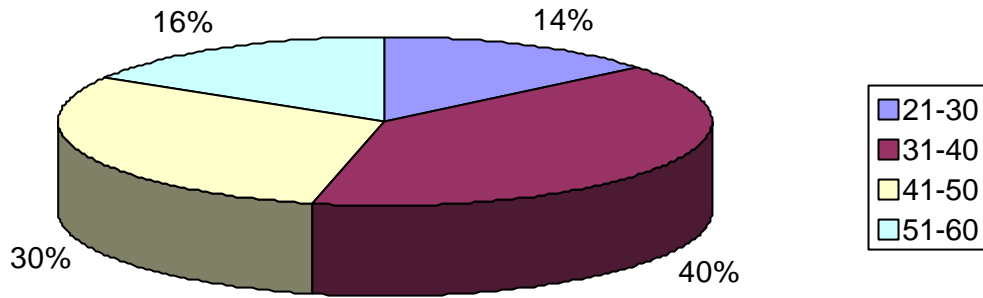


Figure 4 Age of respondents

Job title / description of respondents

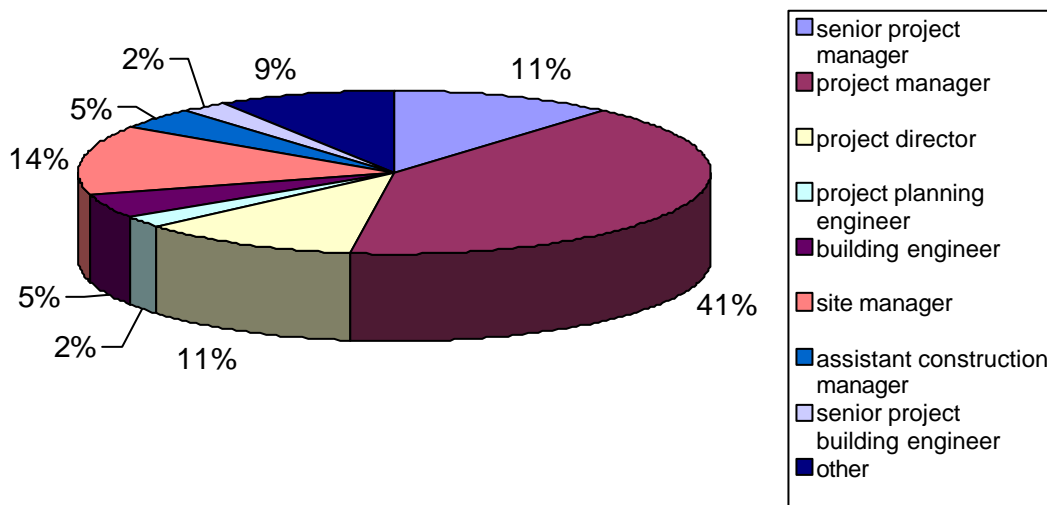


Figure 5 Job title / description of respondents

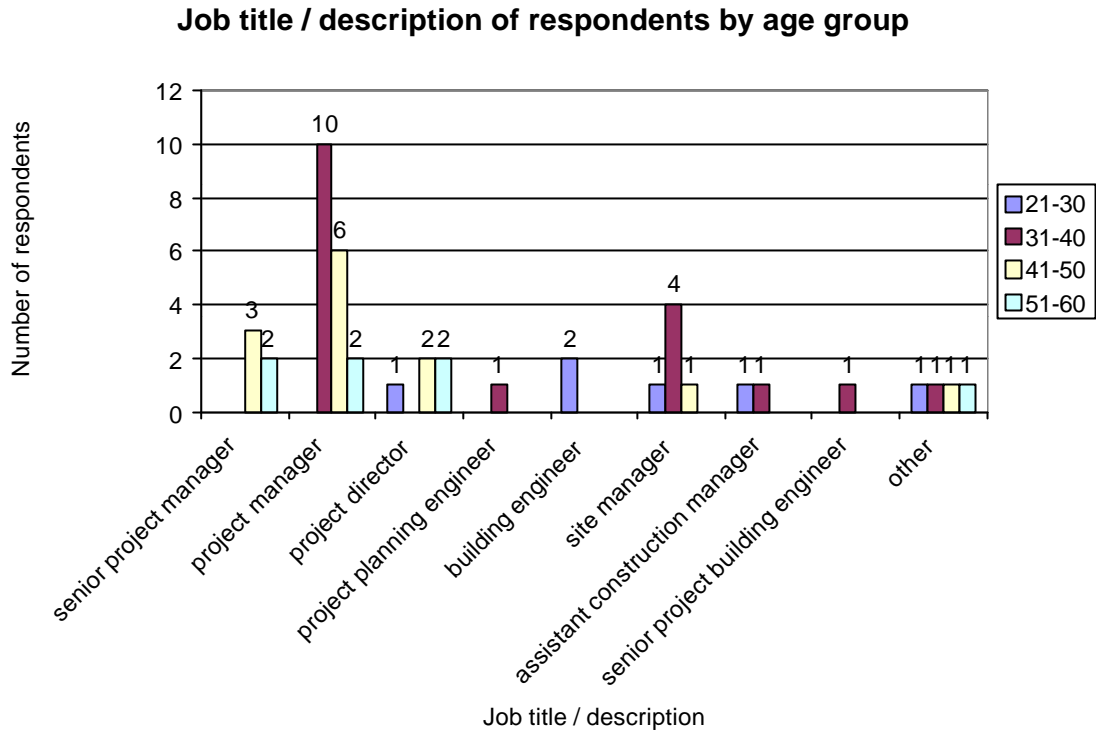


Figure 6 Job title / description of respondents by age group

Size of respondents' organization in terms of number of employees

