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Abstract

This study investigates factors instrumental to the success of software industries of the 3I Nations (India, Ireland and Israel), examines the relationship between its elements, and studies the performance of software firms in West Africa. The study draws on concepts from multiple theoretical perspectives to develop a model for assessing the relationship between intellectual capital of software firms and their performance. The developed model was experimentally validated through a field survey of 83 software companies in West Africa using the Partial Least Square method. The survey results show significant relationship between the elements of intellectual capital and competitive capabilities of firms and between competitive capabilities and firm performance. Mixed results were found on the moderating effects of management commitment and transformational leadership. The findings provide important implications to researchers, policy makers, software developers and other market players while contributing to knowledge on strategic management and the strategic importance of intellectual capital.

Keywords Intellectual Capital, Competitive Capability, Firm Performance, Software Industry Dynamics

INTRODUCTION

During the past two decades the software industries of India, Ireland and Israel have been touted as success stories due to their significant gains in export revenues in the global software market. The industry statistics of these nations for the period in question are testimonies of the strides they have achieved and present yet more opportunities to be explored in future. While the software industry in India grew at a significant rate of 40 to 50 percent, generating an export revenue of US$3.9 billion in 2000 (Narayana, 2001) and hit US$60 billion in exports in FY2009, as forecasted in "Software Industry Detail Analysis" (Amit, 2008 **),** the Irish software industry generated a combined turnover of €14.9 billion in 2003, showing a 7% increase on the previous year (Keane and Richardson, 2005). Likewise, the software industry in Israel has enjoyed a significant growth in its export business. Starting in the early 1990s with exports totaling US$90 million, the export figure rose to US$2.6 billion in 2000 and is currently at US$3.6 billion, representing over one-quarter of all technology exports from Israel and almost one-tenth of total national exports.

Following the successes recorded by the 3I nations, the software industries of some developing countries (Heeks and Nicholson, 2002) including some member countries of the Economic Community of West African States (ECOWAS) have been striving to develop their competitive edge and export capacity. Albeit amidst challenges, these nations are attempting to gain entry into the booming global software market, but they have not made any significant gains yet.

Even though limited studies have been undertaken in the area of global competitiveness of software companies, arguments so far advanced for successes of national industries have been many and varied. Whereas success in the manufacturing sector have been explained in macro-economic terms, and attributed it to government policy and interventions in the market place or to competitive advantages of some nations in management practices and labor management relations (Carmel, 2003), success in the high technology industry have been explained using the High Tech Indicator model developed by Porter, Roessner and Newman (2001). Porter et al. (2001) argue that *technological infrastructure, production capacity, socio-economic factors, and national orientation* influence the technological standing and the technology mix in a country's exports. Keane and Richardson (2005) share similar views, citing factors such as *education and technological innovation*, *telecommunication infrastructure*, *tax incentives*, *wage moderation*, *English speaking workforce* and *government's leadership* by example, in terms of financial policies, as some of the main reasons for the success of the Irish software industries (Keane and Richardson, 2005).

Among other factors, the intellectual capital of these nations is said to have contributed significantly to their success in the software industry (Heeks and Nicholson, 2002). Hence, there is a general consensus that management of intellectual capital constitutes the most important source of competitive advantage for organizations (Quinn, 1992; Stewart, 1997; Toffler, 1990). Although the Intellectual Capital Theory attracted lots of criticism in the beginning, it has since been consolidated (Ashour, 1997; Bontis, 1996, 1998; Brooking, 1997; Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997; Seleim Ashour and Bontis, 2004; 2007; Riahi-Belkaoui, 2002; Chaminade and Roberts, 2003; Habersam and Piper, 2003; Gibson, 2004).

However, only a handful of the literature reviewed (Cantrell et al., 2006; Seleim et al., 2007) investigated the value of human capital investments in a software industry setting. Cantrell et al. (2005) used a case study approach to investigate and report on the efforts of SAP (Systems, Applications, and Products in Data Processing), a major provider of software solutions, to link human capital practices with performance improvements. Using a model that involved measuring 13 human capital processes that fed into 7 human capital capabilities, SAP found that many of the initiatives launched a year earlier seemed to be paying off in relatively high processes and capability scores. Seleim et al. (2007), on their part, examined human capital and their impact on organizational performance (export intensity) of software companies in Egypt. Even though the human capital metrics were based on CEO self-reported scores, therefore limiting the ability to generalize in that context, it showed a positive relationship between the number of superstar developers and export intensity. These findings provide support for the development and/or recruitment of superstar developers.

This study builds on previous literature on human capital, developed within a North African context, in a study carried out by Seleim et al. (2004). Drawing on concepts used in Seleim et al. (2004), this study examines the relationship between intellectual capital and firm competitiveness. Even though Seleim et al. investigated human capital in relation to the performance of software firms in an African setting (Egypt), the model developed was not tested. This study enhances the Seleim et al. model to include relational capital and structural capital, and seeks to validate the model in a different geographical and cultural setting (Sub-Sahara Africa). This study focuses on three countries in the ECOWAS region of Africa – Ghana, Nigeria and Senegal.

The aim of this study is twofold. First, it is to determine the factors that have been instrumental to the success of the 3I nations. Secondly, focusing on intellectual capital as one of the cited critical success factors in related studies, the paper has developed a theoretical model grounded upon the intellectual capital theory, the resource-based theory and literature on competitiveness and firm performance to investigate the influence of intellectual capital on the performance of software firms in West Africa.

The research questions to be addressed in this paper are: (1) What are the human, organizational and inter-organizational factors that shape the performance of software firms? (2) What is the impact of intellectual capital on software firms' competitive capabilities? (3) How does leadership commitment moderate relationship between elements of intellectual capital and firm competitive capabilities? (4) How does firm competitive capability impact firm performance?

The study thus examines on one hand how the sub-constructs of intellectual capital relate with firm competitive capability. On the other hand, using firm level competitive capability as a mediating variable, it examines whether there is an indirect relationship between intellectual capital and firm performance.

As intellectual capital is increasingly gaining recognition for a much greater significant role in creating and maintaining firms' competitive advantage (Tayles et al., 2007), the findings of this study provides evidence that would have a substantial impact on the operations of software firms in Economic Community Of West African States (ECOWAS) and other regions of Africa. The study also provides important implications to researchers, policy makers, software developers, and other market players.

The rest of the paper is organized as follows: In the next section, we present a review of background literature related to intellectual capital, competitive capabilities, and firm performance. We discuss the main arguments advanced by various scholars and researchers on issues pertaining to intellectual capital and firm as well as industry evaluation; drawing on findings of earlier and extant research. We then develop a theoretical framework, which integrates the intellectual capital theory, the resource-based theory and the knowledge-based theory. Based on the theoretical framework, in later sections we develop a research model. Subsequently, we present and discuss the findings of a survey carried out to validate the model. In subsequent sections we discuss the implications and limitation of this study and conclude with some policy recommendations and research future plans.

THEORETICAL FRAMEWORK

The foundations of our theoretical framework rest on four elements: intellectual capital theory, resource-based and knowledge-based views of the firm and the literature on competitive capabilities and firm performance. During the past two decades, we have witnessed the emergence of a knowledge-based economy and a realization of Penrose's perception of firms as repositories of knowledge and experience with knowledge as the critical factor explaining the growth of firms (Penrose, 1959). The period has also been characterized by a growing agreement among researchers and practitioners that intellectual capital is a critical resource for the competitiveness of a firm (Bontis, 1996, 1998, 1999, 2001, 2003; Quinn, 1992; Stewart, 1997; Toffler, 1990). Hence, this has generated a lot of interest in the subject (Ashour, 1997; Bontis, 1996, 1998, 1999, 2001, 2003; Brooking, 1997; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997). However, the terms associated with intellectual capital have attracted numerous and varied definitions, resulting in lack of consensus among researchers regarding the terms and definitions (Marr and Mustaghfir, 2005).

