
Towards improving the planning and scheduling of construction projects in the UAE: a review of the human factor

Zeed K. Alaiwi

School of Property, Construction and Project Management,
RMIT University,
Melbourne, VIC 3001, Australia
Email: zeed.alaiwi@rmit.edu.au

Malik M.A. Khalfan*

School of Property, Construction and Project Management,
RMIT University,
Melbourne VIC 3001, Australia
and
Department of Civil Infrastructure and Environmental Engineering,
Khalifa University,
Abu Dhabi, UAE
Email: malik.khalfan@gmail.com
*Corresponding author

Amrit Sagoo and Maged Georgy

School of Property, Construction and Project Management,
RMIT University,
Melbourne, VIC 3001, Australia
Email: amrit.sagoo@rmit.edu.au
Email: maged.georgy@rmit.edu.au

Abstract: The agenda of effectiveness, efficiency and economics has dominated business organisations operating in an agile environment where teamwork, accountability, transparency and responsiveness to client are paramount ingredients for business survival. Construction organisations also have to shift their focus to preplanning stages of a project to eliminate or reduce the risks during the construction phases of the project. This paper proposes an integrated conceptual model to enhance planning and scheduling stages. The model, discussed within the context of the United Arab Emirates (UAE), consists of six main parameters with associated elements include: the project (size, scope and complexity), the organisation (structure, lines of responsibilities, span of control and culture), the human aspects (education, experience and support), the construction methodologies (methods, preferred techniques, resources, out-sourcing, supply chain, health and safety) and the technology (software, tools and support); the contractual framework (obligations, risks legal); and the environment (internal and external).

Keywords: planning; scheduling; human factor; United Arab Emirates; UAE; conceptual model.

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Biographical notes: Zeed K. Alaiwi is a PhD research student at the School of Property, Construction and Project Management, RMIT University, Australia. He has several years of experience working as a Project Manager within the construction industry, both in Australia and the UAE.

Malik Khalfan has more than 19 years of research, teaching, consultancy and construction industry experience by working in the UK, Hong Kong, Pakistan, Australia, Singapore, Vietnam, Malaysia and the UAE. He has published more than 150 papers in refereed journals and conference proceedings.

Amrit Sagoo is a Senior Lecturer at the School of Property, Construction and Project Management, RMIT University, Australia. He has several years of experience at various universities in the UK as well as he played vital role in establishing UK degrees in different parts of the world including Malaysia and Hong Kong.

Maged Georgy is a Senior Lecturer at the School of Property, Construction and Project Management, RMIT University, Australia. He has studied and worked in the USA and the Middle East.

1 Introduction

One of the biggest challenges facing the construction project team is planning (Zwikael and Sadeh, 2007; Zhang et al., 2005; Waly and Thabet, 2003; Arditi, 1985; Kenley, 2004; Koskela, 2000) and that decisions made during this phase impact enormously on the successful completion of a project (De Snoo et al., 2011; Berglund and Karlun, 2007; MacCarthy and Wilson, 2001; Jackson et al., 2004; McKay and Wiers, 1999). Planning, in fact, is often regarded as transitioning and developing effective collaboration of supply chain through to the work phases (Sriprasert and Dawood, 2003). Planning and scheduling can be developed at various stages of the design and construction process (Faniran et al., 1999). It is commonly accepted that the planning process has two aspects: macro-planning, for decisions made prior to, and micro-planning, for more detailed decisions which are made during the construction process (Waly and Thabet, 2003). However, the ultimate aim of the planning process is to ensure *buildability* of the proposed schematic design as well as ensuring the planning and controlling of the actual construction phases. In fact, the planning and scheduling process is developed to satisfy the time, cost and quality constraints of a project together with developing a construction methodology which eliminates or reduces health and safety risks. In reality however, the planning and scheduling is a very complex process and heavily relies on reasoning process (Jackson et al., 2004; MacCarthy and Wilson, 2001). This process relies on the

construction planners to translate tender documentations (drawings, specifications, bill of quantities, schedules, etc.) and produce a coherent set of work tasks based on method statement(s) with their logical sequential relationships and postulate a prediction of the work flow, visualising and capturing every aspect of the project stages including providing preventative measures reducing any safety risk (De Snoo et al., 2011; Berglund and Karlton, 2007; Jackson et al., 2004; MacCarthy et al., 2001; McKay and Wiers, 1999; Cherneff et al., 1991). Inevitably, this stage will involve gathering of information and interpretation, communication and negotiation with different stakeholders to make decision and unpack or solve problems. In formulating planning and scheduling, the planners integrate their knowledge of construction practices, costing and productivity together with data specific to the project design. de Vries and Harink (2007) suggest that planners not only needs to possess knowledge and experience of the construction process but must be able to estimate labour and material requirements from the design documentation.