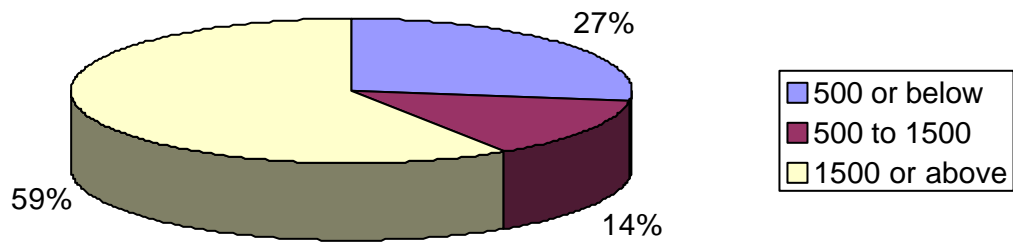


Figure 7 Size of respondents' organization in terms of number of employees

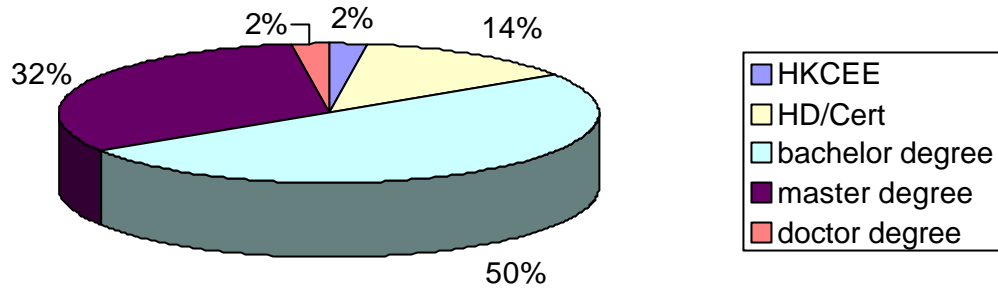


Figure 8 Highest education attained by respondents

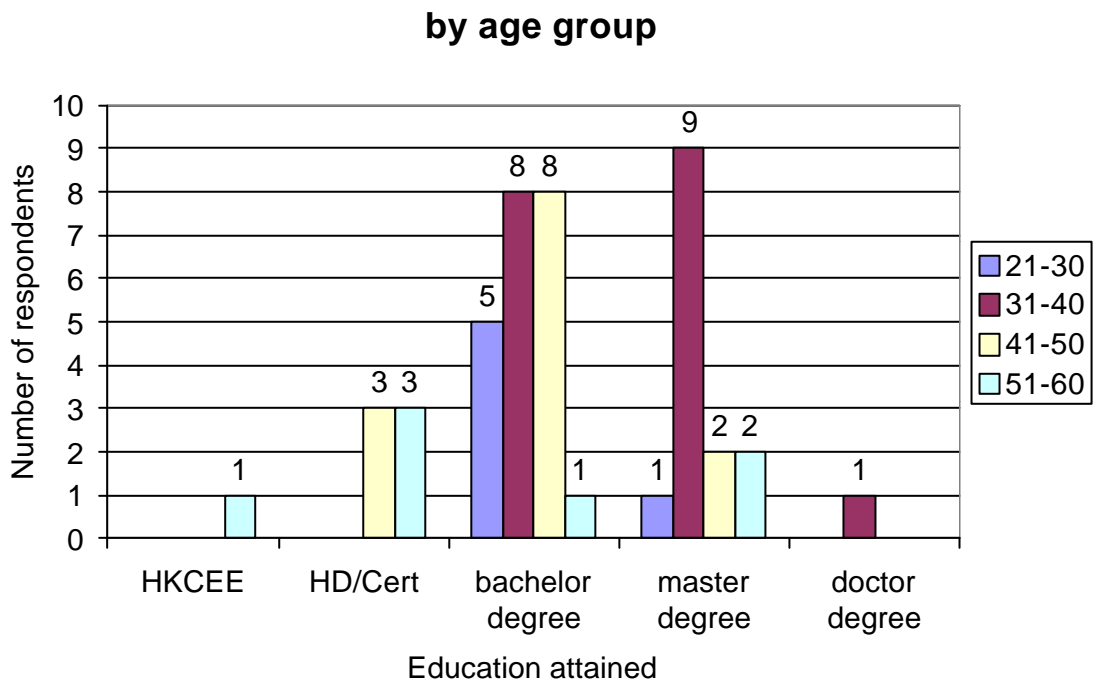


Figure 9 Highest education attained by respondents by age group

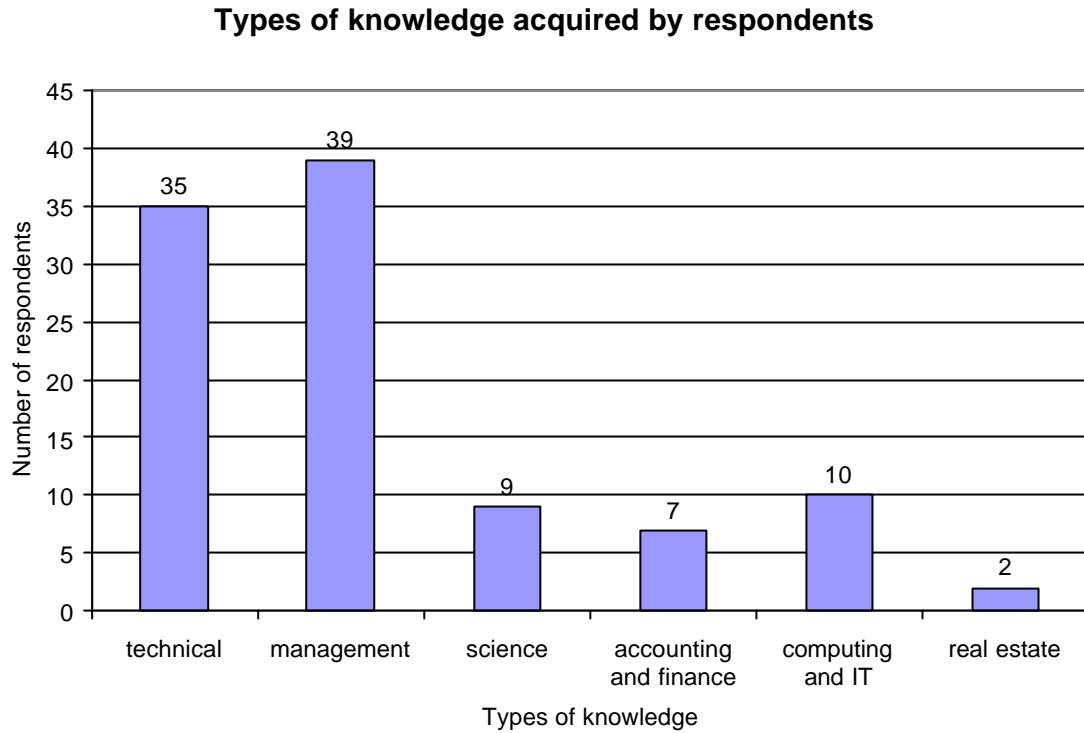