The Intellectual Capital Theory

In this study, we have adopted as our operational definition the definition proposed by Rastogi (2003). According to Rastogi, intellectual capital is the "holistic or meta-level capability of an enterprise to co-ordinate, orchestrate and deploy its knowledge resources to create value in pursuit of its future vision" (Rastogi, 2003, p. 230). This view of intellectual capital reflects the strategic management community's viewpoint of intellectual capital and is the view shared in this study as intangible resources have been documented as performance influencing factors within and across the software industries of the 3I nations (Carmel, 2003; Heeks and Nicholson, 2002) and elsewhere (Cantrell et al., 2006; Seleim et al., 2007). The portfolio of intangible resources is said to include three main sets of elements: one set that hold the potential for future success (skills, competencies, professional experience, expertise, commitment, motivation, relationships); another that encompasses organizational business routines (protected knowledge, methods, concepts, processes, rules,

infrastructure, and information techniques); and a third that is embedded with the environment (culture, customers, suppliers, research institutes, investors, society, and other stakeholders) (Auer, 2004). In extant literature, while some experts (Ashour, 2000; Bontis, 1998; Bontis, 1999, 2001; and Sveiby, 1997) classify these groupings as human capital, structural capital and relational capital respectively, Guthrie and Petty (2000) offer an alternative classification: human capital, internal structure, and external structure; whereas Nielsen and Dane-Nielsen (2008) identify three relevant levels, namely the individual level, the organizational level, and the market level.

However, much as the field seems to be novel and interesting, it has been beset with so much uncertainty in relation to its understanding. The root cause of this uncertainty is divergence in views on how to handle the value of intellectual capital (Nielsen et al., 2008), particularly across different levels of a business entity, e.g. the transfer of the value of intellectual capital from a departmental level to a corporate level.

While pioneers in the field, such as Sveiby (1997), Edvinsson (Edvinsson and Malone, 1997), uphold strongly to the assumptions and principles of the standard intellectual capital theory, extant literature such as Marti (2003) and Nielsen et al. (2008) question and critique those assumptions and principles and the way intellectual capital is managed.

Marti (2003) argues that for some researchers the danger of attempts to treat intangible assets as if they were tangible constitutes the basis of the numerous debates surrounding intellectual capital; he claims it induces people to think of "intangibles" as assets that can be entered in books as if they were tangibles. Marti (2003) critiques further that by breaking down intellectual capital into three categories – human, structural and relational, each type of capital is deemed independent from the rest in the model's intrinsic processes. However, the actual daily operations of firms paint a different picture, thus making the division artificial. Marti explains this relationship, "All three types of intellectual capital act together, and as such a division never arises. – physical and financial assets act together with the intangible assets in the value creation processes" (2003).

In a related study, Nielsen et al. (2008) present an emergent property perspective of intellectual capital. They argue that intellectual capital is a social phenomenon and that the "phenomenon at different levels have different characteristics, unique patterns of behavior or other specific properties" (Nielsen et al., 2008, pp. 5) and when "higher level properties are often not explainable by the properties of the lower elements that cause the phenomenon, it is said that novel properties have emerged" (Nielsen et al., 2008, pp. 5). They further argue that "the emergence of new properties from one level to another is a result of a process where subunits react in a process according to particular mechanism under influence of the initial conditions determined by the environment for the process" (Nielsen et al.., 2008, pp. 5). This argument is consistent with Coleman's (1990) systems theory in which he emphasizes a number of elements relating to the role of the individual in relation to a system. According to Coleman (1990), organizational behavior/action is an emergent phenomenon, manifested or derived from interaction of individual actors or some sort of interdependence of individuals' actions, but not merely from aggregated individual behavior. Therefore, as an emergent property, system level action characterizes the system as a whole (Coleman, 1990).

This line of reasoning and perspective, known as emergentism, is also held by the likes of Bunge, Coleman, Durkheim, Pepper, Ritzer, and Simmel (Bunge, 2000; Coleman, 1990; Durkheim, 1982; Pepper, 1926; Ritzer, 1996; Simmel, 1907). Pepper (1926) for instance postulates that "such a theory of emergentism must involve three propositions: (1) that there are levels of existence defined in terms of degrees of integration; (2) that there are marks that distinguish these levels from one another over and above the degree of integration; and (3) that it is impossible to deduce the marks of a higher level from those of a lower level and perhaps impossible to deduce the marks of a lower level from those of a higher level." On the basis of these postulates, Nielsen et al. argues that emergentism acknowledges transition between different levels of analysis; however, "in the move between the different levels, new and qualitatively different properties will arise from original components as a function of mechanisms, structure and environment" (Nielsen et al., 2008, pp. 6). This position, even though commensurate with the existence of different groups, classes or levels of capital, as espoused by the standard capital theorists, compels one to conceive of these phenomenon as residing, not in the

elements –individuals, structures, and relations in the case of the standard theory–but in the entity formed by the union of these elements (Nielsen et al., 2008). The substance of this view is vividly captured by Durkheim (1982, pp. 39) in an analogical comparison of society with living cells. Living cells are nothing but chemical particles much as society is made up of nothing but individuals. However, it is clearly impossible for the characteristic phenomenon of life to reside in the atoms of hydrogen, oxygen, carbon and nitrogen that make up these elements (living cells). To illustrate this position further, consider the knowledge of the employees of a software company. In such a knowledge-intensive company, it is the knowledge that creates the value, not the employee. The employee is merely a container of the knowledge, hence just a component; and the knowledge constitute the property of the component that is being utilized.

It should also be noted that the transition process through which new components and their properties emerge is a process without intermediate stages. According to Nielsen et al. (2008), it is not a linear function, but it is governed by natural laws and takes place in and is influenced by an environment. It is instigated by mechanisms involving components and laws in a certain environment that provides the necessary background conditions.

Our conception of intellectual capital is consistent with that of both pioneers, Sveiby (1997) and Edvinsson (Edvinsson and Malone, 1997); and also consistent with that of Marti (2003) and Nielsen et al. (2008), but differs from them in important ways. Whereas the pioneers treat intangibles as if they were tangibles, we argue that once they are entered into accounting books they could be used to make comparisons among any type of firms, no matter their nature. But such value systems are usually organizational, industry and market specific. Furthermore, even though the models of the standard intellectual capital paradigm incorporate cause-and-effect relationships between each of the three types of capital and each of the strategic and financial objectives, we subscribe to Marti's (2003) position that it is extremely difficult to establish, given the artificial separation of the models' intangible assets. We also recognize Marti's position of the inter-dependency between the various types of capital, as evident in the daily operations of organizations. However, in contrast with Marti who opposes the separation, we maintain the existence of the three types of capital, but argue that in the day-to-day operations of an organization these unique types of capital co-exist and influence one another as they participate in the value creation process and they are inter-twined in such a way that it is difficult to quantify the separate contribution of each type. And their collective contribution at one level exists as an emergent property at different levels of the organization (Nielsen et al., 2008).

The Resource-Based and Knowledge-Based Views of the Firm

The resource-based view (RBV) of the firm was developed two decades ago, largely to diffuse the dominance of the competitive forces analysis of firm strategy (Bontis, 2002a). Adopting an internal perspective of the firm, the RBV is used to explain how a firm's distinct collection of internal resources and capabilities constitute the basis for developing strategies for value-creation. Variance in firms' resources and capabilities dictates differences in strategies developed, hence accounting for performance differences across firms (Michael, Leonard, Katshuhiko and Rahul, 2001). Resources and capabilities that are unique and difficult to imitate are the foundational stones on which a firm's competitive advantage is built (Michael et al., 2001; Amit and Schoemaker, 1993; Barney, 1991). And the competitive advantages gained in turn result in positive returns, as reported by most of the literature on empirical tests on the resource-based view (Miller and Shamsie, 1996; Pennings et al., 1998). The modus operandi of the RBV is thus to seek a strategy that will combine these resources in a way that will yield the optimal above-average return in the firm's industry for the firm to have competitive advantage.

