Knowledge Management, Intellectual Capital and Project Management: Connecting the Dots

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Abstract: Traditionally, the fields of knowledge management (KM), intellectual capital (IC) and project management (PM) have been studied separately. More recently, scholars have started to call for convergence between these disciplines in order to broaden research interests and opportunities in academia and enhance their value to practice. Following the current trend, the purpose of this paper is to propose a new conceptual model that merges elements of knowledge management (KM), intellectual capital (IC) and project management (PM) and thus connects dynamic (KM), static (IC) and performance (PM) aspects of project-based organisations. It is expected that the proposed model will serve as a valuable theoretical basis for future empirical research of modern knowledge organisations.

Keywords: knowledge management, intellectual capital, project management, conceptual model

1. Introduction

Organisations operating in today's world face increased global competition, technological advances and a knowledge-based economy. To grow and survive in such a world, organisations need to continually learn and transform their knowledge into improved and innovative products and services. Typically, these products and services are delivered as the end results of the organisational project initiatives. The current literature on project management reports a high percentage (up to 70%) of failed projects. These projects are not delivered on time, within budget and/or scope (King 2003, Lewis 2003). Among potential reasons given for such a high project failure rate is insufficient knowledge acquired and transferred from past projects to enhance the success rate of future projects (Yeong and Lim 2010).

The ability to identify and leverage the required knowledge assets plays a critical role in project-based organisations competing in the new economy (Drucker 1993, Stewart 1997). Therefore, companies are facing challenges to better manage knowledge assets in the project's environment. Effective knowledge management is seen as the key to survival and prosperity in the new economy. In order to improve project success and thus increase organisational competitiveness, this paper argues that aspects of knowledge management (KM), intellectual capital (IC) and project management (PM) should be merged. Accordingly, the paper proposes a new conceptual model that combines elements of KM, IC and PM into a single converged model. Prior to this, the paper reviews the existing concepts and frameworks of KM, IC and PM and discusses some past attempts on their integration. It derives the proposed model from the literature presented and discussed in the following sections.

2. Knowledge Management

In order to make sense of the variety of perspectives of KM that exist in literature, there have been a number of attempts to categorise or group them (Holsapple and Joshi 1999, McAdam and McCreedy 1999, Earl 2001, Alavi and Leidner 2001, Handzic 2004). In this paper, we use the notion of "generations" as a context for discussing different types of strategies or schools of KM.

2.1 Three Generations of Fragmented KM Models

The first generation of KM can be described as technocratic (Earl 2001). It views knowledge as an object and places emphasis on the role of information and communication technologies in KM. The systems focus on formalised knowledge bases in which the knowledge of human experts is made explicit so that they can be used by non-expert workers. Knowledge directories and Yellow Pages of experts allow other workers to locate those who have the knowledge they need more easily. KM systems are designed to document knowledge processes and store best business practices. Data captured in shared databases, data warehouses and document management systems are used to support planning and decision making to meet customers' needs. Hahn and Subramani (2000) identify a number of issues and challenges related to the utilisation of information and communication technologies for KM: the need to balance knowledge exploitation and exploration, overload and useful content, additional workload and

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accurate content. There is also a need for flexibility, evolutionary development and user acceptance of knowledge systems.

Second generation KM is orientated towards people and organisations. It emphasises knowledge as a competitive weapon and sees KM as a firm's strategy. Sveiby's (1997) model of Intellectual Capital (IC) incorporates human capital as one of the key knowledge assets from which organisations extract value. Other assets include relational and structural capital. The essence of second generation KM is the pooling of knowledge by networked employees and communities of practice. It focuses on organisational structures and cultures that facilitate knowledge sharing and pooling. It also considers physical spaces for greater facilitation of knowledge exchange. These facilitators are reflected in the concept of "ba" introduced by Nonaka and Konno (1998). These authors suggest that ba (or place) acts as a promoter of the knowledge creation spiral proposed by Nonaka (1998). In general, second generation KM models address issues of organisational culture and learning, change and risk management, and the support of communities of practice.