Figure 10 Types of knowledge acquired by respondents

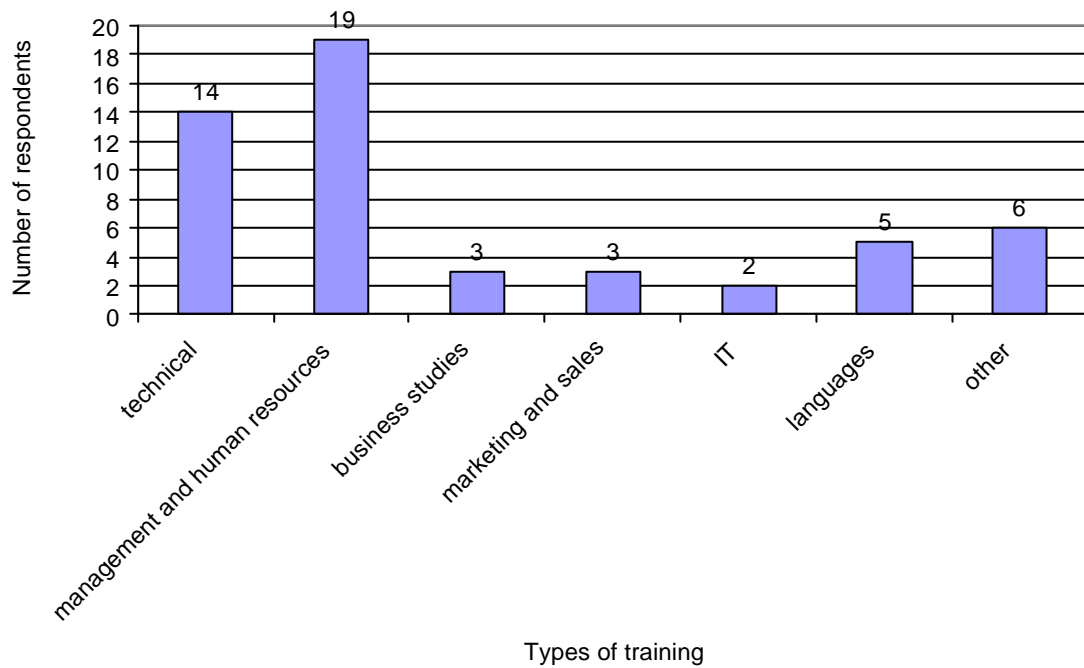


Figure 11 Types of current training taken by respondents



Figure 12 Types of training willing to take in the future by respondents

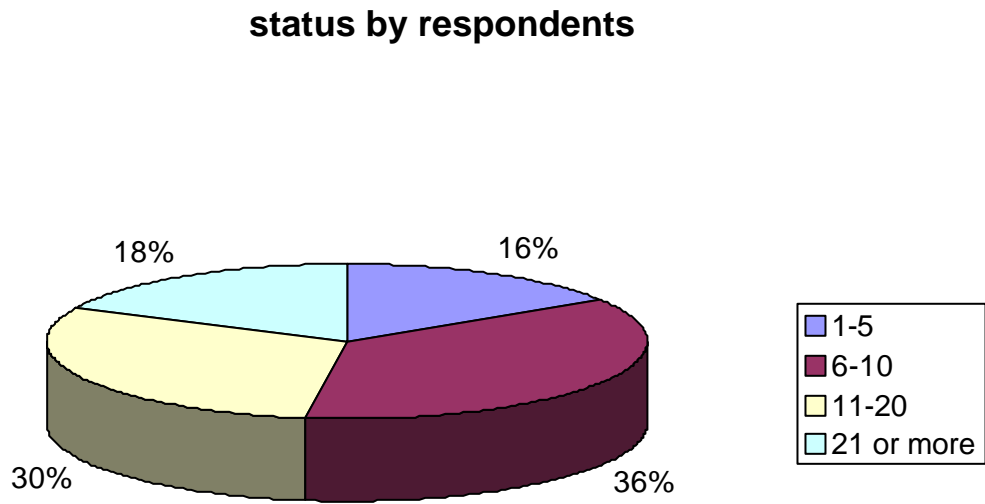


Figure 13 Years of experience before attaining the current status by respondents

Number of posts held before attaining the current status by respondents

