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# **Intellectual Capital and Innovation in Construction Organizations: A Conceptual Framework**

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## **INTELLECTUAL CAPITAL AND INNOVATION IN CONSTRUCTION ORGANIZATIONS: A CONCEPTUAL FRAMEWORK**

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### **ABSTRACT**

The role of knowledge resources in the success of the innovation process in organizations has been emphasized with some researchers noting the relevance of organizations' intellectual capital (IC) as an underlying mechanism that impacts the capabilities of organizations for innovation activity. This necessitates the need to better understand such a relationship for effective innovation management practices in organizations. There is, however, a dearth of studies that explore the relationship between intellectual capital and its subtypes with the pursuit of explorative and exploitative innovation by organizations. Whilst some studies have linked different conceptualizations of innovation (e.g. incremental vs. radical) with intellectual capital, these studies have failed to explore how intellectual capital impacts organization's ability to pursue explorative and or exploitative forms of innovation or how subtypes of intellectual capital differentially impact the explorative and or exploitative innovation capability of organizations. Attempts at connecting the two have come from anecdotal evidence from case studies. This paper draws on the theories of intellectual capital and ambidexterity to develop a conceptual framework of how intellectual capital across different levels of an organization and its subtypes individually or in combination relate to or facilitate the innovation capability of organizations. Innovation is conceptualized as the ability of organizations to pursue explorative and or exploitative forms of novel ideas, a departure from the traditional incremental vs radical typology of innovation. Improving the explorative and or exploitative innovation capability of organizations through its intellectual capital in the end will be dependent on gaining a deeper insight into the intellectual capital profiles of organizations as well as the mechanisms through which such profiles impact an organization's explorative and or exploitative innovation capabilities.

**KEYWORDS:** Innovation, Intellectual Capital, Exploration, Exploitation

### **INTRODUCTION**

Innovation has been deemed to give an avenue to organizations to distinguish their products and services from others serving as an alternate strategy to competition in terms of cost (Dulaimi et al., 2005; Slaughter, 1998). In construction it presents an opportunity for organizations to improve on their final products and performance. The proper management of innovation in construction organizations results in the achievement of project outcomes, and the ability of organizations to be competitive in the dynamic environment requires the development of capabilities for innovation (Gajendran et al., 2013; Sexton & Barrett, 2003). The role of knowledge in the success of the innovation process in organizations has been emphasized in the extant literature. Not only is knowledge recognized as a great source of wealth to organizations (Dougherty, 1999; Porter, 1990), but it is a vital organizational and project resource, giving leverage in terms of both organizational innovations and the success of projects (Egbu, 2004). Management of knowledge has been suggested to be a process of creating value for organizations whilst others such as Stewart (1997) have underscored how

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new products and services are an embodiment of knowledge. Yet others are of the view that innovation is a process of managing knowledge (Subramaniam & Youndt, 2005), denoting intricate knowledge management processes of identifying and using new ideas, opportunities and tools for the creation of new and enhanced products and services (Andriopoulos & Lewis, 2009). Researchers have noted the relevance of organizations' intellectual capital (sum of knowledge used to achieve competitive advantage) as an underlying mechanism that impacts the capabilities of organizations (Bontis, 1996, 1998; Morris & Snell, 2011; Nahapiet & Ghoshal, 1998; Subramaniam & Youndt, 2005).

Understanding of the role of knowledge, particularly tacit knowledge in innovations, in construction organizations has been suggested to be limited (Egbu, 2004). This necessitates the need to understand the relationship that exists between intellectual capital as a form of knowledge, and innovation in attempts to improve innovation management practices in organizations. How intellectual capital as a form of knowledge gets accumulated and utilized and its association with explorative and exploitative innovation activity or capability is less explored. More therefore need to be done to understand the precise nature of how such knowledge assets are connected to different forms of innovation (Subramaniam & Youndt, 2005). The connection between knowledge and innovation has not been direct as empirical studies have often treated knowledge and innovation as moderating and or mediating variables for models of performance. This has left the mechanisms of the relationship between knowledge (embedded in individuals, groups and networks or in organizations) and innovation or its different forms unspecified and especially so in the project based environment.

Some studies have linked different conceptualizations, such as incremental vs radical, with knowledge or intellectual capital (e.g. Subramaniam & Youndt, 2005). Not only did such studies fail to relate IC with explorative and exploitative innovation capability of organizations, such studies are also limited to product development manufacturing organizations (Ahuja, 2000; Delgado-Verde et al., 2011; Dumay et al., 2013; Subramaniam & Venkatraman, 2001; Subramaniam & Youndt, 2005). The findings of such studies may not be applicable to construction given the context specificity of innovation (Newell et al., 2009; Reichstein et al., 2008). Indeed, some researchers (e.g. He & Wong, 2004) have argued that what constitute explorative and exploitative innovation may differ between high technology intensive organizations where there is much R& D and low technology intensive that engage in less R&D and where innovation is often for problem solving using new knowledge, methods and techniques or reuse and refinement of existing technologies and methods.

The knowledge gap in the relationship between IC and exploitative and explorative innovation calls for more studies on intellectual capital and its outcomes as well as similar studies in other industrial settings other than manufacturing or high technology intensive organizations. For instance, Martín-de-Castro et al., (2011) have called for an increase in empirical studies on the effects of intellectual capital in organizations and more specifically, a deeper understanding of how intellectual capital management impacts innovation. Lavie et al., (2010) also propose the need to explore the antecedents of exploration and exploitation and more specifically how different resources facilitate exploration and exploitation in organizations. These are consistent with the need for a systematic study of how intellectual capital and its subtypes as a form of knowledge resource impact the explorative and or exploitative innovative capability of organizations in attempts to gain competitive advantage.

Lu and Sexton (2006) through a single case study looked at how knowledge capital impacts innovation in small professional service organizations. Such a study offers anecdotal evidence that is context specific, limited to the circumstances of a single organization and might not be generalizable to other organizations in the industry which are of different size or other than professional service organizations. Reliance on such studies inhibits more holistic

and empirical insights. There is the need to strengthen the theory that links IC and innovation which are considered to be meta- narratives formulated at high levels based on generality, and relationships often not derived from empirical research (Dumay et al., 2013).