Third generation KM departs from the earlier held universalistic perspective on KM by arguing that the effectiveness of a knowledge management practice depends on the context in which the knowledge is being used. A number of researchers have taken a contingent theoretical approach to KM and provided considerable empirical support for the view (e.g. Hansen et al. 1999, Snowden 2002, Becerra-Fernandez and Sabherwal 2001; Becerra-Fernandez et al. 2004). Among these, Snowden (2002) holds an interesting position that a bureaucratic context is good as a training environment, communities of practice encourage knowledge exchange through socialisation, informal contexts use stories and symbols to provide shared understanding, while innovative contexts require action and risk taking to impose order on chaos.

The above-mentioned discussion on the groupings of KM approaches shows that KM frameworks encompass a broad range of issues, methods and theories. In addition, a KM survey by Edwards et al. (2003) reveals a significant difference between Eastern and Western approaches to KM. Serious paradoxes are found to exist in KM due to competing unitary views of KM on a variety of concepts leading to a call to look at KM dialectically (Chae and Bloodgood 2004). Ultimately, according to Davenport and Prusak (1998), the full power of knowledge can only be realised by taking a holistic approach to KM.

2.2 Integrated KM Models

Handzic and Hasan (2003) have reviewed a number of projects worldwide that are working on integrated models of KM. The reviews reveal that all integrated frameworks consider KM as a complex and multidimensional concept; synthesise the object and human perspectives of knowledge; view KM as both a social and technological concept; and recognise the evolutionary and contextual nature of KM. In this paper, we use the *context-driver-enabler-process-knowledge-outcome* model adapted from Handzic et al. (2008) and presented in Figure 1 as a basis for discussing the fundamental concepts of KM in a holistic manner.

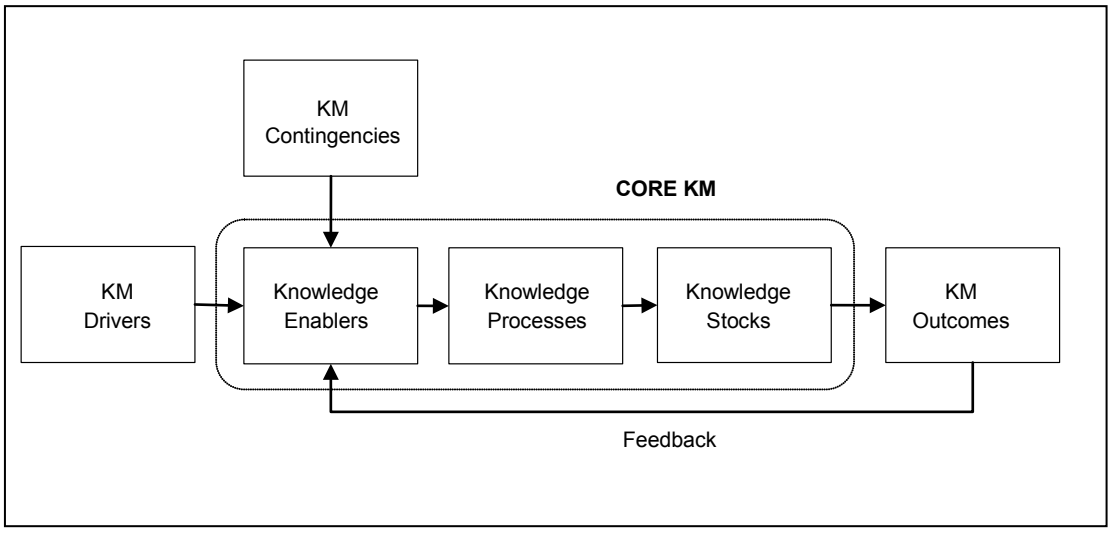

Figure 1. Integrated KM model (adapted from Handzic et al. 2008)

The integrated KM model builds on the author's earlier work (Handzic and Hasan 2003; Handzic 2004) and essentially provides a link between three generations of fragmented KM approaches. The main contribution of the model is that it helps organise various individual factors in a more meaningful way. Figure 1 depicts the model's six main components and their interrelationships. The model distinguishes between core and extended elements.