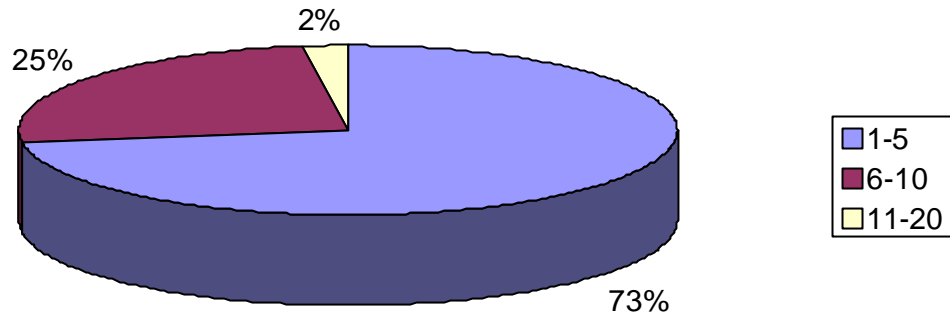


Figure 14 Number of posts held before attaining the current status by respondents

Number of projects experienced before attaining the current status by respondents

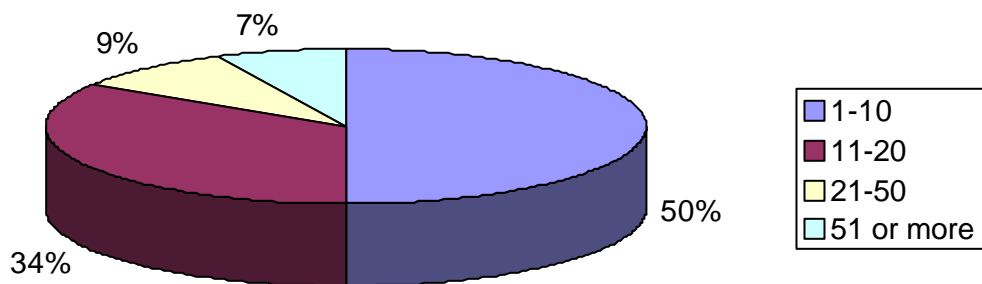


Figure 15 Number of projects experienced before attaining the current status by respondents