Some researchers (e.g. Youndt et al., 2004) have suggested the need to know the full profile of an organizations intellectual capital in the form of an aggregate rather than its individual parts to get a better understanding of its development and effects on organizational outcomes. This notwithstanding, such dimensions or their possible sub-dimensions might affect organizational outcomes in different ways. For instance, Morris and Snell (2011) suggests that within the categories of intellectual capital are possible dimensions that depend on the context and that the challenge is to identify which dimensions of intellectual capital might be linked to specific capabilities or how such resources might serve to complement each other in impacting such capabilities. This fits to the RBV stipulation of realizing the value of resources when bundled with other resources. It will be worth exploring how intellectual capital or its archetypes impact the explorative and exploitative innovation capability of organizations which is largely lacking in extant literature and specifically so in construction management literature on innovation. Such explorative and exploitative forms of innovation are expected to draw differently on the knowledge or intellectual assets of organizations.

This paper draws on the theories of intellectual capital and ambidexterity to propose a framework of how intellectual capital and its subtypes relate to different forms of organizations innovation capabilities. Rooted in the resource and knowledge based views of the firm intellectual capital is conceptualized as the knowledge assets of the organization across the levels of the individual, relationships and the organization at the strategic level. Innovation, on the other hand, is conceptualized as being explorative and or exploitative, which departs from the traditional conceptualization of innovation as being either incremental or radical. The framework takes innovation from a capability perspective, allowing the possible exploration of the theoretical and empirical evidence underpinning the relationship between intellectual capital and its subtypes with the innovation (explorative and or exploitative) capability of organizations. Finally, the framework is outlined and a research agenda introducing organizational and environmental factors that potentially mediate and or moderate the intellectual capital-explorative/exploitative innovation relationship. A number of hypotheses that can be generated from the proposed framework are also outlined

## **INTELLECTUAL CAPITAL IN ORGANIZATIONS**

The resource based view is criticized for being too general with some researchers questioning how to conceptualize and measure a concept that emanates from the interaction of resources that are intangible and or unobservable. These concerns raise questions regarding the lack of specificity of the resource based view and hence its legitimacy as a theory making it difficult to test empirically (Reed et al., 2006). This has resulted in some researchers (e.g. Peteraf & Barney, 2003) adopting a pragmatic approach by proposing the intellectual capital based view of the firm which is a narrow mid-range theory representing a specific aspect of the resource based view and deemed to lend itself to hypothesis development and testing. Others propose it as attempts to develop much more specific classification systems for better categorization and understanding of knowledge in organizations.

Intellectual capital has been interpreted in a myriad of ways and a number of definitions have been put forward. Intellectual capital is considered as an organizations' knowledge stock embedded in individuals, teams/groups/networks as well as organizational routines, systems and processes (Kang & Snell, 2009; Starbuck, 1992). Other researchers

consider it as the sum of all the knowledge an organization utilizes to achieve competitive advantage (Nahapiet & Ghoshal, 1998; Youndt et al., 2004). To this Youndt et al. (2004) suggest that the sum of knowledge implies knowledge that exists at different levels within and outside an organization and such knowledge must be leveraged to be considered as intellectual capital. They go on to define intellectual capital as “the sum of all knowledge an organization is able to leverage in the process of conducting business to gain competitive advantage”. Brooking consider it as the combination of intangible assets that allows the firm to operate whilst Bontis (1998) describe it as the stock of knowledge in the firm despite acknowledgement of the fact that often the most precious knowledge in the firm is the one that cannot be passed on. Stewart (1998:67) define intellectual capital as “knowledge that exist in an organization that can be used to create differential advantage. These suggest that intellectual capital represent the stock of knowledge, intangible assets, resources and capabilities that help with the development of the processes of organizations and make it possible to achieve competitive advantage (Martín-de-Castro et al., 2011).

### **Components of Intellectual Capital**

There have been myriad propositions regarding what constitutes intellectual capital. The focus has been to define the subcategories of intellectual capital to the extent that such components are at times considered as independent constructs resulting often in loss of sight of intellectual capital as a whole. Considering subcategories as discrete unidimensional constructs in themselves tend to result in its simplification of reality which fails to acknowledge the possible patterns of coexistence among such dimensions. Edvinsson and Malone (1997) consider IC as a two level construct that comprises of human capital and structural capital. This also consists of organizational capital and customer capital. In another conceptualization proposed by Stewart, 1997, customer capital is on equal footing with structural capital rather than being subsumed by it. Bontis (1996) has referred to customer capital as part of relational capital, and others also propose internal social capital or the capital gained from relationships between employees and superiors in the same organization (Nahapiet & Ghoshal, 1998). Reed et al. (2006) propose a more succinct but encompassing summary of the components of intellectual capital as comprising human capital, organizational capital and, internal and external social capital. This is consistent with the conceptualization by Youndt et al. (2004) who proposed and developed a three dimensional scale for the measurement of intellectual capital across different industries, and argue for the use of organizational capital as more fitting rather than structural capital due to the fact that such is knowledge that is owned by the organization.

#### *Human Capital*

Human capital is considered to comprise of the knowledge, skills, experience as well as abilities of individuals that are utilized to achieve organizational outcomes (Morris & Snell, 2011; Schultz, 1961) with experience considered the key component in the theory of human capital. The collective experience of members of a subunit or team is can be considered as an indicator of the level as well as the type of human capital such units possess. This is rooted in the notion that people work or are educated in certain settings, and gain experience that results in human capital that can be applied to execute specific tasks (Morris & Snell, 2011). Such individual knowledge and experience serve as the source of ideas and knowledge creation in organizations (Nonaka & Takeuchi, 1995). Organizational learning researchers (e.g. Argyris & Schon, 1978; Nonaka, 1994) suggests that organizations in themselves do not create knowledge but human capital are the origins of knowledge. Individuals in organizations are the ones who question prevailing norms and search for

solutions that are fundamentally different from preserved knowledge, to deal with existing problems. Individuals are the repository of diverse knowledge and offer flexibility in the acquisition of new skills (March, 1991). Human capital is crucial in the exposition of organizations to the boundaries of new technology, increasing the ability to absorb and use knowledge from a myriad of domains. The hallmark of human capital is the existence of bright, creative and skilled employees with the expertise in their roles and functions that serve as the source of novel ideas and knowledge in organizations (Snell & Dean, 1992; Subramaniam & Youndt, 2005).