To date researchers concentrated primarily on operational level of project planning and control and have develop numerous models and framework associated in the following areas:

- analysing causes of low productivity (through inappropriate working methods, rework, mistakes, time delays and cost overrun (Banwo et al., 2015; Motaleb and Kishk, 2010; Al-Kharashi and Skitmore, 2009; Faridi and El-Sayegh, 2006; Assaf and Al-Hejji, 2006; Horman and Kenley, 2005; Zhang et al., 2005; Al-Tabtabai and Thomas, 2004; Alwi and Hampson, 2003; Koskela and Vrijhoef, 2001; Lam et al., 2001; Morris, 1990; Winch, 1998).
- examination of the effectiveness of project management tools and the relative merits and demerits (Yaowu and Qingpeng, 2011; Kenley and Seppänen, 2010; Galloway, 2006; Harris and McCaffer, 2006; Henrich and Koskela, 2005; Kenley, 2004; Arditi et al., 2002; Atkinson, 1999, 2000; McKinney and Fischer, 1998; Hamilton, 1997; Jaafari, 1984; Moder and Phillips, 1970)
- project management quality tools (Chileshe and Haupt, 2005; Ford and Bhargav, 2006)
- stakeholder management interactions, collaborations (Becerik, 2004; Ahiaga-Dagbui and Smith, 2014; Ahuja et al., 2009; Nguyen et al., 2009; Liu and Fang, 2006; Slattery and Sumner 2011; Wong et al., 2000).

However, there still remains a knowledge gap for developing a holistic model capable of capturing a range of key factors influencing the reasoning behind the strategic decision making in developing planning and scheduling for construction projects. Although these concerns have been raised by numerous researcher (King, 1976; MacCarthy and Liu, 1993; Buxey, 1989; McKay et al., 1988; LaForge and Craighead, 2000; McKay et al., 2002) but there nothing has been presently conceptualised, implemented and tested. From an academic viewpoint, this paper formalises the conceptual model and contributes to useful directions to future research in this area with the detailed discussion on Human factor affecting the planning process.

Apart from the level of detail information contained in tender documentations which is dictated by the type of contract and procurement route selected by the clients professional advisory team, e.g., design and build projects (tender documents may

include but not limited to schedule of requirements, schedule of rates); traditional contracts (working drawings, specifications, schedules, bill of quantities) and in processing this tender information, the planner not only relies on his/her knowledge, experience and ability to visualise, etc. but there are often constrained and influenced by the external environment (contract form, communication structure within the team); internal environment in which there are working in terms of the organisation (its structure, culture, role, responsibility and level of control assigned); the technologies (working practices, preference on resources, supply chain, hard/software, planning tools); and the human (Berglund and Karlton, 2007).

1.1 Why United Arab Emirates

The landscape of United Arab Emirates (UAE) has been dramatically changing over the past five decades and UAE is widely known as one of the pioneer's of innovation amongst developing countries in the Middle East. UAE is associated with modern approaches to usage of land and unique built environment together unique infrastructure in terms of design and quality where cost and quality are not comprise and this has result be one-off mega construction projects building on reclaimed sea beds and deserts. Construction industry contributes 11% to the GDP (ADCCI, 2015). Every year the government invests billions in major capital projects. However, construction in UAE are not immune to delays and disruptions regardless of the cost injected to maintain building quality, according to Faridi and El-Sayegh (2006), nearly half of the construction projects in UAE suffer from delays these are generally associated with construction companies and economic stability of the country. However, the construction industry of UAE employs diverse range of consultants (architects, project managers, cost engineers/quantity surveyors, etc.); multiples international construction companies employing diverse range of workforce (from developing countries); and harsh environment setting. All these complex array of challenges and huge responsibilities placed upon the construction planners engaged in the planning process. Hence, the remit of this research investigation is limited to the planning and construction phase of project's life cycle as opposed to the complete project's life-cycle.