Years of experience in project management by respondents

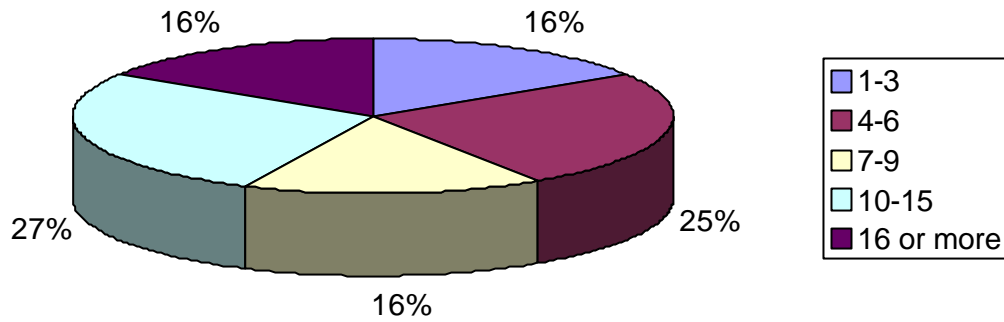


Figure 16 Years of experience in project management by respondents

Number of projects managed by respondents

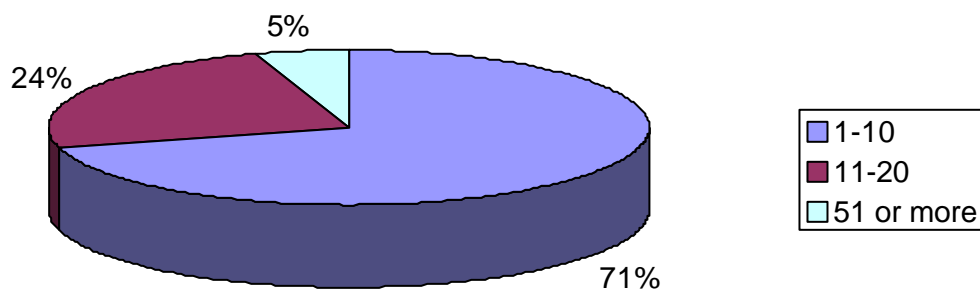


Figure 17 Number of projects managed by respondents

Number of projects currently managed by

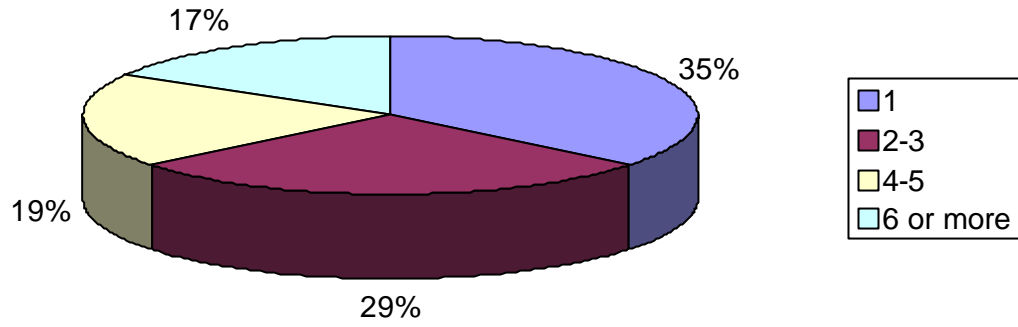


Figure 18 Number of projects currently managed by respondents

Appendix 4 Results of one-way ANOVA

For different age (question 2)

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Technical skills	21-30	31-40	.0256	.23045	.912
		41-50	-.4596	.23952	.062
		51-60	.0641	.26209	.808
	31-40	21-30	-.0256	.23045	.912
		41-50	-.4852(*)	.17880	.010
		51-60	.0385	.20807	.854
	41-50	21-30	.4596	.23952	.062
		31-40	.4852(*)	.17880	.010
		51-60	.5237(*)	.21807	.021
	51-60	21-30	-.0641	.26209	.808
		31-40	-.0385	.20807	.854
		41-50	-.5237(*)	.21807	.021
Managerial skills	21-30	31-40	.0212	.30059	.944
		41-50	-.2201	.31242	.485
		51-60	.2535	.34187	.463
	31-40	21-30	-.0212	.30059	.944
		41-50	-.2413	.23323	.307
		51-60	.2322	.27140	.397
	41-50	21-30	.2201	.31242	.485
		31-40	.2413	.23323	.307
		51-60	.4736	.28445	.104
	51-60	21-30	-.2535	.34187	.463
		31-40	-.2322	.27140	.397
		41-50	-.4736	.28445	.104
Financial skills	21-30	31-40	-.1835	.32749	.578
		41-50	-.1227	.34038	.720
		51-60	.1012	.37246	.787
	31-40	21-30	.1835	.32749	.578
		41-50	.0608	.25410	.812
		51-60	.2847	.29569	.341
	41-50	21-30	.1227	.34038	.720
		31-40	-.0608	.25410	.812
		51-60	.2239	.30991	.474
	51-60	21-30	-.1012	.37246	.787
		31-40	-.2847	.29569	.341
		41-50	-.2239	.30991	.474
IT skills	21-30	31-40	.1351	.31755	.673
		41-50	.1396	.33005	.675
		51-60	.3843	.36115	.294
	31-40	21-30	-.1351	.31755	.673