Organizational economists and theorists do not only acknowledge the existence of these firm level differences, but argue that these differences contribute significantly in shaping the economic performance of firms and, by extension, the differences in the performance of industries and nations. The global software industry is an excellent illustration of this argument, where the industries of the 3I nations which constitute, in the parlance of Heeks et al. (2002), the first-tier software exporters, have competitive advantage over the industries of the second-tier software exporters of China, Philippines, and Russia (Heeks et al., 2002). Besides main stream strategy (Ansoff, 1965, Andrews,

1971), the RBV (Penrose, 1959; Rubin 1973; Teece, 1982; Wernerfelt, 1984; Barney 1986; Dierickx and Cool, 1989), evolutionary theory (Nelson and Winter, 1982; Winter, 1987), and core competency are other approaches espoused by organization economists and theorists as solutions for organizations to develop, maintain and exploit knowledge for innovation.

The RBV has been critiqued on several grounds as: being too internally focused; being saddled with a plethora of terms and definitions–"distinctive competence," "strategic firm resources," "invisible assets," "core competences," "dynamic capabilities," and a host of others (Bontis, 2002); laying too much emphasis on firm resources, thus presenting the organisation as the only feasible unit of analysis; hence being quite limiting. There is sufficient empirical evidence in Bontis (2002) indicating that profit differences arise mostly due to industry effects, citing firm effects as being insignificant. Where both firm effects and industry effects are found to be significant, the evidence indicate the firm effects were dominated by industry effects (Bontis, 2002). In view of the extreme internal focus of the RBV of the firm, the knowledge-based (KB) view of the firm was developed as an extension of the RBV.

The KB view of the firm is more insightful than the RBV of the firm because it perceives the firm as a "dynamic, evolving, quasi-autonomous system of knowledge production and application" (Bontis, 2002a; Spender, 1996, pp. 59). So for this study, we shall adopt the RBV of the firm for internal analysis of the firms. However, for an analysis of what kind of services a firm can render using its resources, we shall adopt a KB view of the firm, since the KB view of the firm perceives a firm as a knowledge system that uses knowledge to transform whatever resources it has into unique services.

The Conceptual Framework

The point of departure of the conceptual framework of this study is the "Oval Model" of national software export success factors developed by Carmel (2003) and the Software Export Success Model (SESM) developed by Heeks et al. (2002). Drawing on concepts from these two models based on the literature reviewed above, we developed the conceptual framework for this study as none of the models per se fully captured the constructs featured in the literature. Moreover, we considered using the SESM as a point of departure for developing our conceptual framework because it was developed using success factors from the 3I nations; the 31 nations' software industries have become more or less de-facto benchmarks for software industries of developing countries.

The SESM consists of five major factors: demand for software, national software vision and strategy, international linkages and trust, national software industry characteristics, and national software related infrastructure. Even though inherent in three of these five factors is the commonality of the human capital construct, we find the level of abstraction of this model to be too high, hence not directly amenable to a second level analysis as it does not explicitly capture the human capital as a construct for analysis. However, it would be suitable for a higher level (industry) analysis as has been carried out in Nicholson and Sahay (2003). Nevertheless, we find constructs such as international linkages and trust interesting and directly related to intellectual capital (relational/market), but not so of software related infrastructure, which include constructs from both human and structural capital.

The Oval Model on the other hand includes eight factors and extends the SESM in a number of important respects (Carmel, 2003). While emphasizing factors such as human capital, financial capital and industry, it de-emphasizes factors considered secondary, such as piracy (trust, in Heeks parlance), and incorporates another construct, Quality of Life (Carmel, 2003). We consider trust to be an important construct worth investigating. The oval model depicts the linkages between human capital, industry, financial capital and the external environment as critical to gaining access to the global software market.

From the viewpoint that the human capital factor is inherently common among three of the five sources (Porter,1990; Becker et al., 1999; Heeks et al., 2002) mentioned above and features explicitly in the Oval Model (Carmel, 2003), we argue that human capital should be incorporated in our conceptual framework together with other sub-constructs of Intellectual Capital– structural capital and relational capital–as they have been found to be interdependent (Ashour, 2000; Bontis, 1998; Bontis, 1999, 2001). Bontis argues that human capital represents the stock of knowledge that is embedded in

the firm's collective capability to extract the best solutions from its individual employees (Bontis, 1999, 2001). Edvinsson and Malone defined it as "the sum of the workers' skills, experience, capabilities, and tacit knowledge" (Edvinsson and Malone, 1997, pp. 34-5), while Davenport and Prusak add that "human capital includes the intangible resources of abilities, effort, and time that workers bring to invest in their work" (Davenport and Prusak, 1998, pp. 49).

There is a general agreement that as a core component of intellectual capital human capital is a critical resource in many industries, including the software industry to the extent that it would continue to be the most important corporate resource for the next 20 years (Seleim et al., 2007). Human capital has been defined as "talented, smart and sophisticated business people who are technologically literate, globally astute, and operationally agile" (Seleim et al., 2007, pp 790). Human capital relates with various outcome variables, and this has been documented in various literature (Seleim et al., 2007), including literature on organizational learning (Bontis et al., 2002), human capital theory (Ducharme, 1998), the resource view of the firm (Barney, 1991) and the knowledge-based view of the firm (Grant, 1996; Spender, 1996).

Moreover, the emergence of the knowledge-based economies and associated competition in the markets has been dovetailed with an increasing recognition of high levels of skills and competence as essential ingredients for the future security and success of individuals, organizations and nations (Seleim et al., 2007). As individuals acquire more education and training, human capital of firms, industries and nations are equipped to drive the production of goods and services, and to churn out new innovations in the market place. Such linkage between these human capital elements and economic development is well established (Benhabib and Spiegel, 1994; Appleton and Teal, 1998).

According to Roos and Roos, what is left behind at the end of the day when employees go home constitutes structural capital (Roos and Roos, 1997). Hence, in view of its strong linkage with the organizational structures, it has been succinctly described as the best approximation of intellectual capital, since it is what is owned by the firm and what is assumed not to be reproduced or shared (Riahi-Belkaoui, 2002). Seleim et al. also argue that because it "focuses on the codified knowledge base of the firm, it reflects the firm's ability to translate the innovation and energy of its human capital into corporate asset, while capitalizing on that innovation to create wealth" (Seleim et al., 2004, pp. 333). Bontis enhances that argument by stating that "an individual can have a high level of intellect, but if the organization has poor systems and procedures by which to track his or her actions, the overall intellectual capital will not reach its fullest potential" (Bontis, 2002a, pp. 631). The strategic importance of structural capital has also been captured in Michalisin, Kline and Smith(2000), where it is seen as a form of know-how available only to the firm, and is the main driver of the firm's capabilities and growth. Elsewhere in extant literature, it is perceived as the determinant of several activities: how resources are deployed to generate new products and services (Amit and Schoemaker, 1993), to create new physical technologies (Rumelt, 1984; Wernerfelt, 1984) and to develop new resource strategies (Galunic and Rodan, 1998).