2 Research design

The research design entails two main phases: a literature review and a multiple case analysis. The literature review revealed uncovering the constructs and variables associated with the planning process. The case studies will be aimed at exploring, theory-building patterns or linkages between the proposed constructs and variables in concept model. The objective of overall research involves the descriptive and normative study of the planning process and more importantly understand the cognitive decision-making process through exploring the importance of constructs and elements and their dynamics interrelationships in terms of how they interact with each other. With this in mind, this paper focuses on the first research objective and reviews previous researches and literature available on domain surrounding this subject area from an integrated perspective. This will assist in defining the main elements and constructs of a proposed conceptual model that constitute the formation of building blocks of the

conceptual holistic approach to planning model and form a basis of further probing and investigation to vary scoping and its appropriateness to the real world. Like with any research project, there will be numerous set of research questions arising from an extensive literature review and these forms the basis for future scoping of research agenda and it is anticipated that any data collected will undergo rigorous testing using empirical investigative approaches.

The novel of the proposed conceptual model lies in the different perspective on the constructs and elements that characterises cognitive decision-making approach in develop the construction planning and scheduling process. The rationale of the present research is based on the fact that the construction industry suffers from lack of efficiency comparing to other industries (Koskela and Vrijheof, 2001; Winch, 1998; Zhang et al, 2005; Horman and Kenley, 2005). The model will aid a better understanding of the complex decision-making process in the planning stages which in turn affects the project being delivered within the time, cost and quality constraints as well as increasing buildability on construction sites and related benefits. The research team intends to address several gaps in existent construction literature and to best of our knowledge all research undertaken in this subject domain have focused primarily on micro aspects of the planning process. The next phase of research methodology is not included within this paper and it will be conducted through a multiple case study analysis. It will be used with the two-fold purpose of exploring and theory-building research propositions and hypothesis related to the proposed model. The case study analysis was considered suitable to obtain in-depth results in a research area that is characterised by limited empirical research as planning process.