		41-50	.0045	.24638	.985
		51-60	.2492	.28671	.390
	41-50	21-30	-.1396	.33005	.675
		31-40	-.0045	.24638	.985
		51-60	.2447	.30050	.420
	51-60	21-30	-.3843	.36115	.294
		31-40	-.2492	.28671	.390
		41-50	-.2447	.30050	.420
Legal skills	21-30	31-40	-.0163	.32658	.960
		41-50	-.3120	.33944	.364
		51-60	.0694	.37143	.853
	31-40	21-30	.0163	.32658	.960
		41-50	-.2956	.25339	.250
		51-60	.0858	.29487	.773
	41-50	21-30	.3120	.33944	.364
		31-40	.2956	.25339	.250
		51-60	.3814	.30905	.224
	51-60	21-30	-.0694	.37143	.853
		31-40	-.0858	.29487	.773
		41-50	-.3814	.30905	.224
Communication skills	21-30	31-40	.3824	.38878	.331
		41-50	.0769	.40408	.850
		51-60	.5000	.44216	.265
	31-40	21-30	-.3824	.38878	.331
		41-50	-.3054	.30165	.317
		51-60	.1176	.35103	.739
	41-50	21-30	-.0769	.40408	.850
		31-40	.3054	.30165	.317
		51-60	.4231	.36790	.257
	51-60	21-30	-.5000	.44216	.265
		31-40	-.1176	.35103	.739
		41-50	-.4231	.36790	.257
General skills	21-30	31-40	.3162	.35916	.384
		41-50	.1635	.37330	.664
		51-60	.5313	.40848	.201
	31-40	21-30	-.3162	.35916	.384
		41-50	-.1527	.27867	.587
		51-60	.2151	.32428	.511
	41-50	21-30	-.1635	.37330	.664
		31-40	.1527	.27867	.587
		51-60	.3678	.33987	.286
	51-60	21-30	-.5313	.40848	.201
		31-40	-.2151	.32428	.511
		41-50	-.3678	.33987	.286

* The mean difference is significant at the .05 level.

For different years of working experience (question 9)

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Technical skills	1-5	6-10	-.0886	.23373	.707
		11-20	-.3331	.24180	.176
		21 or more	.0701	.26694	.794
	6-10	1-5	.0886	.23373	.707
		11-20	-.2445	.19259	.212
		21 or more	.1587	.22334	.482
	11-20	1-5	.3331	.24180	.176
		6-10	.2445	.19259	.212
		21 or more	.4031	.23177	.090
	21 or more	1-5	-.0701	.26694	.794
		6-10	-.1587	.22334	.482
		11-20	-.4031	.23177	.090
Managerial skills	1-5	6-10	.1205	.29157	.682
		11-20	-.0806	.30164	.791
		21 or more	.2455	.33300	.465
	6-10	1-5	-.1205	.29157	.682
		11-20	-.2011	.24025	.407
		21 or more	.1250	.27861	.656
	11-20	1-5	.0806	.30164	.791
		6-10	.2011	.24025	.407
		21 or more	.3261	.28913	.266
	21 or more	1-5	-.2455	.33300	.465
		6-10	-.1250	.27861	.656
		11-20	-.3261	.28913	.266
Financial skills	1-5	6-10	.1671	.29674	.577
		11-20	.0565	.30698	.855
		21 or more	.6760	.33890	.053
	6-10	1-5	-.1671	.29674	.577
		11-20	-.1106	.24450	.654
		21 or more	.5089	.28354	.080
	11-20	1-5	-.0565	.30698	.855
		6-10	.1106	.24450	.654
		21 or more	.6195(*)	.29424	.042
	21 or more	1-5	-.6760	.33890	.053
		6-10	-.5089	.28354	.080
		11-20	-.6195(*)	.29424	.042
IT skills	1-5	6-10	.1280	.28850	.660
		11-20	-.1514	.29846	.615
		21 or more	.5099	.32949	.130
	6-10	1-5	-.1280	.28850	.660
		11-20	-.2794	.23771	.247
		21 or more	.3819	.27567	.174
	11-20	1-5	.1514	.29846	.615

		6-10	.2794	.23771	.247
		21 or more	.6613(*)	.28608	.026
	21 or more	1-5	-.5099	.32949	.130
		6-10	-.3819	.27567	.174
		11-20	-.6613(*)	.28608	.026
Legal skills	1-5	6-10	.1116	.29640	.709
		11-20	-.4341	.30663	.165
		21 or more	.1845	.33851	.589
	6-10	1-5	-.1116	.29640	.709
		11-20	-.5457(*)	.24422	.031
		21 or more	.0729	.28322	.798
	11-20	1-5	.4341	.30663	.165
		6-10	.5457(*)	.24422	.031
		21 or more	.6186(*)	.29391	.042
	21 or more	1-5	-.1845	.33851	.589
		6-10	-.0729	.28322	.798
		11-20	-.6186(*)	.29391	.042
Communication skills	1-5	6-10	.7545(*)	.35165	.038
		11-20	.3626	.36379	.325
		21 or more	.9107(*)	.40161	.029
	6-10	1-5	-.7545(*)	.35165	.038
		11-20	-.3918	.28975	.184
		21 or more	.1563	.33601	.644
	11-20	1-5	-.3626	.36379	.325
		6-10	.3918	.28975	.184
		21 or more	.5481	.34869	.124
	21 or more	1-5	-.9107(*)	.40161	.029
		6-10	-.1563	.33601	.644
		11-20	-.5481	.34869	.124
General skills	1-5	6-10	.4174	.33872	.225
		11-20	.2912	.35041	.411
		21 or more	.6518	.38685	.100
	6-10	1-5	-.4174	.33872	.225
		11-20	-.1262	.27910	.654
		21 or more	.2344	.32366	.473
	11-20	1-5	-.2912	.35041	.411
		6-10	.1262	.27910	.654
		21 or more	.3606	.33588	.289
	21 or more	1-5	-.6518	.38685	.100
		6-10	-.2344	.32366	.473
		11-20	-.3606	.33588	.289

* The mean difference is significant at the .05 level.