Relational capital, on its part, is a reflection of a firm's ability to interact positively with the business community. Through such interaction, the potential for wealth creation is stimulated by enhancing human and structural capital (Seleim et al., 2004). It is thus seen as an embodiment of all the knowledge assets accumulated by the firm from its interaction with customers, partners, competitors, associations and governments or other organizations that interact with the firm (Seleim et al., 2004; Bontis, 1999). Therefore, embedded within the conceptualization of relational capital is market orientation. There is an abundance of evidence showing a positive relationship between an organization's performance (financially as well as organizationally) and its level of relational capital. While Narver and Slater (1990) report that business performance is strongly related to market orientation, Jaworski and Korhli's (1993) study of 222 US businesses corroborates that market orientation is an important determinant of performance, regardless of competitive intensity, market or technological turbulence. Greenley (1995) and Lusch and Laaczniak (1987) also report positive association between market orientation with firm performance. Bontis, (2002a) reports of an increasing trend in organizational structure towards what he described as "delayering, lean production,

making decisions closer to the customer and establishing semi-autonomous workgroups, with an emphasis on employee involvement and empowerment" (Bontis, 2002a, pp. 636).

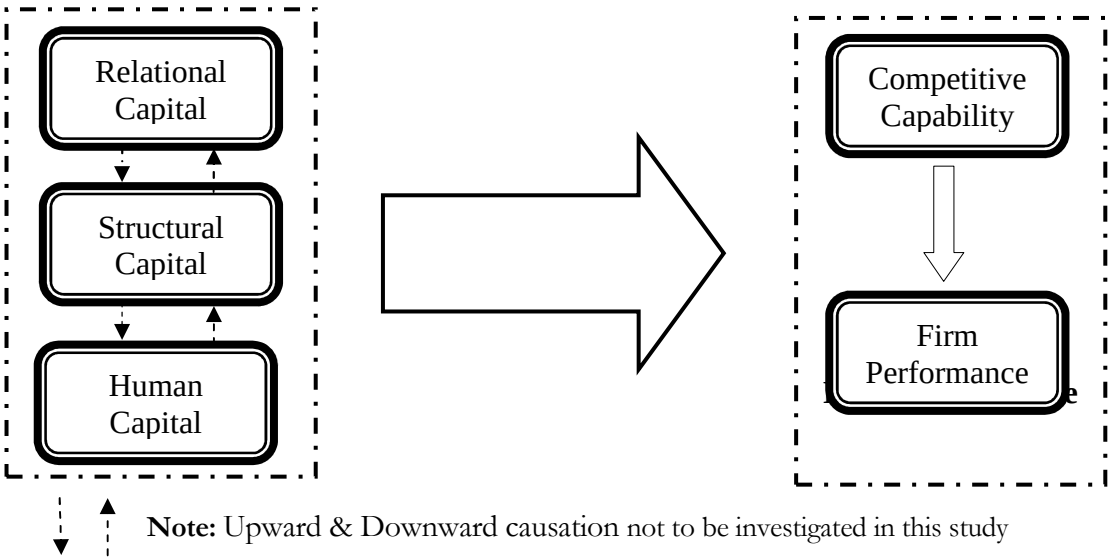

Figure 1: Conceptual Framework

From the above review, we argue that intellectual capital can be operationalized as consisting of three components, human capital, structural capital and relational capital. Furthermore, in line with the emergenist reasoning, we conceptualize it as being layered, with the human capital being at the lower level, and the relational capital being at the top level, and the structural capital serving as an interface between the two generic classes. Following Nielsen et al. (2008), we argue that it also includes downward causation, where the higher level phenomenon have a downward causal effect on lower level processes, thus assuming that higher level properties constitute an operating environment for the lower level.

Finally, grounded on the resource-based and knowledge-based views of the firm, the intellectual capital general theory, and the emergenist view, we argue that elements of the intellectual capital at the individual level, operating under certain firm conditions and guided by some organizational mechanisms exert direct influence on the firm, resulting in the emergence of core competencies and competitive capabilities of the firm at the firm level. In addition, under the prevailing conditions of the industry, and guided by some industry mechanisms, the firm level intellectual capital exerts some influence on the industry, resulting in the emergence at the industry level some level of industry performance (see Appendix A).

THE RESEARCH MODEL AND HYPOTHESES

Grounded on intellectual capital theory, the resource-based view and knowledge-based views of the firm and drawing on extant literature with particular reference to Heek's SESM (Heeks and Nicholson, 2002), Carmel's "Oval Model" (Carmel, 2003) and Seleim et al. (2004) study, we developed the research model shown in Figure 3 below and proposed the associated hypotheses.

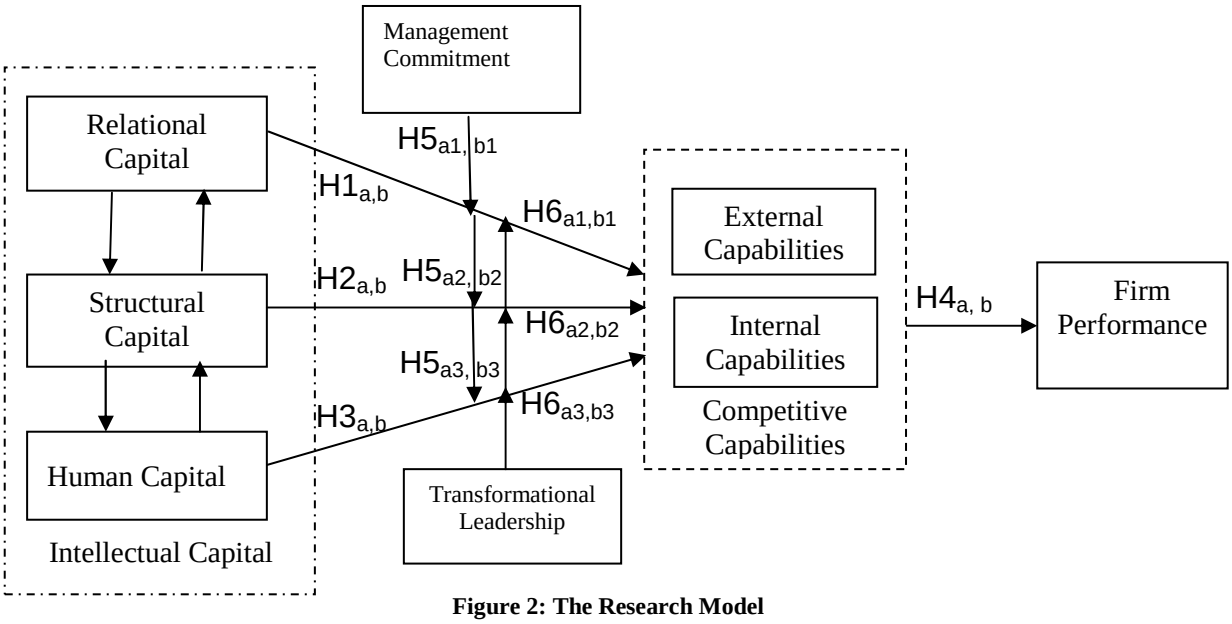

Figure 2: The Research Model

Intellectual Capital and Firm Competitiveness

A firm's competitive capability is "its capacity to deploy resources, usually in combination, using organizational processes" (Amit and Schoemaker, 1993, pp. 35) to achieve a strategic objective. In extant literature it has been established that such capabilities are critical to the pursuit of competitive advantage (Teece et al., 1997). The capacity of a firm to deploy its resources rests on its human capital, structural capital and relational capital, because "capabilities are information based, tangible or intangible processes that are firm specific and are developed over time through complex interactions among the firm's resources" (Amit and Schoemaker, 1993, pp. 35). These resources include tradable know-how, human capital, and physical or financial assets among other things.

Although earlier studies on variations in competitive capabilities of firms adopted an atomistic view of the firm (McEvily and Zaheer, 1999), and to a large extent, attributed the variations to imperfections in factor markets (Barney, 1986), path dependence (David, 1985), causal ambiguity and uncertain imitability (Lippman and Rumelt, 1982), and relatively immobile internal resources (Barney, 1991), McEvily and Zaheer (1999) introduced a new dimension in the study of variations in firm competitive capabilities.