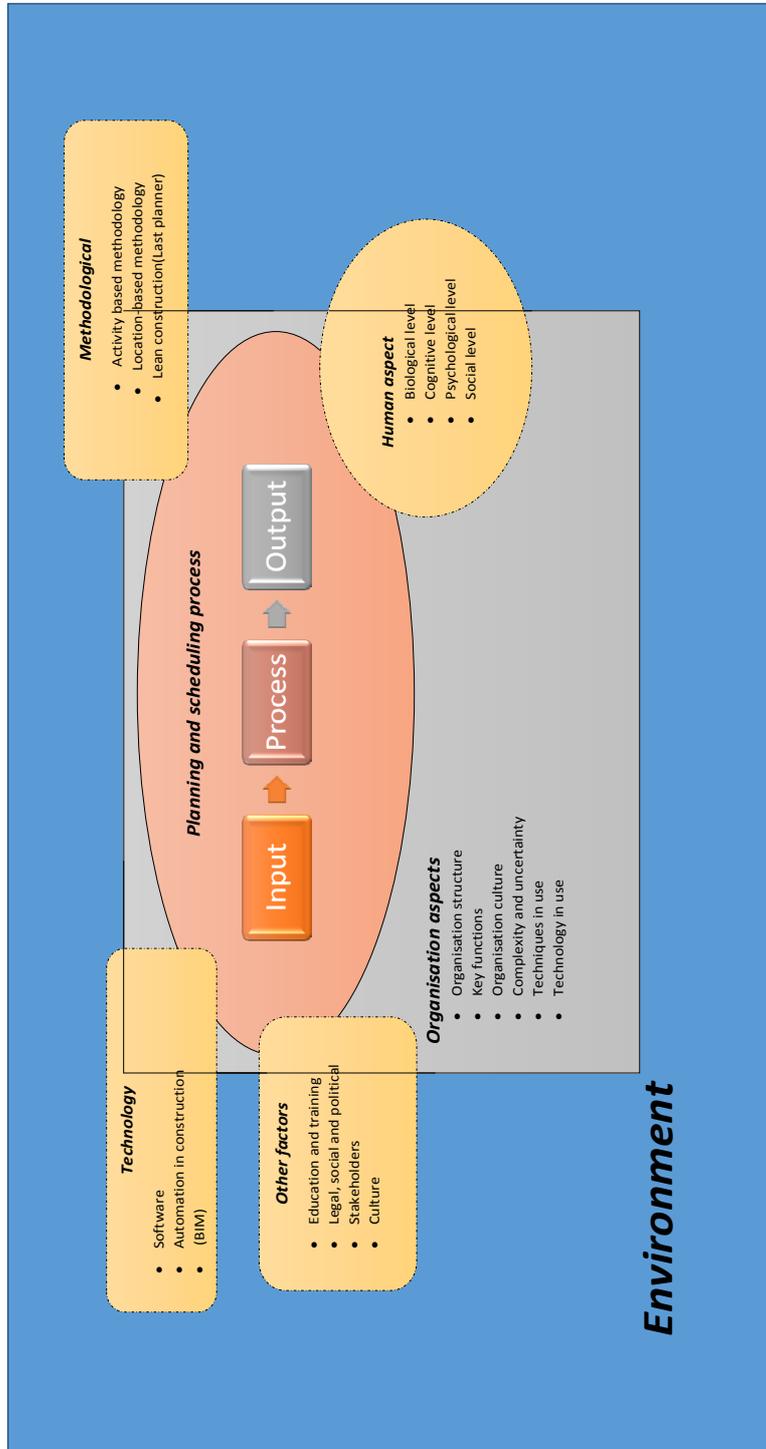
2.1 Conceptual model

The proposed conceptual framework is displayed in Figure 1 and capture an environment in which the construction planners are constrained by. Figure 1 illustrates the relationships between the key elements which comprise both internal and external factors influencing the planning process. This paper talks in detail about the human factor.

2.2 The human factor

The success of execution of the planning and scheduling process hinges on the ability of construction planners to interpret, extrapolate, evaluate and synthesis the tender information to form decisions on time, allocate appropriate resources and develop a logical sequence. Hence, this task ultimately challenges the construction planners cognitive reasoning and mental ability to visualise every aspects of the project sequences and their relative inter-relationship; communicate these to coordinate various members of the project team; and level of competency is displayed through the construction planners professionalism in terms of depth and breadth of professional experience and knowledge, educational background, and personal characteristics (De Snoo et al., 2011; Buchmann-Slorup and Andersson, 2010; Berglund, 2000; Berglund and Karlton, 2007; Jackson et al., 2004; Russell and Taylor, 2003; Meredith and Mantel, 1995). In this regard, several researchers (Koo and Fischer, 2000; Illingworth, 2000; Kelsey et al., 2001) suggest the importance of a competent construction planner which is on the decline with increasing in project complexity (Allen and Smallwood, 2008).

Figure 1 Proposed conceptual model of the planning and scheduling process (see online version for colours)



At present, there are no standards or guidelines or planning control framework available to assist the construction planner in making decisions, hence construction planners are totally reliant on using their intuition based on their personal experience. Daniellou (2001) describes the human contribution to the process at one of the following four levels:

- Biological level, where the human is regarded as a physiological system (this dimension is beyond the scope of this study and has not be taken forward).
- Cognitive level, where the human is considered as an information processing system, including thought processes, representations, and decision-making.
- Psychological level, where the human has a unique history, leading to a specific subjective processing of the situations he/she experiences.
- Social level, where it is emphasised that every single individual is a member of several social groups with different cultures, which will partly determine his/her values and habits.

2.2.1 Cognitive level

Under cognitive level, people are regarded as information processing units and how they make decisions based on the processed information. The thinking process resembles information processing hence the brain is considered to work like computers. The human brain has the capability to store information to a certain limit, require input, and output sections that determine the information that can be processed in a single time. The type of information made available to a person determines the outcome of the information processed (Cooper, 2015).

The main concept under cognitive level is that human beings always try to understand and make sense of anything around them. This helps them to adapt to their environment and derive the important meaning of anything they encounter during their lifetime (Jones, 2015). According to the cognitive level of thinking, people plan and participate in activities in a particular manner based on priority (Friedman, 2014). For example, when people have two proposals on how to conduct a building project, several considerations need assessment, and all depend on the amount of resources required to complete a certain project. Therefore, the decision makers will choose a viable project depending on the resources it would require for completion. This involves a schemas process, which involves proper organisation of individual knowledge and experience that determine how individuals make sense of situations and objects.

In addition, under cognitive level, the human mind and memory play an important role in the decisions that people make (Kreager, 2012). The human mind is organised into various categories of which each category has a particular function in the processing of information. That is, the brain has components that store memories that help in processing current and future information. They include, working memory and long-term memory. The components overlap each other since the current information that can be processed and make decisions can depend on experience and the existing outcome can remain in human memory for future references.