Human capital has been categorized as either specialist or generalist (Kang and Snell, 2009). Whilst specialists have deep localized knowledge that embodies domain specific knowledge, generalists, on the other, hand are multi-skilled with a versatile stock of abilities (Kang and Snell, 2009; Kang et al, 2012). The multi-skill characteristic of generalists is considered to develop flexibility in mental models that are less entrenched in specific perspectives and can be subject to adjustment in different situations (Bunderson and Sutcliffe, 2002) or broadly positioned in varied knowledge domains (Kang et al, 2012). Generalists are deemed to have more integrated and diverse knowledge, with specialists, on the other hand, being more effective in the acquisition and assimilation of new in-depth knowledge within a narrow range of parameters (Brown and Duguid, 1991). Generalists are less prone to functional bias with the capacity for varied interpretations of problems (Bunderson and Sutcliffe, 2002). The same cannot, however, be said of specialists who are more prone to functional bias, often unwilling to exchange and combine new knowledge beyond their specialized area. Specialist human capital has to do with domain or technical expertise which in the context of project-based environments can include: technical domain knowledge (e.g. of a specific technology, technique, professional specialization) and project management knowledge (skills, knowledge of essential tools, techniques and procedures, qualifications and training) (Turner et al, 2015). Generalist knowledge in such contexts includes prior experience, a broader experience in managerial roles and an understanding of projects in the broader context of the business strategy, firm operations and industry or market.

### *Social Capital*

Social capital can be described as a network of interrelationships among individuals that help with knowledge exchange and integration within an organization (Kang & Snell, 2009). Social capital has had different conceptualizations but there is a wide acceptance of three dimensions: structural, affective and cognitive (Adler & Kwon, 2002). According to Adler and Kwon (2002), the structural dimension signifies the configuration of the network or the pattern of the interconnections that exist among individuals. The affective dimension addresses the relationship aspects of interpersonal exchanges such as trust, motives and expectations among individuals in a network whilst the cognitive dimension emphasizes the relevance of the shared systems of meaning, understanding and representation. These dimensions are deemed to complement each other in the provision of opportunity, motivation and ability to exchange knowledge. Social capital as a dimension of intellectual capital is rooted in knowledge management and is the knowledge capital that results from relationships and network of interactions among a group of people (Youndt et al., 2004). Social capital resides in the pattern and structure of interaction between individuals as well as the norms and values associated with them (Morris & Snell, 2011). This suggests that social capital is structurally based and found in social interactions as well as cognitively based, found in the norms and values. It is knowledge that is embedded within and utilized by individuals through a network of interrelationships serving as a means by which knowledge is exchanged and combined within the organization. Thus, social relationships facilitate the sharing of

insights, knowledge and mental models, which help organizations combine the varied knowledge among employees (Kogut & Zander, 1992; Nahapiet & Ghoshal, 1998).

Social capital is regarded as less impacted by the movement of individual network members and therefore, there is the preservation of the norms, sharing and interaction even with the changes in personnel. It acts as conduits for knowledge exchange, facilitating the leveraging of human and organizational capital. Such knowledge evolves through social interactions among individuals or groups that do not follow any laid-down rules in order to share, access or engage in transactions of information (Youndt et al., 2004). Social capital is crucial for the preservation and renewal of knowledge as the quality of interactions and relationships improve, impacting the update and reinforcement of knowledge. As Subramaniam and Youndt (2005) put it social assist in the process of iteration, making it possible for teams to refine existing knowledge, as well as draw on it. Such a role suggests that social capital helps in the reinforcement of knowledge in the organization through the codification of updated knowledge among or within social groups.

Social capital has been described as either cooperative or entrepreneurial. In the description of Kang and Snell, (2009) cooperative social capital represents a social system that is tightly coupled with strong and dense networks of inter-connections. Entrepreneurial archetype of social capital is characterized by weak, often redundant relational networks where members share a common piece of knowledge that is more a reflection of their shared technical, professional and operational knowledge. Such an archetype of social capital can facilitate flexibility required in the acquisition and absorption of new knowledge, techniques and technologies but with the potential to obviating needed efficiency (Kang et al, 2007). In effect cooperative social capital involves the existence of strong ties among colleagues for the efficient sharing of knowledge whilst entrepreneurial social capital is about having access to a myriad of contacts from whom knowledge and expertise can be accessed when needed without necessarily having a close social relationship (c.f. Turner et al, 2015).

### *Organizational Capital*

Organizational capital depicts the knowledge in processes, systems, structures, as well as behavior, norms, mental maps, core competencies and culture influencing outputs in the organization (Egbu, 2004). Organizational capital is context specific and relates to the internal structure and organization in a firm. Organizational capital also consists of codified experiences and institutionalized knowledge that remain in the firm and used through databases, to codify and preserve knowledge and to create routines, processes and procedures for continuous and repeated usage (Youndt et al., 2004). This knowledge is institutionalized through the codification of established structures, processes and routines (Kang & Snell, 2009). Unlike human capital, organizational capital is less affected by employee turnover as knowledge and its associated capital, processes and systems are institutionalized. The creation and preservation of organizational capital is largely through structured guidelines that manifest in manuals and databases used to accumulate and retain knowledge (Reed et al., 2006; Subramaniam & Youndt, 2005). This makes the knowledge in organizational capital much more bounded within set parameters as well as accumulated to be utilized in established ways. Organizational capital is considered as having its roots in the unique context characterized by the organization's internal as well as external position which defines how the organization positions itself and capabilities.

Kang and Snell, (2009) propose two archetypes of organizational capital: mechanistic or organic. Whilst the mechanistic archetype involves detailing routines (standard rules, procedures and structures for coordination) the organic type of organizational capital is where there is loose or simple routines, an offer of priorities, vision and boundaries within which individuals and teams must work (Eisenhardt and Martin, 2000, Nelson and Winter, 1982).

This is more of a culture of conformity versus the encouragement of proactivity and creative thinking that can be associated with empowerment or autonomy to be able to shape or challenge established norms (Kang and Snell, 2009). Thus, mechanistic archetype is where there are structures in place for coordination and control of activities and processes whilst the organic provides the flexibility to accommodate unexpected events and allow problem-solving through novel thinking (Turner et al., 2015).

## **EXPLORATIVE AND EXPLOITATIVE INNOVATION IN ORGANIZATIONS**

Organizations adapt to their environment through exploiting existing capabilities by continuously improving processes, technologies and methods and or exploring new possibilities through the trial of new ways of designing or developing new products, new methods or techniques. The organizational adaptation literature has focused on exploration and exploitation as two different approaches (March, 1991; O'Reilly & Tushman, 2008) that focus on exploring new possibilities, with maximization of variance, involving trial and error or emphasize the usage of already existing competencies, incremental changes and continuous improvement (Liu & Leitner, 2012). The literature suggests that exploration and exploitation relate to technological innovation (Gupta et al., 2006; Smith & Tushman, 2005) organizational learning (March, 1991), organizational adaptation, organizational design and strategic management (Raisch & Birkinshaw, 2008). The ability of organizations to pursue contrasting activities has been referred to as ambidexterity and this according to O'Reilly and Tushman (2008) is the ability of organizations to exploit existing knowledge and technologies for short term gains and as well explore new knowledge for the enhancement of long-term development.