The model core views KM as configurations of an organisation's socio-technical knowledge enablers, knowledge processes and knowledge stocks. Supported by Nonaka and Konno's (1998) concept of ba, the model brings together technology- and people-orientated approaches to KM. It emphasises the importance of both social and technical factors in enabling and facilitating knowledge processes. Organisational structures, cultures and technologies are believed to be tightly interconnected.

With respect to knowledge processes, the model recognises their dynamic nature. It covers various processes through which knowledge is moved (e.g. transfer person-to-person, person-to-document) and modified (e.g. creative idea generation, mining of hidden patterns in captured data). The underlying assumption is that the better the processes of knowledge generation, sharing, capture and/or discovery, the greater the likelihood that the knowledge needed will be available, leading to more effective and innovative organisational performance.

Since knowledge is seen as the most valuable organisational asset in the knowledge economy, the model core incorporates the knowledge stock component. More importantly, it synthesises different human- and object-orientated perspectives on knowledge and proposes a multidimensional view of the concept (e.g. human, structural and relational; explicit and tacit; know-what and know-how; etc.)

In its extended form, the model recognises explicitly that KM is driven by forces from its surrounding external environment. Acting as strategic levers through which an organisation delivers its desired outcomes, drivers prioritise projects competing for its limited resources. Typical strategic drivers of KM found across business and government entities include operational excellence, stakeholder intimacy, service delivery, growth, sustainable profitability and risk mitigation (AS5037 2003).

Taking into consideration that KM creates value for an organisation in the form of improved productivity, innovation, agility or reputation, the extended model incorporates the component of KM outcome. While it may be hard to identify all the immediate benefits from a KM initiative, organisations need to get some feedback on the degree to which KM fulfils their articulated drivers.

Finally, the extended model promotes a contingency view of KM, which argues that no one solution is best under all circumstances. Various knowledge task, environment and worker related factors influence the "right" choice. Organisations need to select among multiple possible paths the one that best fits their particular set of circumstances.

Overall, the integrated model points to the importance of KM consciousness in a firm's business strategy. The major challenge for an organisation is to develop a knowledge management solution that will enable knowledge workers to effectively perform their tasks within the organisational context. The special focus of this paper is on KM in the project's environment, more specifically on enhancing project success.

3. Intellectual Capital

In management literature, the term intellectual capital (IC) refers to intellectual material in its various forms that drives growth and value creation for an organisation. The term is synonymous with intellectual assets, intangible resources and knowledge capital (Guthrie, 2001). One of the most recent definitions of IC describes the concept from the static "stock" perspective as "the sum of all the intangible and knowledge-related resources that an organisation is able to use in its productive processes in the attempt to create value" (Kianto et al., 2014). These resources may include professional skills and experience of people, organisational technologies and features embedded in organisational processes, as well as the relationships with customers that the organisations draw upon to convert to profit and achieve competitive advantage (Evidson and Malone, 1997; Sullivan 1998).

While the majority of KM literature addresses the mechanisms by which knowledge resources can be managed, IC literature examines primarily the kind of intangible resources that contribute to value creation. Typically, stocks of knowledge assets are divided into human (people), structural (organisational) and relational (customer) capital. To date, this remains the most popular categorisation of IC (Edvinsson and Malone, 1997; Stewart, 1997). However, more recently, multidimensional views are being suggested of human capital consisting of the abilities of management and

human resource capabilities; structural capital covering innovation and internal process capabilities; and relational capital involving networking capabilities and customer loyalty (Molodchik et al., 2014). Other dimensions seen as plausible parts of organisational IC include renewal capital in terms of innovative products and services; trust capital in terms of internal and external relationships; and entrepreneurial capital in terms of competence and commitment to entrepreneurial activities (Kianto et al., 2014).

The overall IC can be viewed as a raw material, a measurable and categorisable asset or resource for organisational value creation (Stewart, 1997). IC can create or add value to an organisation, its customers and stakeholders by synergistic combinations and interactions among human, structural and relational capital (Bontis, 1998). However, different organisations may require different types and combinations of knowledge assets. Hence, an important challenge for a company is to determine which knowledge assets are best suited for its particular needs.