Under cognitive level, there exist different types of information processing modules depending on the type and relationship to each other. In addition, it is only based on the behaviour of an individual in relation to the mental processes and ability to make several

conclusions from a situation. Some people can manipulate information or the way it is processed in the human brain to reach a certain type of conclusion or decision (Rothmann, 2015).

Wiers (1996) studied the decision behaviour of four production schedulers in a truck manufacturing company by means of a quantitative model. The model consists of three parts: performance variables, action variables and disturbance variables. The outcomes show that there is a large difference between schedulers that apparently have the same type of decision problem. Another interesting finding is that some scheduling actions work positively in the short term, but negatively over a longer term.

Some individuals can decide on their free will while others get influenced by circumstances or their current situation. Therefore, there is an interactionist view in that, human behaviour or actions are greatly influenced by the experience or the innate capacities of the human brain that process information that determines the final action a person takes. The cognitive level of effective planning and scheduling processes is homological because it relies on processing information by more than one knowledgeable individual.

2.2.2 Psychological level

Experience is a critical component of expertise for construction managers. Time allows them to inductively construct and organise knowledge about the construction management domain that often cannot be easily formalised.

According to Craik (1943), the mind constructs 'small-scale models' of reality that it uses to anticipate events (Johnson-Laird and Byrne, 2000). Such models are conceptualisations of the world that the mind builds by incorporating the individuals' views of the world, of themselves, of their own capabilities and of the tasks that they are required to perform (Norman, 1983) and are referred to as mental models. Individuals construct mental models of themselves and the environment that they are required to interact with from perception, imagination, and the comprehension of discourse.

Under psychological level, the environment always influences the individual's perception of what is real. The environment determines their level of reasoning and interaction. Psychological level focuses on how people process their situations and information according to their unique past. Every person has his or her personal experiences that differentiate people's personality and views on circumstances or other individuals (Cacciabue, 2013).

The performance of professional persons is related to the background knowledge and professional experience (Marzano, 2004). In the construction industry, it is believed that the background knowledge of the project members has a significant impact on the project success (Hinze and Plautz 1988). Construction individuals build expertise through experience. Experience at handling unique real life project scenarios allows them to assimilate patterns of information and inductively construct and organise knowledge about the construction management domain that cannot be easily formalised or perceived analytically. In critical situations, they tend to isolate, recognise and match the pattern of the problem at hand with familiar patterns that they have encountered before. Novices on the other hand tend to concentrate on the surface features of the problem at hand (Mukherjee et al., 2005).

The psychological aspect focuses on the personal views and perceptions based on the moral reasoning and feelings. Therefore, people use their knowledge and skills when they

interact or solve a situation. However, these individual characteristics can be changed influencing the result or change people's view on reality and other individuals.

According to Monereo and Pozo (2011), people always develop personal identity, which brings the uniqueness and differences of how people think and make decisions. The formation of human person depends on the level of self-awareness based on the brain capacity. Elements such as culture, society and language shape a human character that lasts a lifetime. The psychological level relates to the identities that people form resulting in the diversity determined by the mental capacity and level of individual reasoning regarding situations and development of skills and values.

The psychological level of reasoning is determined by the biographical construction, which describes three dimensions of human life, which are: past, present and future. Individuals are always developed important balance, which defines the current and future personalities. Self-definition and reasoning are a continuous process, which enables us to derive some meaning and values of various situations to make important decisions regarding a project or activity that we participate in.

Under psychological perspective, the strengths and values of individuals are important in determining their talents and capabilities. In addition, the feelings of an individual also play an important role on how people participate in various activities. Human feels are a true reflection of how people relate to issues and other people based on experience and process of interaction. For example, when an activity is to be carried out, people will make decisions regarding their past interaction with the similar activity or what they have learned through observation and interaction with others. Personal values are also important since they define who we are as an individual. Therefore, a person can decide to participate or avoid any form of activity depending on their personal values (Vallverdú, 2014).

In reference to human life that is from childhood to adulthood, people undergo different experiences that can be related to seasons in reality. For example, childhood can be compared to spring, which is an important stage of growth, and life presents various opportunities that allow us to grow. This stage plays an important role in the preparation of later life, which involves various activities that are more challenging. As people grow, the stage of adolescence can be linked to summer as it relates to the strength, energy, and establishment of a new framework that allows individuals to address various aspects of adult life. Autumn resembles the life of adult life and winter is associated with adulthood. These seasons play a critical role in indicating how brains develop in relation to personality formation. In the process, people develop values and unique way of reasoning that enables them to reach different conclusions about issues (Stenning, 2012).