Some researchers (e.g. Jansen et al., 2006; Smith & Tushman, 2005) have used exploration and exploitation to depict incremental (small improvements) and radical (discontinuous or out of the world) innovations. Such researchers consider exploratory innovations as radical which require new knowledge or a departure from the knowledge that already exists. Exploitative innovation on the other hand is equated to incremental innovations, building on existing knowledge and providing reinforcement for existing skills, structures and processes (Abernathy & Clark, 1985; Benner & Tushman, 2003; Jansen et al., 2006). This classification is from the context of product manufacturing where organizations are innovation generators mostly through the products they produce. In organizations that often adopt innovations, especially of products for utilization in their operations, what constitutes exploratory or exploitative innovation may differ. Therefore, incremental and radical innovation being considered as exploitative and explorative innovation respectively may have to do with the context. Indeed, some researchers (e.g. He & Wong, 2004) have moved away from equating exploration to radical innovation and exploitation to incremental innovation especially for less technology intensive organizations where little research and development activity is undertaken and organizations undertake problem-solving activity by using new knowledge, methods and technologies or refine and reuse existing knowledge, technologies and methods.

He and Wong (2004) suggest that exploration and exploitation have to do with a firm and its resources, processes and capabilities and what is considered an exploration to one firm might be an exploitation for another. This can also be said of different industries and contexts. For instance, as manufacturing and high technology intensive organizations engage in breakthrough innovative activities often through research and development that results in patents, project-based organizations often rather engage in innovative activity on business projects initiated by clients with less research and development or breakthrough innovative activity (c.f. Blindenbach-Driessen & Van Den Ende, 2006; Gann & Salter, 2000). This

further reinforces the context dependency of innovation in terms of its nature and how it occurs in different industries or environments.

### **Explorative Innovation**

Exploration involves search, risk taking, experimentation and flexibility (March, 1991). Exploration refers to searching for and discovering innovative solutions or the search for and experimentation with new approaches, processes, or procedures with an aim to find new solutions or develop new products or services (O'Reilly & Tushman, 2008). Exploration thrives where there is the encouragement of new ideas and the taking of calculate risks. Exploration involves the processes of concerted variation and planned experimentation (Baum et al., 2000) that involve innovation along a shift to a new path or a different trajectory of technology, and often results in innovations for new markets. The essence of exploration according to March (1991) is to experiment with new alternatives (e.g. technologies, methods, materials, products), but can often be associated with many undeveloped new ideas with little distinctive competence (Gupta et al., 2006). Exploration represent the development of novel capabilities needed for organization's survival. This involves experimentation with new alternatives with uncertain returns that are distant and often negative or dead ends but can also result in groundbreaking change. Exploratory activities denote innovation from technological and market information, which are beyond the existing experiences of an organization. The degree of exploration can be manifested in terms of how and or in what ways newness manifest itself in the context of an organization whether in terms of products, materials, methods, technology or resources.

### **Exploitative Innovation**

Exploitation refers to efforts to refine and gradually improve existing capabilities and/or procedures with an objective to capitalize on existing capabilities as much as possible (O'Reilly & Tushman, 2008). It focuses on refining existing processes, products/services with the aim of gradually improving efficiency with limited risk of novelty to enable incremental innovation (Andriopoulos & Lewis, 2009). Exploitation involves local search, experiential refinement, the selection and reuse of existing routines or the ongoing use of existing knowledge, technologies and methods. Exploitative innovations are described as improvements to existing components that build on previous technological trajectories (Benner & Tushman, 2003), or technological innovation aimed to improve existing product market domains (He and Wong, 2004). It involves the efficient deployment of current or existing assets and capabilities to survive in the short term and March (1991) consider it to involve refining and extension of such existing competencies, technologies and paradigms. Exploitation is deemed to start when the variety of content from explorations is reduced and becomes consolidated into a dominant design with reduced uncertainty (Gilsing & Nooteboom, 2006). Exploitation is associated with codified knowledge from the consolidated and dominant design and makes diffusion within and across organizations faster. It is the codification that facilitates the diffusion of knowledge, technologies, and methods across the firm but with the risk of spillover, despite its provision of opportunities for options and possible outcomes (Gupta et al., 2006). Exploitative innovation is concerned with limited and well-defined technological and market solution space that relates to the organization's earlier experience to ensure efficiency and implementation of solutions (Li et al, 2010). Organizations in this instance, therefore, continue in familiar areas that proximate to existing practices, albeit with improvements and refinements to methods, processes and technologies rather than the pursuant of novel or emerging knowledge, technologies and approaches.

From the discussion both explorative and exploitative innovations entail knowledge combinations where one utilizes the existing and well-understood ways with the other leveraging knowledge that is varied and dispersed. Exploitative innovation demands efficiency and convergent thinking to be able to harness existing capabilities to improve products and services on a continual basis whilst explorative involve efforts to generate novel recombination of knowledge through search and experimentation (Andriopoulos & Lewis, 2009) and the ability to excel in both is vital for successful product development and performance of organizations

### **Explorative and Exploitative Innovation in Construction Organizations**

Explorative and exploitative forms of technological innovation have been identified as types of knowledge based innovation in construction (Sexton & Lu, 2012). Lu and Sexton (2006) following from previous ambidexterity researchers (e.g. Andriopoulos & Lewis, 2009; He & Wong, 2004) consider that explorative innovation is to be within the immediate new domains of a project involving search, experimentation and activity aimed at solving problems that are specific to individual projects. Exploitative innovation, on the other hand, is to do with the development of generic organizational infrastructure aimed at refining and improving the efficiency of the organization's operations to nurture its capability for the future. Exploitation could be argued to also involve such refinements and improvements on previous solutions by teams to solve problems in the course of executing a particular project. For instance, Eriksson and Szentes (2014) report that industry personnel consider exploitation as the use of existing technology, fine tuning, and continuous development. Explorative innovation is more client and problem solving focused, often dependent on the ability and motivation of personnel at the operational level to engineer solutions for the client. This is possibly through practitioner research, which goes to enhance the organization's short term competitiveness (Sexton & Lu, 2012). Explorative innovation can be in the form of new materials, methods and technologies, often project specific and driven by project stakeholders. Exploitative innovation rather focuses on internal organization and client development activity that is not specific to individual projects but dependent on the ability and motivation of the organization to improve efficiency and effectiveness (Lu & Sexton, 2012). One major distinction is how embedded the innovative idea is within systems and structures in the organization. With this, organizations have the challenge to balancing exploitative and explorative innovation capabilities within the short to long term to improve on their competitiveness in their market.