3.1 Organisational IC Assets Portfolio

Every organisation possesses valuable intellectual materials in the form of data, documents, procedures, capabilities, etc. These can be found in people, organisational structures and processes, and customer relationships. To succeed, organisations need to have a clear understanding of which knowledge assets are important to their success and how these assets are distributed over different parts of the company and among different functions and workers. According to Grant (1991), the portfolio of knowledge assets is typically determined by an organisation's strategic plan. The following sections present some examples of knowledge assets under each IC category: human capital (people), structural capital (organisational capital) and relational capital (customer capital).

Human capital refers to human intellect of organisations' employees. Bontis (1998) defines the concept as a combination of employees' genetic inheritance, education, experience and attitudes. It has been recognised that a significant proportion of a company's knowledge assets is often stored in the minds of its employees. When organisational knowledge is concentrated in the minds of highly skilled individuals, they can become irreplaceable and their departure from the company may create gaps that are difficult to fill. Therefore, vital people's competencies need to be carefully identified and evaluated. In general, human capital is considered as an important source of organisational innovation and strategic renewal. According to Handzic and Zhou (2005), the success of many projects and strategies depends not only on the individual abilities of knowledge workers, but also on whether different knowledge workers and different components in the knowledge base can be combined efficiently. Collective knowledge is more than the sum of individual knowledge. It is particularly important for the long-term survival and success of a company.

Structural capital deals with systems and procedures, mechanisms and structures of an organisation that can help support employees in their actions and performance, and thus business performance (Bontis, 1998). This kind of organisational knowledge is usually manifested in the organisation's behaviours: its culture, infrastructure, purpose and strategy (Handzic and Zhou, 2005). An organisation's culture comprises basic assumptions and beliefs that govern participants' activities; infrastructure regulates participants' roles and relationships between co-workers; and purpose and strategy define an organisation's mission, vision, objectives and a plan to achieve its purpose. Some organisational knowledge is manifested in the form of artefacts. Examples include books, memos, business plans, manuals, patents and products (Handzic and Zhou, 2005). A knowledge artefact embodies that knowledge in an object, thus facilitating its preservation and sharing.

Relational capital represents external organisational links. It is a valuable asset of an organisation due to external environment intangibles, such as the knowledge embedded in customers, suppliers, the government or related industry associations (Bontis, 1998). Such knowledge can become a critical factor in determining a firm's competitive edge in a mature and highly competitive market environment (Handzic and Zhou 2005).

3.2 IC and Organisational Performance

In his exploratory work on IC measures and models, Bontis (1998) proposed and empirically tested several model specifications relating different dimensions of IC to the business performance of an organisation. The model specification presented in Figure 2 proved to be the best fit to empirical data. The main contribution of this model is to show that that there must exist an interplay among human, structural and customer capital in order for an organisation to leverage its knowledge base. According to Cabrita and Vaz (2005), the more IC components interact, the more value is generated. Isolated stocks of knowledge that reside in the employees' minds that are not turned into organisational knowledge will not significantly affect business performance.

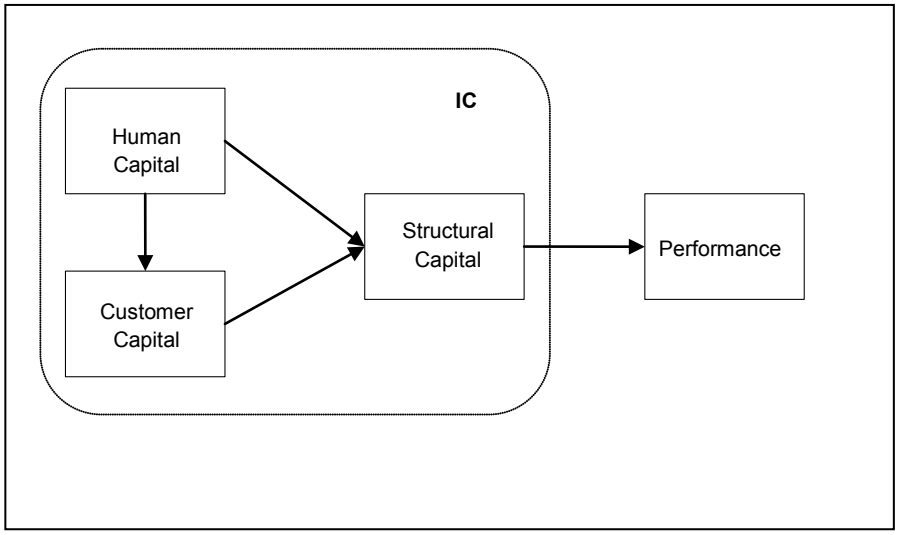

Figure 2. Model of IC impact on performance (adapted from Bontis, 1998)