Berglund and Karlton (2007) have conducted a study to address how the production-scheduling processes in four different manufacturing companies (sawmill, parquet manufacturing, furniture manufacturing and house manufacturing) are influenced by human, technological and organisational aspects. The research led to the conclusion that the schedulers are adding such capabilities of humans as knowledge and personal experience, negotiation, conflict resolution, and formation of teams to accomplish difficult goals have an influence on the process of scheduling.

According to the psychological view, people are considered frequent learners about their environment and their personalities. The learning process determines how we deal with situations at present and in future. Therefore, it is very important to note that decision-making process in planning activity is purely based on, personal experiences and knowledge of an individual.

2.2.3 Social level

The scheduler can be considered as information node and integrated link between different departments. Thus, the scheduler's role will require him/her to get information from other personals/departments formally and informally. The schedulers will contact with variety of personnel and departmental teams across the organisation. Therefore, the schedulers required to possess good social skills and develop a thorough understanding of the process of production and the strategies of company (Berglund and Karlton, 2007).

Under social level, each individual is considered a member of other groups that have different cultures based on their values and behaviour. The social circle of an individual greatly influences an individual's memory of certain information. The ability to memorise is always influenced by culture, events and emotions. Some people have the capability to process a lot of information at a single period because of high brain capacity compared to others who have low brain capacity. In addition, the knowledge acquired under social level is through interaction with other people, events and the external environment (Barone, 2012).

The ability to process information and make decisions, therefore, depend on the individual attitude and beliefs, which greatly influences how people recall and process information. Besides, the process of learning is a result of external stimuli (Barone, 2012). The external stimuli make an individual to process information, make an interoperation and reach conclusion depending on how he or she relates to the acquired information.

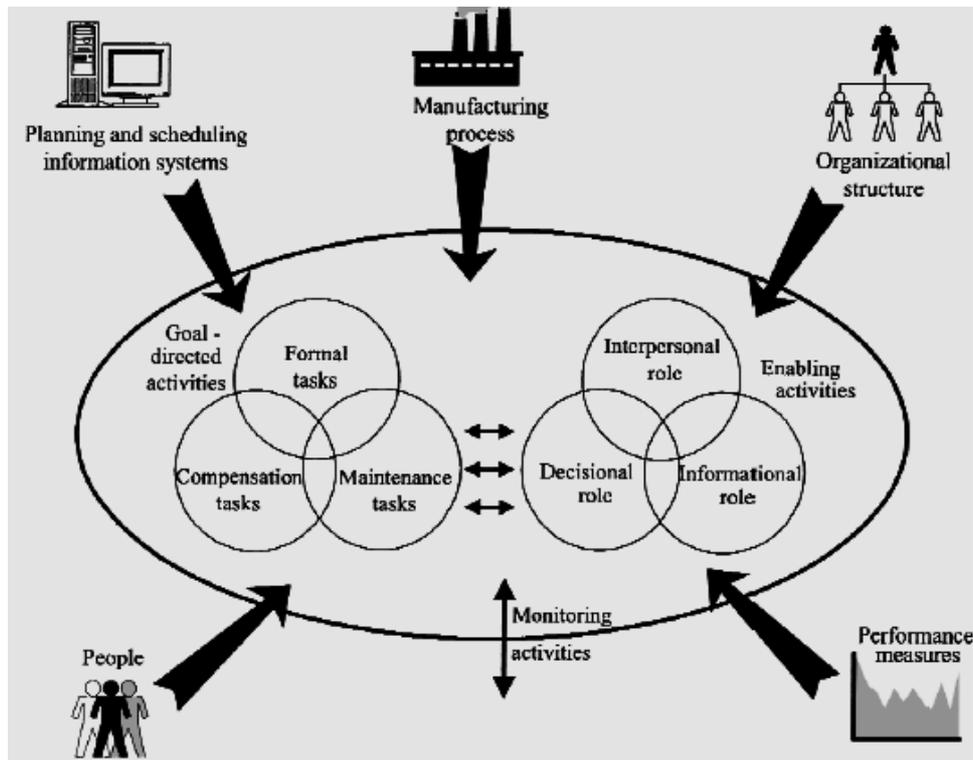
In addition, people can create mental images or predict what can happen in a certain situation. This can greatly influence how a person can remember events and make decisions based on past situation. Besides, an individual's language plays an important role in how people develop their mental ability and capacity. Through the process of interaction, people meet others from different background and setting. Therefore, as a result of cultural diversity, some circumstances can force an individual to learn a new language which is different from what they know (Shaki and Gevers, 2011). People learn other people's language because they believe and expect that their process of interaction will; be effective as they will be able to understand each other. Therefore, language as a social aspect has great capability to influence the way a person can process information. Also, people use language to determine the nature of tasks by illustrating clear instructions which describe how the task can be carried out. This needs effective processing of information in order to complete a certain task as required.