Adopting an embeddedness perspective, McEvily and Zaheer (1999) argue that to be able to account for variation in competitive capabilities of firms operating within the same industrial sector, it is worthwhile evaluating the role of firms' social, economic and professional networks in the quest for explanation for their economic actions such as alliance formation, inter-firm exchange and organizational survival and how that impacts their competitive capabilities and their performance.

Relational Capital and Firm Competitiveness

A firm's relational capital is an embodiment of all the knowledge assets accumulated by the firm from its interaction with customers, partners, competitors, associations and governments or other organizations that interact with the firm (Seleim et al., 2004; Bontis, 1999). Through such interaction, the potential for wealth creation is stimulated by enhancing human and structural capital (Seleim et al., 2004). Thus, firm's networks of ties constitute a good source of explanation for differences in competitive capabilities. Viewing economic action as embedded in firms' network of ties, McEvily and Zaheer (1999) found that "firm actions and outcomes are substantially influenced by the ongoing pattern of relationships maintained with other firms and non-market organizations" (McEvily and Zaheer, 1999, pp. 1134) and as "networks of social relations" are said to "penetrate irregularly and in differing degrees in different sectors of economic life" (Granovetter, 1985 pp. 491). The study by

McEvily and Zaheer (1999) highlights two key differentiating facets of firms' network resources, bridging ties and linkages to regional institutions as sources of competitive capabilities, and argues that:

- when firms are embedded in highly differentiated ways they become linked to different sets of agents, hence are exposed to sharply distinct opportunities and constraints;
- regional institutions facilitate the development of competitive capabilities among firms by acting as network intermediaries for interaction;
- embedded ties among firms foster higher levels of trust that enable knowledge sharing among firms (Saxenian,1994); hence, they have "the institutional capacity to continuously learn, adjust and improve in economic performance…. as initiatives from one firm intersect with others and modify the production capabilities and opportunities for each firm" (McEvily and Zaheer, 1999 pp. 1135); and
- through embedded network ties decision making is improved because bounded rationality is reduced by expanding the range of data attended to and increasing the speed of processing (Uzzi, 1997).

McEvily and Zaheer (1999) thus proposed that:

- Firms whose networks are rich in non-redundant ties will acquire much more competitive capabilities than firms with networks lacking redundant ties.
- Firms' exposure, via their networks, to more diverse sources of information is equivalent to gaining access to a richer set of opportunities.
- Advised networks composed of contacts with which a focal firm interacts frequently, tend to interact with each other frequently as well; i.e. it is less likely to contain bridging ties (Granovetter, 1973) because a good chunk of time available to them is invested in interacting with those in the clique, leaving no time to interact with actors from other parts of a social system.

Based on the above arguments and proposals, and in addition to Greenley's (1995) and Lusch and Laaczniak's (1987) reports on positive association between market orientation and firm performance, we posit the following hypotheses:

Hypothesis 1: There is a positive relationship between relational capital and the competitive capabilities of software firms,

1a: The relational capital of a firm will positively influence its external competitive capabilities

1b: The relational capital of a firm will positively influence its internal competitive capabilities.

Structural Capital and Firm Competitiveness

Structural capital can be described as the intellectual value the firm accumulates as a result of products or systems the firm has created over time. It comprises the internal processes, patents, and polices, infrastructure (such as information technology and systems), and organizational culture and strategies that support its core competence (Edvinsson et al., 1997a). It is the supportive infrastructure that enables the human capital to function, and hence includes the content part of the enterprise knowledge asset and the intellectual investment made in the physical, technical and organizational culture infrastructure that support its activities (Muhammad, Bharu, and Ismail, 2009).

The impact of structural capital on economic performance of firms such as productivity or profitability has been extensively documented (Arthur, 1994; Kelly, 1994; Huselid, 1995; Delany and Huselid, 1996; Ichniowski, Shaw, and Prennushi, 1997; Black and Lynch, 2001). On the basis of the above, we posit the following:

Hypothesis 2: There is a positive relationship between a firm's structural capital and its competitive capabilities; the higher the level of the structural capital of a software firm, the more competitive it becomes.

2a: The structural capital of a firm will positively influence its external competitive capabilities

2b: The structural capital of a firm will positively influence its internal competitive capabilities

Human Capital and Firm Competitiveness

Following the works of Theodore Schultz and Gary Becker and the emergence of the "endogenous growth theory," human capital has been touted as the most critical resource responsible for performance differences among firms and nations. It has since been described as the "engine of growth" (Ehrlich, 1990) and as the ultimate determinant of the character and pace of nations' economic and social development (Olaniyan and Okemakinde, 2008). The significance of its critical role spans many industries, including the software industry, as it has been claimed to be the most important corporate resource for the next 20 years (Seleim et al., 2007). The significance of human capital in explaining differences in productivity and in overall levels of technology has also been documented (Olaniyan et al., 2008; Psacharopoulos and Woodhall, 1997) and has gained special attribution for the spectacular economic growth in East Asian countries such as Hong Kong, Korea, Singapore, and Taiwan. Based on the above reasons we hypothesize that:

Hypothesis 3: There is a positive association between the human capital of a firm and its competitive capability; the higher the level of human capital in a firm, the greater its competitive capabilities.

3a: The human capital of a firm is positively associated with its external competitive capabilities.

3b: The human capital of a firm is positively associated with its internal competitive capabilities.

Based on the above literature review, we also posit that:

Hypothesis 4: There is a positive relationship between the competitive capabilities of a software firm and its performance; the greater the competitive capabilities of a software firm, the greater its performance.

4a: The external competitive capabilities of a firm are positively associated with its performance.

4b: The internal competitive capabilities of a firm are positively associated with its performance.

The Moderation Effects of Management Commitment and Leadership on Competitive Capability

Intellectual capital management has been a hotspot in extant research. Management of intellectual capital has therefore been cited as being critical in realization of the potential of intellectual capital in transforming a firm's resources into productive gains. Transformational leadership theory considers profound insight and farsightedness as some of the key characteristics of transformational leaders. In Wilderom and Berg (2000) transformational top leadership was found to be associated positively with firm performance.

Also in Li and Richard (1999) it has been observed that investment in IT and systems in a firm appears to have a stronger positive impact on the firm's performance when top management shows high commitment. In other words, when top management commitment is high, the likelihood that the implementation of the investment made will succeed and subsequently result in a positive impact on the competitiveness of the organization. We thus posit that:

Hypothesis 5: Management Commitment moderates the relationship between the elements of intellectual capital and firm competitive capability.

5a: Management Commitment moderates the relationship between the elements of intellectual capital and firm external competitive capability.

5b: Management Commitment moderates the relationship between the elements of intellectual capital and firm internal competitive capability.

Hypothesis 6: Transformational Leadership moderates the relationship between the elements of intellectual capital and firm competitive capability.

6a: Transformational Leadership moderates the relationship between the elements of intellectual capital and firm external competitive capability.

6b: Transformational Leadership moderates the relationship between the elements of intellectual capital and firm internal competitive capability.

RESEARCH METHODOLOGY

The study used field survey as a method to test the conceptual model developed and the associated hypotheses proposed above. The study empirically investigated the relationship between the most important issues relating to the intellectual capital and firm competitiveness. It also investigated the moderating effects of top management commitment and leadership transformation on the relationship between intellectual capital sub-constructs (human, structural and relational) and firm competitive capability. The choice of field survey as a method was informed by the research questions to be addressed by this study.

Study Site and Population

This study was carried out in the ECOWAS, a regional economic block located on the west coast of Africa and comprising 15 countries. The study population comprises software development firms in the ECOWAS common market that are registered members of various national software producer associations in the member countries, such as the Institute of Software Producers of Nigeria (ISPON) and the Ghana Association of Software and IT Services Companies (GASSCOM). Specifically, the firms constituting the study population are firms that develop and sell software in the West African market and beyond.