In this paper, the special focus is on IC in the project environment. The prime objective is to identify which IC components represent the most valuable project assets and determine how they interact to enhance project success. Therefore, the next section reviews the relevant literature on the concepts of project management (PM).

4. Project Management

A project can be defined as an achievement of a specific objective, which involves a series of activities and tasks which consume different resources. It should be completed within a defined specification, having definite start and end dates (Munns and Bjeirmi 1996). According to Lowery (1994), a project is a set of activities related to a particular period of time that end by a specific accomplishment. Morley (2006) finds that ISO 10006 stipulates that a project is a unique process that consists of a set of coordinated and controlled activities, undertaken in order to achieve an objective in accordance with specific conditions such as time, costs and resource constraints. A similar definition is given by Diallo and Thuillier (2005), who say that a project is a complex and temporary organisational system that produces goods or services contributing to satisfying a goal on time, within budget and with respecting its specifications (Zouaghi and Laghouag 2012).

Of particular interest for this paper is the information system (IS) project. An IS project can be considered as an IT enabled system intended to meet the information processing needs of an organisation. IS can also be characterised as a socio-technical system. There are three characteristics that make IS different from non-IS projects that organisations undertake. These are: (a) IS projects are unique in that they require intense involvement and collaboration of three groups of stakeholders: IS staff, end users, and management. Therefore, IS projects are sets of group-oriented activities, organised and executed in teams. (b) IS projects tend to be conceptual in nature. For that reason, they are very often subject to risks and uncertainties associated with them, if they are difficult to assess with any degree of reliability prior to their start. Those risks can come from the project, its nature, team or their knowledge. (c) IS projects depend on substantial capital and human resources (Ewusi-Mensah 1997).

Project management (PM) is an important aspect of IS implementations. Its focus is on making sure that the project goes in the direction which will make it meet the success criteria. It covers planning, organising, leading and controlling project implementation by taking into account its different characteristics. Lewis (2006) defines PM as the application of knowledge, competences, tools and techniques in project activities in order to fulfil the assigned requirements. This fulfilment is attained through the application and integration of initiation, planning, implementation, monitoring, control and closure processes of the project (Zouaghi and Laghouag 2012). PM uses numerous methods and techniques to accomplish its goal. Charvat (2003) also defines PM as a set of tools, techniques, and knowledge that, when applied, helps the three main goals of scope, cost and time to be achieved (White and Fortune 2002, Hoffer et al. 2008, Attarzadeh and Ow 2008).

4.1 Process Aspect of PM

For IS projects, the process of phases and activities undertaken during their development is defined based on the Software Development Life Cycle (SDLC) models, such as those proposed by Kumar et al. (2013), IBM (2012) and Hoffer et al. (2008).

According to Kumar et al. (2013), the exact sequence of steps in a software development life cycle can depend a lot on the methodology used, but in general all of them come down to five main phases: requirement analysis, design, coding, testing and maintenance.

According to IBM (2012), the SDLC is also comprised of five phases, but organised differently than in Kumar et al. (2013). These phases are: planning, implementation, testing, deployment and maintenance. For smaller teams these steps may occur unconsciously, with individuals being involved in more than one role. However, for larger organisations, where hundreds or thousands of individuals can be devoted to one project, the SDLC becomes a valuable tool for the project development process (IBM 2012).

Hoffer et al. (2008) organise the SDLC as a set of following phases: planning, analysis, design, implementation and maintenance. They highlight the following four steps: analysis, design, code and test as the heart of the IS development process. Furthermore, Hoffer et al. (2008) warn that the SDLC should not be considered as a sequentially ordered set of phases, because the specific steps and their sequence should be adapted as required for a project, consistent with management approaches.