Furthermore, social level determines the development of an individual, which determine the motivation and actions a person has to learn and perform as expected. People are considered information-processing units and have memory units that are referred as cognitive architecture (Drozdial-Szelest, 2014). Therefore, human beings can be considered to behave like machines where information is the main stimulus and is sensed after it is acquired, then the brain performs a processing function. The processed information is then stored for future reference. Therefore, the social influences depend on nature, which determines how people react and develop different decisions depending on the type of information and scenario they are in (Rothmann, 2015).

Processing of information combines the quantitative and qualitative aspects, which results from new strategies that involve retrieval and storage of processed information. This determines the individual abilities that involve the ability to solve problems and establish an effective structure that establishes effective plans (Edwards, 2013). The

increase in knowledge after processing information refers to the ability to remember; hence, making the qualitative and quantitative analysis as important aspects of information processing.

Figure 2 A new model of scheduling in manufacturing



Source: Jackson et al. (2004)

However, a construction planner's role and responsibilities is varies considerably between organisations in terms of the job requirements, level of responsibility, expectations, obligations and the desires to succeed. Jackson et al. (2004) categorises the roles as follows:

- Interpersonal role: these are embodied in the interpersonal networks developed by schedulers over time that complement the formal reporting hierarchies and organisational structure.
- Informational role: a key role performed by the scheduler with an information receiver, processor and transmitter.
- Decisional role: Schedulers are not only problem solver but problem predictors taking avoidance or opportunistic action when appropriate.

Jackson et al. (2004) suggest that the environment in which the construction planner operates is just as important as the competency of the planner. The environment comprise the physical technological process and materials, the organisational structure, the

planning and scheduling information systems, the individuals that the scheduling functions interface with and the execution measures being used – see Figure 2.

2.3 Organisational factor

Since the planning and scheduling process relies on team working ethics and information sharing within the organisation. The organisational structure – its culture, core values, protocols, ethics, experience, reputation, services delivery, agility and customer satisfaction affects how successful the organisation is and this will directly influence the planning and scheduling process (De Snoo et al., 2011; Buchmann-Slorup and Andersson, 2010; Ajmal and Koskinen, 2008; Berglund and Karlton, 2007; Jackson et al., 2004; Covin and Slevin, 1988). According to Robbins and Barnwell (2006), there are three key components are needed to be addressed within any organisation: firstly, organisation's hierarchy and its operating management structure; secondly job descriptions and role responsibilities through standardised; and thirdly, decision-making structure and control. Hence, the planning function will often vary from one organisation to another; some organisations tend to assign a planner solely dedicated on this role, whereas, in other organisation the planner has to perform other duties (Berglund and Karlton, 2007; Jackson et al., 2004; MacCarthy and Wilson, 2001).

2.4 Methodology factor

Presentation techniques used for schedule communication are important vehicles for enabling the collaborative and coordinated work practices that are so important for the success of a building project. According to Kenley and Seppänen (2010), two main planning techniques that are designed to determine the sequence of the construction activities upon which a construction plan is developed and these are as follows:

- activity-based management: CPM (deterministic), PERT (probabilistic), Gantt chart
- location-based management: LOB (unit production), flow line (location production).

2.5 Technology factor

Due to increasing project complexity, there has been increased reliance in use of project management software as a tool for project tracking, time analysis, cost analysis, resource analysis and managing organising construction projects (Liberatore et al., 2001; Choo et al., 1999; Hegazy, 1999; Bounds, 1998). The most popular project management software packages Microsoft Project (MS project) and Primavera Project Planner, and these software packages are widely used with activity-based management methodology (Galloway, 2006). VICO software is also available, though less popular and commonly used with location-based management methodology (Kenley and Seppänen, 2010). The main technology aspects are:

- The scheduling software system availability and its ability to provide sufficient data, control and decision support.
- Automation in the construction industry: building information modelling (BIM).