### **INTELLECTUAL CAPITAL AND INNOVATION - THEORETICAL AND EMPIRICAL LINK**

Intellectual capital is considered as a mid-range theory that provides a framework where an organization's knowledge assets serve as inputs into organizational processes and aid in the achievement of outcomes such as performance and competitiveness. An organization's intellectual assets have been described as an enabler of exploration and exploitation by the ambidexterity literature (Kang & Snell, 2009; Simsek, 2009). Knowledge embedded in the human, social and organizational capitals serve to underpin exploratory and exploitative innovation activity that occur in the specific context. Exploration and exploitation are deemed to optimally occur at the same time. Gupta et al. (2006) argue for the orthogonality of exploration and exploitation rather than being two ends of a continuum. This is appropriate for more practical and decentralized operations of project-based organizations and consistent with contextual ambidexterity proposed by Gibson and Birkinshaw (2004).

Intellectual capital and its dimensions are deemed to play crucial roles in the process of knowledge acquisition, sharing and integration impacting the pursuit of exploration and or exploitation by organizations (Kang et al., 2012). Some researchers have suggested that the quest to understand the tradeoff between exploration and exploitation can lie in the knowledge stocks of organizations (Cohen & Levinthal, 1990; Kang & Snell, 2009) and intellectual capital is the sum of knowledge stocks organizations use to achieve competitive advantage (Subramaniam & Youndt, 2005).

The ability of organization's knowledge resources to influence its ability to innovate is agreed on by researchers. Studies in new product development suggest that innovation is a knowledge management process, or embody the knowledge of organizations (Stewart, 1997). The innovation process is said to be an ongoing pursuit in which new and unique knowledge is harnessed (Nonaka & Takeuchi, 1995). Innovation has been described from this perspective to emanate from the exchange and recombination of knowledge that involves the reuse of prior or existing knowledge and capabilities in a new application context (Henderson & Clark, 1990; Quintane et al., 2011), which is consistent with the theory of knowledge creation (Nonaka, 1994). Such prior knowledge and recombination are very much dependent on individuals and teams in an organization as well as the ability of the organization to institutionalize and disseminate existing knowledge. This is consistent with the notion of combinative capabilities (ability to synthesize and apply knowledge in combination with the potential but unexplored technology) that is deemed to facilitate innovation by generating new applications from existing knowledge (Kogut & Zander, 1992) as well as Grant's concept of knowledge integration considered crucial for the achievement of outcomes that help organizations develop competitive edge (Grant, 1996).

Extant literature points to knowledge being a requirement for the process of innovation and hence the importance of path dependence, with absorptive capacity having been considered as a key predictor of an organization's innovation capability, and being a function of previous knowledge (Gilson et al., 2005; Cohen and Levinthal, 1990). Prior knowledge and skills allow for new associations and combinations especially in situations where organizations are confronted with problems that need solving. The notion of innovations beginning with the need to solve problems is consistent with tacit knowledge development (Nonaka & Takeuchi, 1995) which not only is relevant due to path dependence but also its ability to guide the development of knowledge in anticipation of a solution.

### **Human Capital and Innovation**

Human capital is considered the most pertinent intangible asset possessed by an organization, especially for innovation (Egbu, 2004; Stewart, 1997). The tacit knowledge of individuals is unique and a wellspring for innovation for organizations providing intuition that other intellectual assets are unable to offer. The knowledge and skills for innovation mostly come from individuals who generate ideas drawing on their skill and experience for problem-solving. Innovation involves a creative process that is underlain by the human capital existing in the organization or unit with regards to knowledge, experience and motivation which is the starting point for the innovation process in organizations (Quintane et al., 2011). This is also consistent with the individualist perspective of innovation rooted in psychology and social psychology with the assumption that individuals are the source of innovation often as champions or change agents (Rogers, 2003). Individual's knowledge and experience affect their propensity to share and exchange knowledge which results in recombination for novel ideas. Morris and Snell (2011) suggest that individuals enable and also leverage knowledge sharing when they have prior experience in understanding related ideas. Knowledge and experience of individuals also facilitate their ability to appreciate and accept new knowledge, ideas or approaches. This serves to facilitate the adoption and

generation of novel ideas (Cohen & Levinthal, 1990). Empirically some association has been found between human capital and innovation forms. Subramanian and Youndt (2005) contrary to their hypothesis, found that human capital to be negatively related to the radical innovative capability of organizations. Radical innovation has often been likened to exploration by organizations. The interaction of human capital with social capital, however, exhibited a positive relationship with radical innovation capability.

Wright and Snell (1998) suggested that individuals with broad skill sets help increase the flexibility of the firm not just by bringing their variety of knowledge to bear on the execution of tasks but also adaptability to search, assimilate and recombine new knowledge across a relatively broad range of knowledge domains. Individuals with general knowledge can be considered to have a better absorptive capacity that aids in the interpretation of new knowledge and hence better adoption or generation and implementation of innovation. Having individuals with such broad expertise in an organization according to researchers (e.g. Kang et al., 2012; Taylor & Greve, 2006) results in: the production of outputs for alternative requirements; production of creative solutions through the integration of diverse expertise and knowledge; the adjustment of problem solving techniques across different issues and for different clients and; opening up of new opportunities and expertise currently nonexistent in the organization. Such diversity of knowledge on multiple domains as against knowledge in a specific domain tends to affect mindsets and how individuals behave in the future regarding their knowledge search behaviors or search for new ideas or approaches to undertake tasks (Taylor & Greve, 2006). The possession of such human capital enable teams and organizations to explore new knowledge, methods techniques and technologies. As a result, generalist human capital makes available a variety of knowledge for undertaking tasks as well as the potential for adaptability in attempts to discover, comprehend, integrate and apply new knowledge in the future (Kang & Snell, 2009; Taylor & Greve, 2006). This makes generalist knowledge predisposed to exploration. For instance, the work of Kang and colleagues (Kang et al., 2012) found generalist human capital to be positively (though marginally) associated with explorative learning.

Some members of organizations may be oriented toward the refinement and reuse of existing knowledge, competencies, methods and techniques or area specific knowledge having started with their common expertise. Specialists are relatively better at exploiting institutionalized knowledge, methods and techniques. This stems from the domain specificity of knowledge that affects information processing, systems of interpretation and expectations of events. Such knowledge is likely to be associated with exploitation, given the possible functional bias where the willingness to exchange, share or combine new knowledge beyond specialized area is hampered (Kang & Snell, 2009).