**For different years of working experience in project management
(question 12)**

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Technical skills	1-3	4-6	.0070	.25547	.978
		7-9	.1429	.28243	.616
		10-15	-.1987	.25129	.434
		16 or more	-.2088	.28243	.464
	4-6	1-3	-.0070	.25547	.978
		7-9	.1359	.25547	.598
		10-15	-.2057	.22056	.357
		16 or more	-.2158	.25547	.403
	7-9	1-3	-.1429	.28243	.616
		4-6	-.1359	.25547	.598
		10-15	-.3416	.25129	.182
		16 or more	-.3516	.28243	.221
	10-15	1-3	.1987	.25129	.434
		4-6	.2057	.22056	.357
		7-9	.3416	.25129	.182
		16 or more	-.0101	.25129	.968
	16 or more	1-3	.2088	.28243	.464
		4-6	.2158	.25547	.403
		7-9	.3516	.28243	.221
		10-15	.0101	.25129	.968
Managerial skills	1-3	4-6	-.1104	.30876	.723
		7-9	-.3690	.34135	.286
		10-15	-.4563	.30372	.141
		16 or more	-.2143	.34135	.534
	4-6	1-3	.1104	.30876	.723
		7-9	-.2587	.30876	.407
		10-15	-.3460	.26657	.202
		16 or more	-.1039	.30876	.738
	7-9	1-3	.3690	.34135	.286
		4-6	.2587	.30876	.407
		10-15	-.0873	.30372	.775
		16 or more	.1548	.34135	.653
	10-15	1-3	.4563	.30372	.141
		4-6	.3460	.26657	.202
		7-9	.0873	.30372	.775
		16 or more	.2421	.30372	.430
	16 or more	1-3	.2143	.34135	.534
		4-6	.1039	.30876	.738
		7-9	-.1548	.34135	.653
		10-15	-.2421	.30372	.430
Financial skills	1-3	4-6	-.3766	.32165	.249
		7-9	-.2041	.35560	.569
		10-15	-.6667(*)	.31640	.042

		16 or more	-.2653	.35560	.460
	4-6	1-3	.3766	.32165	.249
		7-9	.1725	.32165	.595
		10-15	-.2900	.27770	.303
		16 or more	.1113	.32165	.731
	7-9	1-3	.2041	.35560	.569
		4-6	-.1725	.32165	.595
		10-15	-.4626	.31640	.152
		16 or more	-.0612	.35560	.864
	10-15	1-3	.6667(*)	.31640	.042
		4-6	.2900	.27770	.303
		7-9	.4626	.31640	.152
		16 or more	.4014	.31640	.212
	16 or more	1-3	.2653	.35560	.460
		4-6	-.1113	.32165	.731
		7-9	.0612	.35560	.864
		10-15	-.4014	.31640	.212
IT skills	1-3	4-6	-.0606	.33132	.856
		7-9	-.1270	.36629	.731
		10-15	-.1667	.32591	.612
		16 or more	-.0952	.36629	.796
	4-6	1-3	.0606	.33132	.856
		7-9	-.0664	.33132	.842
		10-15	-.1061	.28605	.713
		16 or more	-.0346	.33132	.917
	7-9	1-3	.1270	.36629	.731
		4-6	.0664	.33132	.842
		10-15	-.0397	.32591	.904
		16 or more	.0317	.36629	.931
	10-15	1-3	.1667	.32591	.612
		4-6	.1061	.28605	.713
		7-9	.0397	.32591	.904
		16 or more	.0714	.32591	.828
	16 or more	1-3	.0952	.36629	.796
		4-6	.0346	.33132	.917
		7-9	-.0317	.36629	.931
		10-15	-.0714	.32591	.828
Legal skills	1-3	4-6	.0584	.33480	.862
		7-9	.0952	.37013	.798
		10-15	-.3254	.32933	.329
		16 or more	-.1190	.37013	.749
	4-6	1-3	-.0584	.33480	.862
		7-9	.0368	.33480	.913
		10-15	-.3838	.28905	.192
		16 or more	-.1775	.33480	.599
	7-9	1-3	-.0952	.37013	.798
		4-6	-.0368	.33480	.913
		10-15	-.4206	.32933	.209
		16 or more	-.2143	.37013	.566