2.6 *Environment factor*

The environment of any system lies outside the boundary limits of that system and it has negligible ability to control other systems beyond its boundary. System's boundary is used as a tool for understanding and defining the scope of an organisation's interest (Cavaleri and Obloj, 1993). There are some key factors within the environment of planning that influence the scheduling process are: education and training provision; legal and political; culture; and stakeholders.

Generally, it is widely accepted that the background knowledge, experience and grooming of the individual project members has a significant impact on the project's success (Hinze and Plautz, 1988; Marzano, 2004). There are other factors that will help in improving the professional knowledge of a person such as professional training, company training and project training (Hinze and Plautz, 1988); higher education can foster the knowledge required to improve projects' performance (Tatum, 2011). The contractors' experience affects the project quality, job efficiency, project cost and time and owner's satisfaction (Ling, 2004). Therefore, continuous education or training is important in order to raise the knowledge that is required to improve construction project performance.

3 **Summary**

Generally, the measure of any project success (not limited to construction industry) corresponds to the extent to which customer needs are satisfied and the project objectives through time, cost and quality have been met. Cooke-Davies (2002) suggests that the realisation of benefits is essential to establish project success. There are a number of tangible benefits from this research. Firstly, this research culminates into a deeper understanding of the planning process and the factors influencing the project success stem from undertaking a thorough scrutiny is paramount in avoiding project risks in terms of delays, disputes, disruptions and claims during the construction phases. Secondly, a deeper understanding of factors will ensure seamless transition of effectiveness, efficiency and economic project targets are being attained and the planning model should be potentially value-enhance for all the key stakeholders within the design and construction team. Thirdly, this is especially valid for the construction sector, where there is a constant drive to implement time cost quality through innovation, efficiency and effectiveness not only from the individual company perspective but also from a multitude of participants.

Therefore, the cognitive, psychological; and social levels of human reasoning reflect on how people process acquired information. The processing activity involves use of various strategies that a person finds effective in solving current and future situations based on past experiences which offer learning opportunities (Young, 2011). Therefore, memory and knowledge are complementary aspects as they enable people to associate various scenarios in their lives and make both simple and complex decisions based on how they view a situation presented to them. In addition, people take information and expound on it however; this depends on the personal experience since some individuals can simply recall and relate a situation in order to make a decision.

People behave differently depending on their social setting and influencing factors that determine how they communicate and participate in different activities. Therefore,

different psychological development determines the differences in reasoning capacity of each person. The process of communication plays an important role in all the levels analysed above since it involves an exchange of information through the use of language or behaviour. Therefore, it is important to note that through different levels of social interaction, some people acquire power over others. Power gives them an opportunity to influence and manipulate information relayed to others. Personal relationships determine the level of interactions among individuals hence influencing the decision-making process among individuals.

4 Conclusions

This paper has to be framed in a wider research project, which aims to unpack the key factors influencing the planning process and their interactions but also presents a holistic planning model to ensure that planning process is more effective. Organisations can provide additional support on a contingency-basis to meet the project objectives of time cost and quality. The objective of this paper was to present the results of literature review on the planning process, discuss the human factor in detail and to propose a conceptual model with the related research agenda. The model was developed directly from the literature on this topic. It represents an initial attempt at identifying the various elements to be managed within the organisations internal and external environment and how each element interacts within the planning process. The elements that compose the model have been described and a set of further research questions and hypothesis have been proposed.

In conclusion, every construction activity depends on effective planning and scheduling processes. These activities are strongly inclined to the decision-making process by individuals in the building process. The decision-making involves acquiring and processing of information to reach a conclusive outcome. Therefore, this involves analysis of human behaviour and is influenced by available information within their environment and their capability to process the information depending on their brain capacity and ability as individuals. This analysis will involve the determination of the human contribution to the planning process under cognitive, psychological and social levels. The scheduler/planner plays a vital role in developing project plan/schedule. The planning and scheduling process is influence by the scheduler adding human capabilities that cannot be automated such as problem solving, negotiation, linking different department for problem resolution and personal experience and knowledge.

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