### **Social Capital and Innovation**

The realization of innovations is a social process which requires interactions and networking to implement. Social relations between individuals and groups have been linked to the transfer of knowledge and learning with researchers focusing on the pattern of the unit's social network or connectedness and its impact (Jansen et al., 2006). Subramanian and Youndt (2005) put forward the role social networks play in terms of legitimacy in the adoption of innovations. Connectedness is deemed to improve the accessibility of knowledge in organizations and or units and can facilitate the combination and development of new knowledge that can underlie exploratory innovation. A highly dense social network, however, is deemed to diffuse established norms and expectations in terms of behavior, limiting access to divergence in perspectives and myriad of ways of doing things, the scope of search and increased perception of available alternatives (Jansen et al., 2006; Nahapiet & Ghoshal, 1998). This suggests that dense social relations hamper members' departure from already

existing knowledge and hence exploratory innovation. Dense social relations can be likened to what Kang and Snell (2009) refer to as cooperative social capital. Such high level of social relations and connectedness can be deemed good for efficiency and refinement of existing knowledge, processes, sharing of experiences and the development of trust. The social capital perspective emphasizes the collective interaction that results in innovation or during the innovation process and utilizes a complex form of knowledge that is embedded in the network of interactions or collective knowledge (c.f. Nahapiet & Ghoshal, 1998). Interactions between individuals with similar knowledge and skills tend to result in the resistance and limitation to heterogeneity in the information they might receive, opting rather for a repeat of previous patterns or ways of doing things.

Social capital among members of an organization helps to develop shared cognitive maps and a belief of how members should act within the organization, such as how to interpret new information with regards to previous knowledge. Again, there is the reinforcement of repetitive social interactions and cooperation in willingness that enable the refinement of existing solutions (Kang et al., 2012), supporting the tendency for exploitation often involving incremental improvements to existing solutions. This is consistent with the fact that internal social capital facilitates a deep understanding and commitment of team members in organizations to refining existing services and products as well as sharing experiences regarding how certain improvements can be implemented. Notwithstanding the above, social capital supports the acquisition and combination of new knowledge by members of organizations or units that trigger exploratory innovation (Jansen et al., 2006). This can also assist in the adoption of radical innovations through helping with the establishment of legitimacy (Subramaniam & Youndt, 2005). Social capital within a firm can be a means to integrating exploration and exploitation processes and has been found to predict both exploration and exploitation. For instance, Kang et al. (2012) found that internal social capital had a positive effect on both explorative and exploitative learning within law firm practice groups.

Other subtypes of social capital have been linked differently to exploration and exploitation. According to Kang and Snell (2009) cooperative and entrepreneurial relational archetypes respectively relate or align with exploitation and exploration. Cooperative relational archetype supports the efficient acquisition of knowledge as well as the integration of much in-depth and fine-grained knowledge, facilitating exploitation and suppressing the development of new social relations and hence hampering exploration (Kang, Morris, & Snell, 2007). The entrepreneurial archetype on the other hand facilitates the flexibility that is required in the acquisition, absorption and expansion of novel knowledge, methods and technologies and helps organizations pursue exploration. Entrepreneurial social capital can rather hinder the efficiency needed to exploit existing knowledge and technologies (Kang et al., 2007). In their study, Jansen et al, (2006) found social relations to be positively related to both explorative and exploitative innovation in financial service organizations whilst Subramaniam and Youndt, (2005) also found social capital to be positively related to both the incremental and radical innovative capability of organizations. Whilst the interaction of social capital with organizational capital was not significant in predicting organization's incremental innovative capability, the interaction of social capital with human capital is rather positively related to organization's radical innovation capability (Subramaniam & Youndt, 2005).

### **Organizational Capital and Innovation**

Organizational capital has been described as mechanistic or organic. This distinction is also captured in the innovation literature where alternative organizational systems (e.g. mechanistic versus organic) are seen as supporting different kinds of knowledge flows for

incremental versus radical innovation (Dewar and Dutton, 1986; Ghemawat and Costa, 1993; McGrath, 2001). Organizations capture, codify and store the knowledge of individuals and groups and establish structures and processes robust for streamlining inputs into successful innovative outcomes (Subramaniam & Youndt, 2005). This role of the organization could also include the facilitation of communication, interaction and sharing of ideas among individuals and teams in the organization as well as their networks. Codified knowledge facilitates knowledge sharing across the organization, of tested practices and such codified knowledge in databases and intranets serve as a trusted source of knowledge and for innovative idea dissemination across divisions of an organization (Morris & Snell, 2011) facilitating the ability to convert such knowledge into innovation outcomes.

Different types or forms of innovations may draw on the organization's knowledge in different ways. For instance, Subramaniam and Youndt (2005) suggests that incremental innovation draws on reinforced prevailing knowledge, and takes advantage to improve the existing knowledge whilst radical innovation draws on transformed prevailing knowledge. Organizational structures characterized by bureaucracy inhibits spontaneous actions and experimentation and impacts the innovation process negatively. Such bureaucracy can rather facilitate the implementation process or the transformation of ideas into innovation outcomes (Bennet and Gabriel, 1999). Bureaucracy could affect the innovation process through the approval process that needs to be adhered to before an idea can be implemented to deal with a pressing problem. Institutionalized knowledge embedded in routines, processes and systems influences the exploitative capacity and establishes patterns of behavior in the search for new knowledge and its integration for innovative solutions (Grant, 1996; Kang et al., 2012).

Mechanistic and organic forms of organizational capital differ in their impact on the acquisition and integration of knowledge and technologies and hence the pursuance of explorative and exploitative innovation. Mechanistic organizational capital, similar to bureaucratic organizational structure reinforces efficiency and coordination through the establishment of a pattern of behavior and interdependence. Such standardized processes capture and institutionalize knowledge and aid in establishing a common frame of reference (Crossan et al., 1999) that is considered more reliable, robust and legitimized (Katila & Ahuja, 2002). This can result in a bias in the organizations' problem-solving endeavors towards previously tested decision sets that have proved successful (Subramaniam & Youndt, 2005) leading to the refinement and improvement of existing knowledge methods and techniques (exploitative innovation). Thus, organizational capital that is more mechanistic in nature reinforces efficiency through common frames of reference that become ingrained patterns of behavior within a group or organization. Therefore, such practice of codifying and diffusing useful practices tend to facilitate the exploitation of existing methods and techniques and reinforces organizational member's conformity to established practices. The organic organizational capital, on the other hand, provides opportunity and autonomy for experimentation, helping establish a variety and flexible repertoire of behaviors as well as engendering alternative and creative perspectives to interpretation. Such archetype of organizational capital offer routines that rather specify vision, priorities and boundary conditions for possible action (Kang & Snell, 2009). This makes it possible for exploration through the search and integration of new knowledge, methods and technologies.