	10-15	1-3	.3254	.32933	.329
		4-6	.3838	.28905	.192
		7-9	.4206	.32933	.209
		16 or more	.2063	.32933	.535
	16 or more	1-3	.1190	.37013	.749
		4-6	.1775	.33480	.599
		7-9	.2143	.37013	.566
		10-15	-.2063	.32933	.535
Communication skills	1-3	4-6	.4481	.39839	.268
		7-9	.0000	.44043	1.000
		10-15	-.0804	.39188	.839
		16 or more	.1786	.44043	.687
	4-6	1-3	-.4481	.39839	.268
		7-9	-.4481	.39839	.268
		10-15	-.5284	.34395	.133
		16 or more	-.2695	.39839	.503
	7-9	1-3	.0000	.44043	1.000
		4-6	.4481	.39839	.268
		10-15	-.0804	.39188	.839
		16 or more	.1786	.44043	.687
	10-15	1-3	.0804	.39188	.839
		4-6	.5284	.34395	.133
		7-9	.0804	.39188	.839
		16 or more	.2589	.39188	.513
	16 or more	1-3	-.1786	.44043	.687
		4-6	.2695	.39839	.503
		7-9	-.1786	.44043	.687
		10-15	-.2589	.39188	.513
General skills	1-3	4-6	-.1818	.37357	.629
		7-9	-.1429	.41300	.731
		10-15	-.2292	.36747	.537
		16 or more	.1429	.41300	.731
	4-6	1-3	.1818	.37357	.629
		7-9	.0390	.37357	.917
		10-15	-.0473	.32253	.884
		16 or more	.3247	.37357	.390
	7-9	1-3	.1429	.41300	.731
		4-6	-.0390	.37357	.917
		10-15	-.0863	.36747	.816
		16 or more	.2857	.41300	.493
	10-15	1-3	.2292	.36747	.537
		4-6	.0473	.32253	.884
		7-9	.0863	.36747	.816
		16 or more	.3720	.36747	.318
	16 or more	1-3	-.1429	.41300	.731
		4-6	-.3247	.37357	.390
		7-9	-.2857	.41300	.493
		10-15	-.3720	.36747	.318

* The mean difference is significant at the .05 level.

For different number of project currently responsible (question 14)

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.
Technical skills	1	2-3	.0894	.19584	.651
		4-5	-.3145	.22270	.166
		6 or more	.0097	.23326	.967
	2-3	1	-.0894	.19584	.651
		4-5	-.4038	.23708	.096
		6 or more	-.0797	.24703	.749
	4-5	1	.3145	.22270	.166
		2-3	.4038	.23708	.096
		6 or more	.3242	.26882	.235
	6 or more	1	-.0097	.23326	.967
		2-3	.0797	.24703	.749
		4-5	-.3242	.26882	.235
Managerial skills	1	2-3	-.2749	.23565	.250
		4-5	-.4381	.26797	.110
		6 or more	-.4307	.28068	.133
	2-3	1	.2749	.23565	.250
		4-5	-.1632	.28527	.570
		6 or more	-.1558	.29725	.603
	4-5	1	.4381	.26797	.110
		2-3	.1632	.28527	.570
		6 or more	.0074	.32347	.982
	6 or more	1	.4307	.28068	.133
		2-3	.1558	.29725	.603
		4-5	-.0074	.32347	.982
Financial skills	1	2-3	-.1310	.25968	.617
		4-5	.0714	.29530	.810
		6 or more	-.2653	.30931	.396
	2-3	1	.1310	.25968	.617
		4-5	.2024	.31437	.523
		6 or more	-.1344	.32757	.684
	4-5	1	-.0714	.29530	.810
		2-3	-.2024	.31437	.523
		6 or more	-.3367	.35646	.351
	6 or more	1	.2653	.30931	.396
		2-3	.1344	.32757	.684
		4-5	.3367	.35646	.351
IT skills	1	2-3	-.6133(*)	.23694	.013
		4-5	-.2059	.26944	.449
		6 or more	-.2614	.28222	.360
	2-3	1	.6133(*)	.23694	.013
		4-5	.4074	.28684	.163
		6 or more	.3519	.29888	.246
	4-5	1	.2059	.26944	.449

		2-3	-.4074	.28684	.163
		6 or more	-.0556	.32524	.865
	6 or more	1	.2614	.28222	.360
		2-3	-.3519	.29888	.246
		4-5	.0556	.32524	.865
Legal skills	1	2-3	-.1993	.26334	.453
		4-5	-.1924	.29946	.524
		6 or more	-.1835	.31367	.562
	2-3	1	.1993	.26334	.453
		4-5	.0069	.31880	.983
		6 or more	.0159	.33218	.962
	4-5	1	.1924	.29946	.524
		2-3	-.0069	.31880	.983
		6 or more	.0089	.36149	.980
	6 or more	1	.1835	.31367	.562
		2-3	-.0159	.33218	.962
		4-5	-.0089	.36149	.980
Communication skills	1	2-3	-.0993	.31084	.751
		4-5	-.2868	.35347	.422
		6 or more	-.4475	.37024	.234
	2-3	1	.0993	.31084	.751
		4-5	-.1875	.37630	.621
		6 or more	-.3482	.39209	.380
	4-5	1	.2868	.35347	.422
		2-3	.1875	.37630	.621
		6 or more	-.1607	.42668	.708
	6 or more	1	.4475	.37024	.234
		2-3	.3482	.39209	.380
		4-5	.1607	.42668	.708
General skills	1	2-3	-.1814	.28907	.534
		4-5	-.2960	.32871	.373
		6 or more	-.1218	.34431	.725
	2-3	1	.1814	.28907	.534
		4-5	-.1146	.34994	.745
		6 or more	.0595	.36463	.871
	4-5	1	.2960	.32871	.373
		2-3	.1146	.34994	.745
		6 or more	.1741	.39680	.663
	6 or more	1	.1218	.34431	.725
		2-3	-.0595	.36463	.871
		4-5	-.1741	.39680	.663

* The mean difference is significant at the .05 level.