Based on the comparison of similarities and differences between the phases in the above-reviewed approaches, three common aspects of the project process have been identified, namely (1) project planning, (2) project execution and (3) project verification.

During the planning phase, the goal and vision of a project are determined, as well as the business requirements based on customers' requests, market projections, the competitive environment and other business drivers, and time and budget parameters. After the project business goal is set, the responsible team members proceed with the feature requirement analysis, prioritising the partial tasks to be done during the development phase and making the final project plan.

The execution phase that comes right after planning combines design and coding activities. It involves architecture design, coding, code review and source control. Its goal is to move the problem domain towards the solution domain, so as to transform the requirement specification into structure. The design phase converts the description of the recommended solution into logical and then physical system specifications. During this phase the software architects evaluate the project and make relevant decisions about the best model to use for development and the best programming language. Once the decisions are made, the coding starts.

The final phase focuses on code verification activities, as well as the overall status of the project, the amount of work completed, the quality of work, actual costs compared to budget costs, how much time has elapsed and how much time is necessary to complete remaining work, etc. It becomes clear whether some adjustments need to be made if a problem arises during programming, or potential risks can be predicted that could have a negative effect on one of the project success parameters.

4.2 People Aspect of PM

None of the process phases explained in the previous section would be possible without people – people requesting projects, building them and monitoring them. Sambamurthy and Zmud (2014) classify people involved in the project development process from its starting to ending point into three groups: people internal to the project, people internal to the organisation and people external to the organisation.

People internal to the project include project manager(s) and team members. Project managers are responsible for achieving project outcomes and planning, organising and controlling project tasks, while team members are responsible for achieving the project task outcomes (Sambamurthy and Zmud, 2014).

People internal to the organisation are internal end users (employees), project sponsors, co-workers, business/IT senior managers, business/IT middle managers (Sambamurthy and Zmud, 2014). Internal users use project outcomes

or are affected by them. They gain benefits or suffer losses from project outcomes. Sponsors provide funding, specify project outcomes and provide political support. Co-workers possess project-relevant expertise and perspectives. Senior IT managers hold funding and resource allocation rights, while middle IT managers hold direct authority over project team members and control access to needed resources.

People external to the organisation are external end users (customers and suppliers), subcontractors, vendors and IT service providers, strategic partners and regulatory bodies (Sambamurthy and Zmud, 2014). External end users are the people who requested the project and gain benefits or suffer losses from project outcomes. Subcontractors carry out the project tasks. Vendors and IT service providers supply project resources and carry out project tasks. Strategic partners collaborate on project activities, and regulatory bodies specify project outcomes and constrain project activities.

4.3 Critical PM Factors and Project Success

Project success or failure is the ultimate outcome of project management. According to Kumar et al. (2013), Bakker et al. (2009), Hoffer et al. (2008), Attarzadeh and Ow (2008) and many other researchers in the field of information systems, a quality and successful system, that is delivered on time, within budget and within scope, is achieved by following the systems development life cycle (SDLC) guidelines. In addition to the importance of this traditional concern of PM, some researchers such as Sambamurthy and Zmud (2014) also pointed out the importance of people-related PM factors for the ultimate project success.