Sampling Procedure

The data collection was carried out in three selected countries – Ghana, Nigeria and Senegal – based on a stratified random sampling method, and guided by the population size, industry spread and the specialization of the firms. The stratified random sampling used is intended to reflect the industrial diversity and the geographical spread of the population. The region was divided into three sub-regions – West ECOWAS, Central ECOWAS and East ECOWAS – and a sampling size determined based on the proportion of the sub-region's population to the overall population of the ECOWAS region. Subsequently, to minimize bias, survey sites were selected randomly within selected countries in the various sub-regions. The countries were selected based on existence of active software industries and industry associations.

Instrument Development and Administration

An instrument consisting of 50 measurement items was developed based on extensive literature review and expert opinion. All survey instruments were directly adopted from previous studies and then adjusted to reflect the judgment of an expert group, consulted earlier in the study, using the Delphi Method. The questionnaire was subsequently organized based on issues prioritized by the expert group

and then refined, after a pilot survey on selected software firms, before the final set of 43 questionnaires was administered on software firms during the actual survey.

Given that the unit of analysis in this study is an organization to minimize the effect of personal biases, the subjects interviewed – CEOs, Senior Business Managers or Lead Developers – were asked to be guided by the views and positions of their respective organizations as they respond to the questionnaire. A total of 120 firms were served with the questionnaire; and out of the 120 firms served, 83 returned completed questionnaire. This represents a response rate of 69.2 percent; a rate considered far above the accepted minimum norm of 40 percent for academic studies involving chief executives and middle level managers as respondents (Baruch, 1999).

Variables and Item Measurement

The research model specified above (see Fig. 2) consists of three independent, two mediating, one dependent and two moderating constructs. To facilitate cumulative research, the measurement items for these constructs were directly adopted from previous studies (Roos et al., 1997a; Bontis, 1998; Bontis, 1999; Bontis, Keow, and Richardson, 2000; Dooley, 2000; Bontis, 2001; Bontis 2002a; Seleim et al., 2007) and adjusted to reflect the judgment of an expert group, consulted earlier in the study regarding the study context using the Delphi Method (Adler and Ziglio, 1996). Subsequently, on the basis of the definitions assigned to them in the research model, they were operationalized and used to collect the data for this study.

Dependent Variables

The dependent variable specified in the model is firm performance. This was operationalized based on a multi-item measure (operational performance) and was measured by how each manager rated on 7-point bipolar Likert scales their organization's performance during the three year period (2007 to 2010) in terms of their position and satisfaction with their sales growth rate compared to their competitors, market share gains, and firms profitability relative to competitors. Responses for these four adoption items were aggregated to constitute the dependent variable, which is an approach used to enhance comprehensiveness[1] of the performance measurement.

Mediating Variables

Competitive capability is the construct that mediates between the independent variables and the dependent variable. This construct was operationalized and measured based on two multi-item measures – internal competitive capability (ICC) and external competitive capability (ECC). Each manager interviewed rated these measures on 7-point Likert scales on the competitive capability of their respective organizations. Five items were used to measure the level of perceived external competitive capability, while eight items were used to measure the level of perceived internal competitive capability.

Independent Variables

Three independent variables were considered in this study as factors that impinge on the competitive capability of software firms, and hence on their performance. These three constructs were also measured using multi-item, 7-point Likert scales. Likewise, the item ratings were summarized to form a summated rating scale for each independent variable.

Moderating Variables

To capture the most influential sources of variation in software firms, two moderating variables (management commitment and transformational leadership) were operationalized and included in the study. While management commitment was measured using two items – demonstrating to staff quality values required for long term success and implementing corporate values via appropriate action and

[1] Necessary to secure the interest of various facets of the operations

behaviors – transformational leadership was measured using three items – the extent to which leadership actions and behaviors result in mutual confidence between management and staff, raising the belief of staff in the corporate mission and vision, and the extent to which the leadership style stimulate idea generation and innovation.

Control Variables

Given the wide recognition of the proactive roles governments can play and have played in every one of the factors cited as success factors of the software industry (Carmel, 2003) intellectual capital inclusive, we included government commitment to control for its potential effect on firms' competitive capability as our mediating variable[2]. It has been argued that in the global software market firm size plays a significant role in the success of a firm, particularly the size of the technical team – requirements engineers, analyst programmers and personnel who test run the programs. The size of the firm thus determines the scale of jobs that can be handled by the firm. Large scale programming jobs require big teams to meet delivery deadlines. Hence small usually cannot compete with large firms for such jobs, as they are deemed not to have the capacity to execute such jobs within the deadlines required. In view of the above concerns and possible effects of firm size on firm performance, the effect of firm size was controlled through the dependent variable.

DATA ANALYSIS AND RESULTS

In this study, we carried out a correlation analysis and hierarchical linear regression based on Structural Equation Modeling (SEM) using the partial least squares (PLS) technique. We chose the variance-based SEM, as implemented in PLS Graph, over the covariance-based SEM, as implemented in LISREL, AMOS, EQS and SEPATH, because in this study we are dealing with multiple-item constructs – a situation where maximum-likelihood covariance-based SEM tools reach their limit (Michael and Andreas, 2004). Whereas PLS focuses on maximizing the variance of the dependent variables explained by the independent variables, the covariance-based approaches attempt to minimize the differences between the sample covariance and those predicted by the theoretical model; thus the approach attempts to reproduce the covariance matrix of the observed measures (Chin and Newsted, 1999). Moreover, using PLS has several advantages. For instance, in addition to not requiring multivariate normality of the data, it is found to be less demanding on sample size (Chin, 1998; Chin, Marcolin, and Newsted, 2003).

The analysis based on PLS is a two-step process. The first step is an assessment of the measurement model (for reliability and validity). The second step entails testing the structural model to ascertain the validity of the proposed hypotheses.

The Measurement Model

Assessment of the measurement model is a type of reliability and validity test. The objective is to find out to what extent the indicators selected for the different measurement scales are reliable and valid. Reliability in this context refers to how consistent and stable the scores derived from a measurement scale are (Tore, 2005).

[2] For example, government can facilitate the development of human capital, through investment in education and through national standard bodies. It is envisaged that governments can insist on streamlining and standardizing processes and routines used in the production of software, possibly along the lines of International Standards Organisation's ISO 9000, or CMU's Software Engineering Institute's CMM/CMMI software process improvement models.

Constructs	Number of Items	Items Deleted	Chronbach's alpha	AVE	Composite Reliability
Human Capital	5	2	0.88	0.81	0.93
Structural Capital	5	2	0.76	0.62	0.83
Relational Capital	5	2	0.81	0.72	0.89
Internal Competitive Capability	8	3	0.83	0.59	0.88
External Competitive Capability	4	0	0.74	0.56	0.84
Firm Performance	4	0	0.95	0.90	0.97

Table 2: Reliability Analysis - Composite, Chronbach's alpha and Average Variance Extracted

We assessed the reliability of each construct by means of composite reliability and the Cronbach's alpha coefficient; first, by considering the correlation of items within each scale, then correcting item-to-total (item-scale) correlations and finally deleting the effects on reliability after items with low values of composite reliability and Cronbach's alpha coefficient (Tore, 2005).