In a recent study, Kang et al. (2012) found mechanistic organizational capital to be positively related to exploitation in law practice groups looking at ambidexterity from a learning perspective. This notwithstanding some studies present findings that contradict the notion that mechanistic organizational capital hinders deviation and variation seeking. The work of Gilson et al. (2005) suggests that standardized work practices also facilitate creativity and exploration where individuals rely on routines to perform simple tasks whilst allocating more effort and time to complex innovative ideas.

## **PROPOSED CONCEPTUAL FRAMEWORK AND RESEARCH AGENDA**

Despite the theoretical linkage of intellectual capital to innovation in organizations, little empirical evidence exists. Empirical evidence linking intellectual capital with exploration and exploitation have been inconsistent. Findings from such studies are a mix of positive and negative relationships; ranging from marginal to significant relationships, or have been anecdotal single case studies. Again empirical studies have often related different conceptualizations of innovation (e.g. incremental and radical innovation capability) to intellectual capital or looked at exploration and exploitation ability of organizations rather from a learning perspective (e.g. Kang et al,2012). This requires more empirical studies to not only reveal but strengthen the nature of the relationship between the intellectual capital of organizations and their ability to pursue explorative and or exploitative innovation. There is also the need to reveal the intellectual capital profiles of organizations and how the dimensions of intellectual capital and their subtypes which can be influenced by context, individually or in combination impact organizations explorative and or exploitative innovative ability.

In their recent review Simsek et al., (2009) suggest that less is known about the drivers of what they term harmonic ambidexterity (successful pursuit of both exploration and exploitation) and that for most organizations (especially small ones with little slack resources) intellectual capital might be the foundation for the achievement of exploration and exploitation in such entities. A number of questions can arise from looking at intellectual capital as the basis for explorative and exploitative innovation: what types of human capital (generalist or specialist), social capital (cooperative or entrepreneurial) or organizational capital (organic or mechanistic) facilitate the individual or combinative pursuit of explorative and exploitative innovation? and what is the optimal combination of human, social and organizational capital for pursuing both explorative and exploitative innovation?

From the discussions linking intellectual capital and innovation, not only is intellectual capital expected to have a relationship with exploration and exploitation ability of organizations but explorative innovation is supported by an intellectual capital architecture that consists of generalist human capital, entrepreneurial social capital and organic organizational capital where individuals are exposed to a myriad of ideas through their experiences and social contacts. Individuals have the motivation, flexibility and cognitive ability to combine such knowledge whilst the organization encourages individuals to generate and implement creative or novel ideas for problem-solving (Kang & Snell, 2009). Exploitative innovation will rather be supported by an intellectual capital architecture that comprises of specialist human capital, cooperative social capital and mechanistic organizational capital where social interactions give individuals access to others' knowledge, focuses on the refinement and improvement of knowledge and ideas embedded in prior decisions.

Insight into the inconsistencies in terms of non-significance or a mix of positive and negative results in the relationship between intellectual capital and innovation capability despite the theoretical basis may be accounted for by the existence of an intermediary factor such as organizational learning capability. Whilst learning has been linked to the ability of organizations to innovate, intellectual capital has been suggested to impact learning in organizations through the exchange and integration of existing knowledge, ideas and information that reside in individuals (human capital), teams (social capital) and in the organization (organizational capital) (Kogut & Zander, 1992). Learning in an organization is deemed to be influenced by the combination, interaction and complementarity of all knowledge assets which creates a synergy by the transfer of knowledge between individuals, groups and the organization. Some researchers have suggested learning capability (Garud & Nayyar, 1994; Hsu & Fang, 2009; Zahra & George, 2002) as a mechanism by which

organizations can improve their innovation capability and performance. Such learning capability can be described in terms of absorptive and transformative capability of organizations with regards to knowledge. Absorptive capacity, according to Cohen and Levinthal (1990) is the ability to evaluate and utilize knowledge based on prior related knowledge. This prior knowledge could come from an organization's intellectual assets that enable organizations to be able to recognize the value of new knowledge and to assimilate and apply it. Transformative capability according to Garud and Nayyar (1994) is the ability to choose, maintain as well as reactivate and synthesize old technologies or knowledge with new ones which is consistent with transformation as proposed in the model of absorptive capacity by Zahra and George (2002).

A study of intellectual capital and innovation should also take cognizance of the contingency role of organizational and environmental factors as moderators. For instance, organizations' ability to innovate is not only improved by having the requisite knowledge resources. The climate for innovation (support for innovation and resource provision) in the organization can determine whether intellectual capital translates into the high or low incidence of innovative activity. Support for innovation as a dimension of innovation climate has been found to be an antecedent of innovation performance (Hülshager, Anderson, & Salgado, 2009). Simsek et al. (2009) suggest the need to pay attention to the factors that moderate the relationship between archetypes on outcomes to reveal the unique conditions that can enhance or exacerbate the impact of each of the dimensions (human, social or organizational capital) or their possible sub-dimensions. This is on the backdrop of a dearth of studies that consider the effect of external conditions on the antecedent-ambidexterity relationship (Raisch & Birkinshaw, 2008; Simsek et al., 2009; Tushman & O Reilly, 1996). This is rooted in the idea that environmental uncertainty is critical to the effectiveness of strategic orientation and innovativeness (Simsek, 2009). Technological opportunity (availability of technological knowledge or advances) has been suggested to facilitate the technological progress or innovative activity of organizations (Klevorick et al., 1995; Nieto & Quevedo, 2005) and the level of technological activity can affect the capability of an organization in terms of explorative and exploitative innovation given the level of intellectual capital. These factors (innovation climate and technological opportunity) can be suggested to moderate the effect of intellectual capital on the capability of organizations for explorative and exploitative innovation.