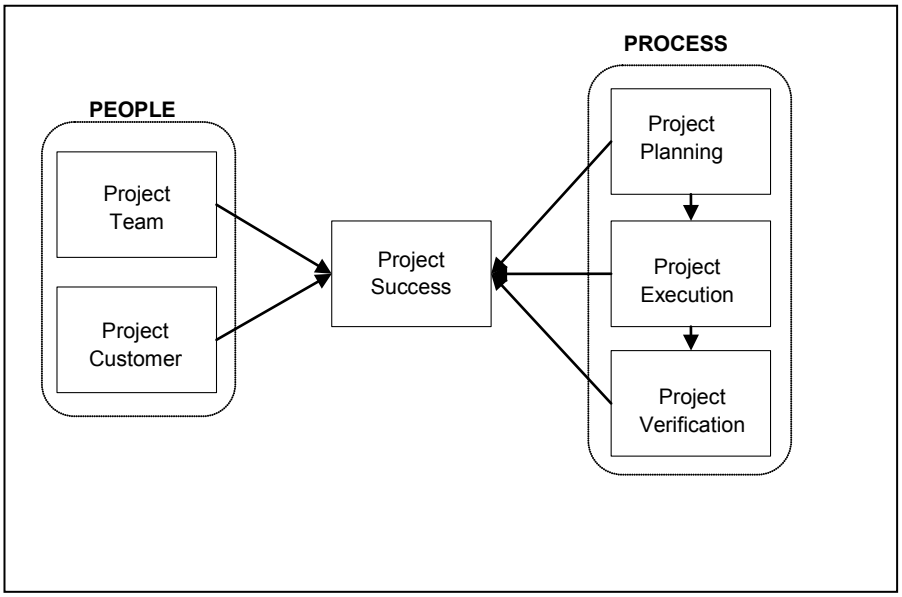

Figure 3. Critical PM factors model of project success

Figure 3 illustrates a model that includes critical PM factors (i.e. project people and process) and shows how they influence project success. In summary, project people include the project team and project customers involved in project development; the process aspect is defined by planning, execution and verification phases; while project success represents the desired outcome of PM in terms of time, budget and scope parameters.

5. Merging KM, IC and PM

There have been a number of recent attempts by various scholars to develop theoretical models connecting KM and IC, as well as KM and PM. Among those arguing the connections between KM as dynamic and IC as static perspective on knowledge, Kianto et al. (2014) proposed several alternative models on how these knowledge-based issues affect organisational performance. In some proposed options, KM practices moderate or mediate the effect of IC assets on performance. In other options, IC assets moderate or mediate the effect of KM practices on performance. Based on the existing litarature, differing conceptual, theoretical and empirical arguments were presented for each option.

The view concerning the manner in which KM practices and IC assets interact in organisational value creation adopted in this paper is based on Handzic's view (2008). The assumption here is that greater utilisation of KM practices results in either creation of new or enhanced levels of existing knowledge stocks (IC assets), leading to innovative or improved performance as the ultimate KM outcome.

Advocates of KM integration with PM claim that it is necessary to enable the people involved in the project to combine individual contributions to the project's objectives and align them with the organisation's strategic objectives (Levin 2010). So far, several attempts have been made to combine aspects of KM and PM in order to improve project success.

For example, Cope et al. (2006) proposed that organisations would benefit greatly from capturing and sharing knowledge within the project management community. Similarly, Lierni and Ribiere (2008) recognised that in the project environments, knowledge comes primarily from explicit knowledge sources, but suggested that project managers could strongly benefit from sharing tacit knowledge associated with the management of former projects. Furthermore, Owen (2008) proposed that knowledge is embedded throughout the project life cycle at both tacit and explicit levels. According to her, tacit knowledge is developed and transferred via mentoring from project members with more experience, while explicit knowledge is reused in terms of project documentation captured during the project life cycle.

Expanding on this, Ismail et al. (2009) developed a model that relates motivational factors with knowledge- sharing behavior and project success. Their model suggests that providing appropriate motivators will lead to more efficient and effective knowledge sharing in projects, which in turn will lead to increased likelihood of project success. Furthermore, in modelling the role of KM in PM, Gudi and Becerra-Fernandez (2006) identified many external (e.g. political, economic) and internal (e.g. innovation, complexity, coupling) factors that affect project risk in organisations. Then, they proposed that KM mechanisms and technologies contribute to project success by influencing the project team's adaptation to project risk. Finally, Yeong and Lim (2010) proposed several common factors that influence both KM and PM. These include culture, process and technology. In addition, they suggested that the alignment of KM and PM and continuous feedback enhance project success.

5.1 Proposed Merged Model

Based on the literature on KM, IC and PM reviewed in previous sections, a new conceptual model is introduced here which combines factors from all three fields in a way that can increase the rate of project success in organisations. The proposed model is presented in Figure 4.