Table 2 captures the process of the reliability analysis by showing the original sets of measurement items associated with the major constructs, the items dropped from the original sets to increase alpha, and the reliability coefficients for the final set of scales. As shown in the table, the composite reliability ranged from 0.78 to 0.97, and the Cronbach's alpha coefficients ranged from 0.74 to 0.95. Since the reliability measures must be greater than 0.70 (Nunnally, 1978) to be considered satisfactory, all scales considered for this study were found to be reliable**.** Moreover, the average variance extracted (AVE) for each measure was found to be above the accepted level of 0.50 (Fornell and Larcker, 1981)**.**

For validity analysis, we assessed the measurement scales for three kinds of validity usually examined for this type of study: content validity, convergent validity and discriminant validity (Tore, 2005). Content validity, which by definition measures the degree to which the scale items represent the domain of the concepts under study, was ensured following the recommendations of Cronbach (1951) and Straub (1989), as spelled out in Tore (2005). Since the selection of the measurement items was based on these generally accepted procedures designed to obtain content validity, we can comfortably conclude that the measurement scales representing the key constructs of the model developed in this study satisfy the content validity criteria.

Convergent validity and discriminant validity are sub-categories of construct validity – a measure that seeks agreement between a theoretical concept and a specific measuring device or procedure. That is, it examines whether the measurement scales represent and act like the attributes (Tore, 2005). Convergent validity establishes if all measures that purport to reflect a particular construct (should be related) are indeed related. Discriminant validity, on the other hand, establishes whether measures that should not be related are indeed not related.

We assessed our measurement scales for these two kinds of construct validity by looking at the patterns of inter-correlations among the measures. Correlations between measures that are supposed to reflect the same construct should be "high" while correlations between measures from different constructs should be "low." Table 3 shows the results of the discriminant validity analysis of the scales used in this study. Along the diagonal, it shows square roots of corresponding AVE values extracted from Table 2. AVE is also featured in discriminant validity analysis. A necessary and sufficient condition for satisfactory discriminant validity for a construct is that the AVE from the construct should be greater than the variance shared between the construct and other constructs in the model (Fornell and Larcker, 1981).

	RC	HC	SC	ICC	ECC	ATT	FP
RC	**0.85**						
HC	0.39	**0.90**					
SC	0.55	0.57	**0.79**				
ICC	0.31	0.33	0.41	**0.77**			
ECC	0.25	0.17	0.34	0.53	**0.75**		
ATT	0.24	0.21	0.29	0.17	0.11	**0.83**	
FP	0.11	0.24	0.13	-0.12	0.46	0.15	**0.95**

Table 3: Discriminant Validity Analysis - Inter-correlation of Latent Variables

Since the square roots of the AVEs (diagonal elements) are greater in all cases than the off-diagonal elements in their corresponding rows and columns, the results confirm the discriminant validity of our measurement scales.

Table 3 also serves as a tool for investigating the data set for common method bias. It shows low correlations between the marker variable (Attitude To Tax) and the rest of the constructs, which is a condition that depicts non-contamination of the data set by common method bias (Podsakoff, MacKenzie, Lee and Podsakoff, 2003).

	RC	HC	SC	ICC	ECC	ATT	FP
RC1	**0.85**	0.40	0.51	0.18	0.23	0.22	0.04
RC2	**0.81**	0.38	0.39	0.35	0.12	0.25	0.03
RC3	**0.88**	0.25	0.48	0.30	0.24	0.16	0.18
HC1	0.34	**0.90**	0.14	0.47	0.17	0.07	-0.01
HC3	0.34	**0.92**	0.07	0.45	0.17	0.20	0.04
HC4	0.38	**0.87**	0.06	0.30	0.29	0.32	0.03
SC2	0.31	0.36	**0.75**	0.34	0.34	0.10	0.21
SC4	0.40	0.57	**0.85**	0.29	0.19	0.27	0.06
SC5	0.57	0.41	**0.76**	0.34	0.26	0.31	0.04
ICC4	0.28	0.40	0.37	**0.79**	0.23	0.19	-0.15
ICC6	0.25	0.27	0.36	**0.82**	0.39	0.08	-0.15
ICC7	0.15	0.42	0.29	**0.78**	0.38	0.11	-0.02
ICC8	0.17	0.35	0.21	**0.77**	0.26	0.09	-0.08
ECC2	0.25	0.04	0.20	0.23	**0.72**	0.03	0.37
ECC3	0.15	0.29	0.35	0.34	**0.85**	0.16	0.40
ECC4	0.14	0.24	0.25	0.26	**0.78**	0.06	0.34
ATT1	0.22	0.27	0.27	0.18	0.06	**0.80**	0.04
ATT2	0.11	0.36	0.34	0.14	0.21	**0.79**	0.10
ATT4	0.26	0.04	0.18	0.13	0.03	**0.90**	0.15
FP1	0.04	0.08	0.16	-0.04	0.48	0.11	**0.93**
FP2	0.11	0.36	0.15	-0.12	0.43	0.09	**0.95**
FP3	0.12	0.01	0.13	-0.13	0.40	0.18	**0.96**
FP4	0.15	-0.07	0.08	-0.16	0.43	0.13	**0.95**

Table 4: Loadings and Cross Loadings

Using PLS-Graph and SPSS, convergent validity was also tested by extracting the factor and cross factor loadings of all the items to their respective constructs (Al-Gahtani, Hubona, and Wang, 2007). Table 4 presents the loadings and cross loadings of the constructs after a process of refinement of the constructs. The validity of a measurement scale is said to be convergent when items load highly (i.e., loading > 0.5) on their associated constructs. In this study, 11 items could not load adequately on their respective constructs and were eliminated from further analysis. Following the refinement, all the items loaded on their respective constructs from a lower bound of 0.72 to an upper bound of 0.95; and they loaded more highly on their respective constructs than on any other construct. In addition, each item's factor loading on its respective construct was highly significant ($p < 0.0005$) as depicted by the t-statistics of the outer model loadings. The t-statistics values ranged from 7.8 to 203.7. These highly significant t-statistics for the individual item loadings coupled with the item loadings and cross loadings of the constructs presented in Table 4 confirm that the items represent distinct latent constructs, hence establishing their convergent validity.

The Structural Model

Following the approach in Chin et al. (1999 and 2003) and Frazier, Tix and Barron (2004), the proposed structural model was analyzed using the main effects – first without the influence of interacting moderator variables and then with their influence.

The interacting terms were expressed as products of corresponding predictor construct indicators and moderator construct indicators. Figure 3 shows the results of the analysis without the interaction effects. Except for Internal Competitive Capability (ICC), all the β path coefficients are positive and statistically significant ($p < 0.0005$). The coefficient of ICC, even though negative, was also significant ($p<0.0005$).