The discussion above results in the proposal of a framework with concepts rooted in the resource-based view, knowledge-based view, intellectual capital based view and ambidexterity theory. Although innovation here is rooted in the theory of ambidexterity, the focus is on explorative and exploitative innovation rather than how organizations achieve a balance between the two. In essence, this adopts a perspective consistent with the notion of orthogonality of exploration and exploitation (Gupta et al., 2006). It also relates with contextual ambidexterity proposed by Gibson and Birkinshaw (2004) where individuals and teams are given the autonomy to make choices of pursuing explorative and or exploitative behaviors dependent on the circumstances. From this we can hypothesize that:

1. Human capital and social capital will each relate positively and significantly with both exploitative and explorative innovation capability of organizations, and organizational capital will relate positively and significantly with exploitative innovation capability but negatively and significantly with explorative innovation capability.
2. Generalist human capital, entrepreneurial social capital and organic organizational capital will each relate positively and significantly with explorative innovation but negatively and significantly with exploitative innovation.

3. Specialist human capital, cooperative social capital and mechanistic organizational capital will each relate positively and significantly with exploitative innovation but negatively and significantly with explorative innovation.
4. Innovation climate and technological opportunity will each moderate the relationship between intellectual capital and its subtypes with the explorative and exploitative innovation capability of organizations.
5. Organizations’ learning ability (absorptive and transformative) will mediate the relationship between intellectual capital and innovation capability.

The proposed models of intellectual capital, learning, innovation and moderators are shown in Fig1a and 1b below:

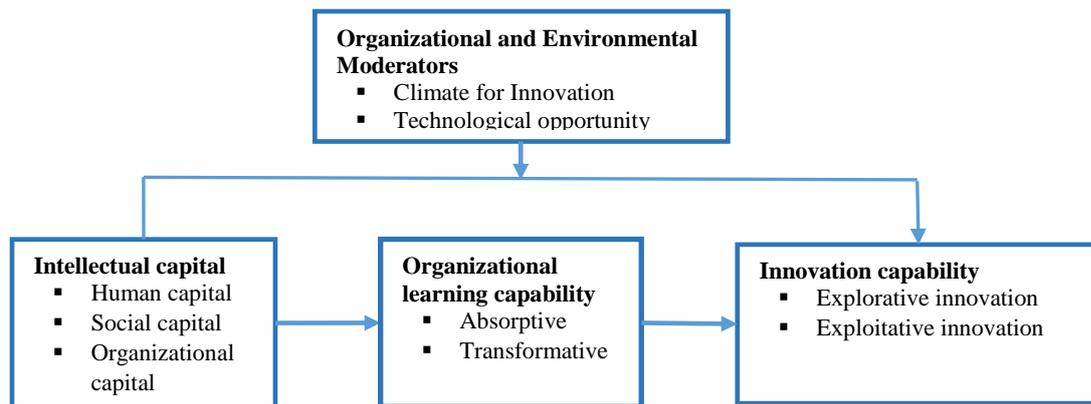


Figure 1a: Intellectual capital, learning, innovation and moderators

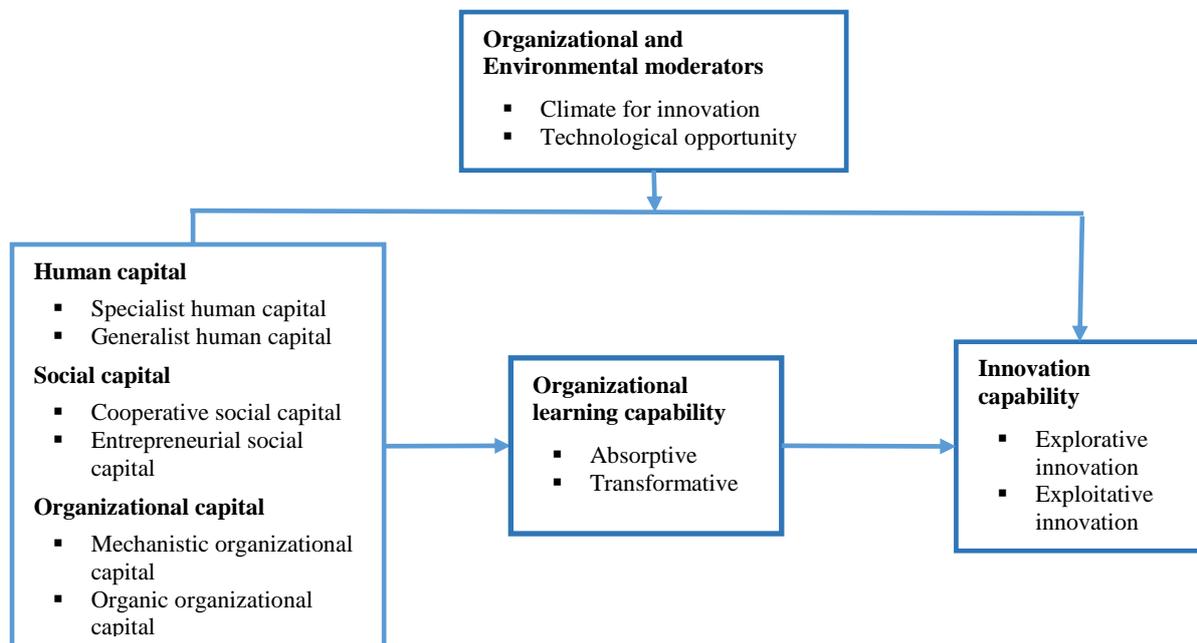


Figure 1b: Intellectual capital subtypes, learning, innovation and moderators

The above forms part of an ongoing research looking at the role of intellectual capital in organization’s innovative activity. This will involve a mixed methods approach to testing the empirical link between intellectual capital and its subtypes with explorative and exploitative innovative capability of organizations through an industry-wide survey of construction organizations. This will be supplemented with longitudinal case studies with a carefully selected range of organizations of different sizes to not only better contextualize the

role of intellectual capital in innovation but also select cases that are representative of organizations within the industry.

## CONCLUSION

The conceptual framework has advanced the role intellectual capital profile of organizations can play in the ability of organizations to pursue explorative and exploitative forms of innovation either directly and through learning ability. The linkage of intellectual capital and its subtypes, which are considered to be influenced by specific contexts, will provide a fine-grained and deeper insight into the relationship between intellectual capital profiles and innovative capability (both directly and indirectly). A study based on such a framework will shed light not only on the intellectual capital profiles of organizations but also what subtypes of human, social and organizational capital enable the combinative pursuit of exploitative and or exploitative innovation. It will also potentially reveal the optimal configuration of IC components or their subtypes that can serve as the basis for the pursuit of explorative and exploitative innovation in organizations. This will help create a differentiation theory of how different subtypes of intellectual capital are aligned to different forms of innovation capability of organizations. An empirical test of the proposed framework will serve as a tool, providing managers of innovation in organization's insight into how to improve, manage or develop intellectual capital to achieve targeted innovation outcomes or to develop specific innovation capabilities.

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