Figure 4 shows a set of interrelated model components derived from KM, IC and PM frameworks presented earlier in Figures 1, 2 and 3. From KM, the proposed model adopted contextual contingencies and drivers of KM, as well as KM practices comprising socio-technical knowledge enablers and processes. From PM, the model adopted people (project team and customer) and process (project planning, execution, verification). elements as critical IC dimensions, and project success as PM, as well as KM outcome component.

With respect to relationships, the proposed model recognises that various motivational forces (Ismail et al., 2009) and contextual contingencies (Gudi and Becerra-Fernandez, 2006) drive and influence the choice and application of KM practices in PM and thus indirectly impact project success.

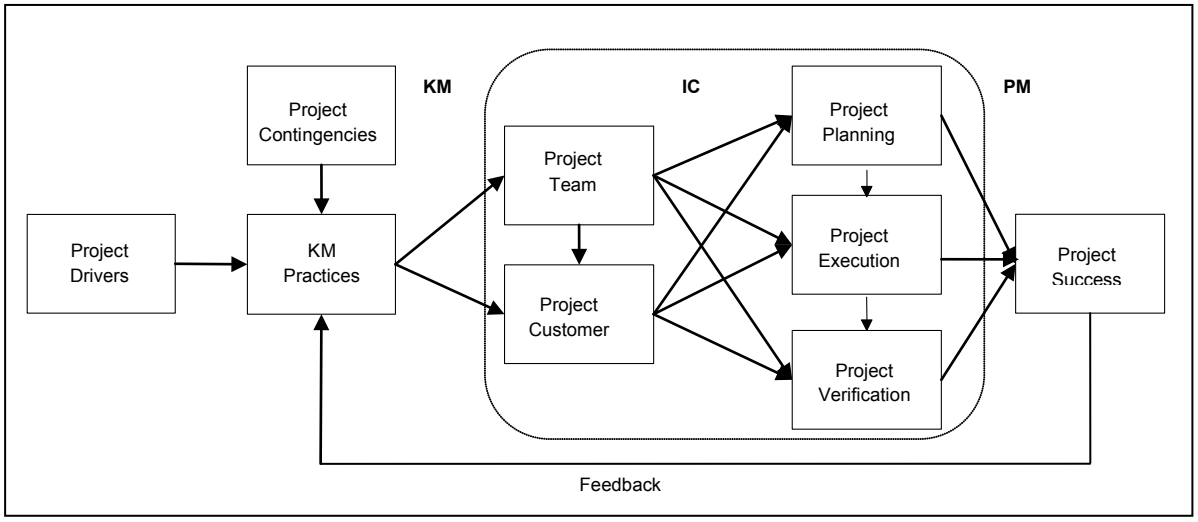

Figure 4. Proposed Merged Model of KM, IC and PM

The model further proposes that KM practices in terms of various social and technical knowledge enablers and knowledge processes foster the development of the project team's competencies and relationships with a project customer. Two most frequently mentioned practices include transferring of tacit knowledge via mentoring and explicit knowledge via documenting (Owen 2008, Cope et al. 2006, Lierni and Ribiere 2008).

Next, the model proposes that the project team and project customer jointly influence the project process, which in turn affects project success. From the IC perspective, human and relational capital (project team and customer) contribute to performance (project outcome) indirectly via structural capital (project process). Thus, in the proposed model, project process (as a structural capital) represents a key factor that can enhance project quality and success.

Finally, the model proposes a feedback loop to indicate the need for continuous development of both tacit and explicit knowledge assets in the project environment. Each project should build on these (Levin 2010).

6. Conclusion

The main purpose of this paper was to respond to the recent calls for a new generation of conceptual models that would converge KM with other disciplines. This is acomplished by proposing one such model that merges knowledge management (KM), intelletual capital (IC) and project management (PM) aspects. Based on the review of relevant literature in these fields, the proposed model was developed to suggest the way in which the fusion of KM, IC and PM can enhance project success. Essentially, it involves fostering the development of project team and customer knowledge and relationships through suitable KM practices and their application in the project life cycle. The model also emphasises the importance of continuous feedback from projects for innovative knowledge creation. By developing a new conceptual model, this paper makes a significant contribution to multiple fields of study. More importantly, it provides a foundation for conducting further empirical research to better understand the value of knowledge stocks and flows for project-based organisational performance.

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