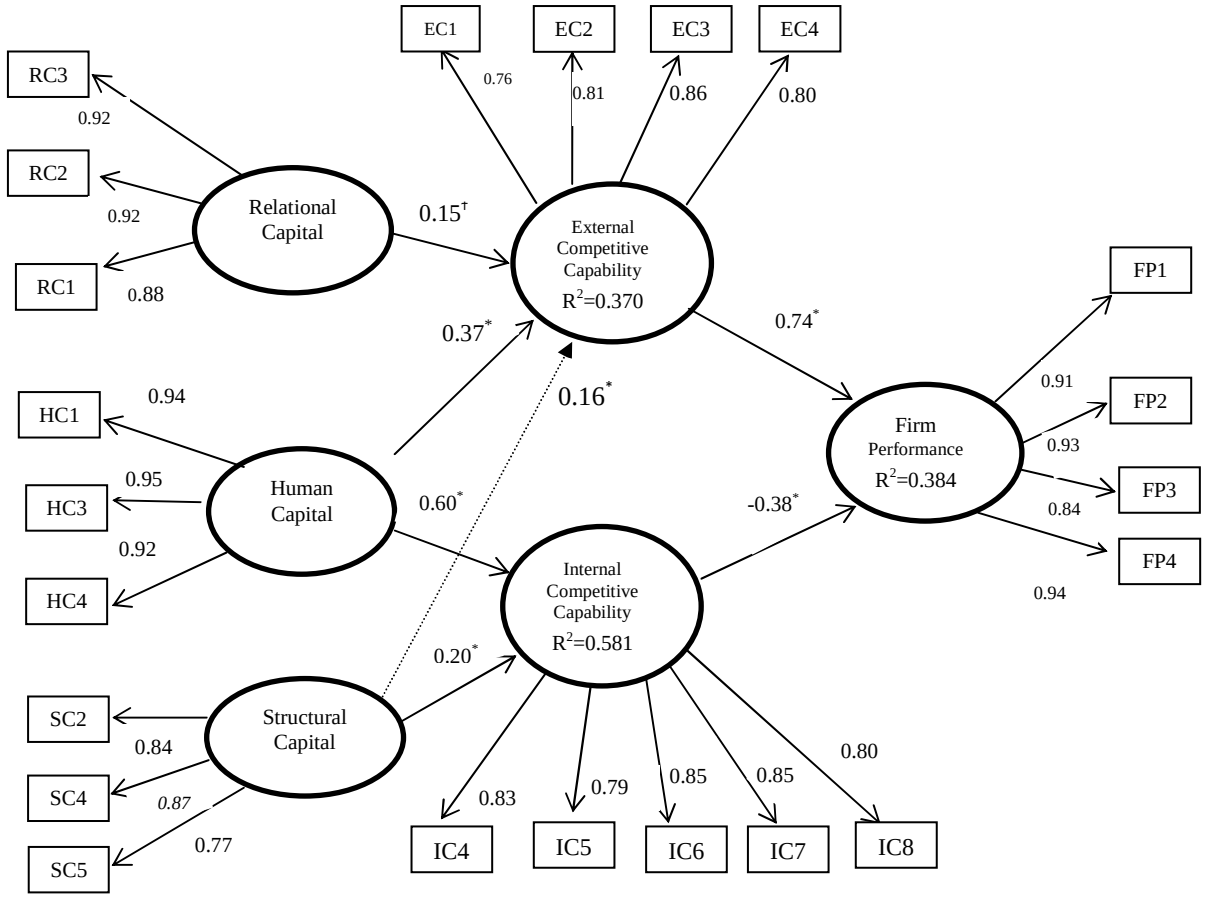

Figure 3: Structural Model Analysis (Main Effects)

Subsequently, we carried out a hierarchical linear regression analysis to compare models with and models without the interacting effects. Hierarchical Linear Modeling is a multi-level analysis in which the predictor variables are entered into the regression equation block-wise (Frazier et al., 2004) to see the effects of each block's predictor variables on the dependent variable.

Table 5 presents the results of the hierarchical process, depicting the way the different sets of predictor variables were entered in the equation and the variance explained by them. The set of variables – relational capital (RC), human capital (HC) and structural capital (SC) – predicting competitive capability and constituting Model 1, were first entered into the equation to test their effect on competitive capability – external capability (ECC) as well as internal capability (ICC). All the variables were found to have positive and significant influence (RC: $\beta = 0.146$, $p < 0.005$; HC: $\beta = 0.365$, $p < 0.0005$; SC: $\beta = 0.156$, $p < 0.01$) on ECC. However, only HC and SC were found to have positive and significant influence (HC: $\beta = 0.599$, $p < 0.0005$; SC: $\beta = 0.202$, $p < 0.0005$) on ICC.

Independent Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Block 1: Main effects							
Relational Capital (RC → ECC)	0.146†	0.105**	0.005 (ns)	0.005 (ns)	0.159****	-0.042 (ns)	-0.042 (ns)
Human Capital (HC → ECC)	0.365*****	0.239*****	0.103*	0.102 (ns)	0.221*****	0.758*****	0.758*****
Structural Capital (SC → ECC)	0.156***	0.184*****	0.202***	0.202**	0.290*****	-0.115*	-0.115*
Relational Capital (RC → ICC)	0.007 (ns)	0.035 (ns)	0.036 (ns)	-0.115**	0.035 (ns)	0.035 (ns)	0.623††
Human Capital (HC → ICC)	0.599*****	0.531*****	0.531*****	0.561*****	0.530*****	0.530*****	0.636*****
Structural Capital (SC → ICC)	0.202*****	0.191*****	0.191*****	0.210†	0.202*****	0.202*****	-0.001 (ns)
Block 2: Direct Effect (Management Commitment)							
MC → ECC		0.371****	0.288****	0.287****			
MC → ICC		0.114****	0.114****	0.078**			
Block 3: MC Interaction Effects with ECC							
RC x MC → ECC			0.210***	0.210***			
HC x MC → ECC			0.162*	0.162*			
SC x MC → ECC			- 0.050 (ns)	- 0.050 (ns)			
Block 4: MC Interaction Effects on ICC							
RC x MC → ICC				0.234****			
HC x MC → ICC				-0.080 (ns)			
SC x MC → ICC				-0.005 (ns)			
Block 5: TL Direct Effect							
LT → ECC					-0.087**	-0.095*	-0.095**
LT → ICC					0.132****	0.132****	0.501***
Block 6: TL Interaction Effects on ECC							
RC x LT→ ECC						0.196***	
HC x LT → ECC						-0.539****	
SC x LT → ECC						0.444****	
Block 7: TL Interaction Effects on ICC							
RC x LT → ICC							-0.715**
HC x LT → ICC							-0.129*
SC x LT → ICC							0.179**
R^2 (ECC, ICC)	(0.370, 0.582)	(0.475, 0.569)	(0.517, 0.569)	(0.517, 0.581)	(0.362, 0.573)	(0.413,0.573)	(0.413, 0.588)
ΔR^2 (ECC, ICC)	(- , -)	(0.105, -0.013)	(0.042, -)	(- , 0.012)	(-0.008 , -0.009)	(0.051, -)	(- , 0.015)

$^{\dagger}p < 0.005$; $^{\dagger\dagger}p < 0.025$; *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001; *****p < 0.0005;

Table5: HLM Analysis -Management Commitment and Transformational Leadership Effects on Competitive Capabilities.

The findings fully support Hypotheses H2 and H3 but partially support hypothesis H1 (only H1a supported).

In Model 2, the moderating variable management commitment (MC) was added to test its effects on ECC and ICC. As shown in Table 5, MC was found to have positive and significant influence (MC_{ECC}: $\beta = 0.371$, $p < 0.001$; MC_{ICC}: $\beta = 0.114$, $p < 0.001$) on ECC and ICC, with $\Delta R^2_{ECC} = 0.105$ and $\Delta R^2_{ICC} = - 0.013$.

Subsequently, in Model 3, we tested for Hypothesis 5a, which suggests that MC has a moderating effect on the relationships between the elements of Intellectual Capital (RC, HC and SC) and external competitive capability (ECC).

As shown in Block 3, Model 3 of Table 5, the interactive effect between MC and RC and between MC and HC on ECC are positive and statistically significant (MC x RC: $\beta = 0.210$, $p < 0.01$; MC x HC: $\beta = 0.162$, $p < 0.10$) with $\Delta R^2_{ECC} = 0.042$. But the interactive effect between MC and SC on ECC although negative, is not statistically significant. Overall, Hypothesis 5a is partially supported, with the interaction between MC and the two elements of intellectual capital (RC and HC) accounting for additional 4.2% of variance in external competitive capability.

In Model 4, we tested Hypothesis 5b, which suggests that MC has a moderating effect on the relationships between the elements of Intellectual Capital (RC, HC and SC) and internal competitive capability (ICC). Here also, whereas the interactive effect between MC and RC is positive and statistically significant (MC x RC: $\beta = 0.234$, $p < 0.001$) on ICC, the effect between MC and HC on ICC is negative and statistically not significant (MC x HC: $\beta = -0.080$). The change in R^2 (ΔR^2_{ICC}), is 0.012. Thus, it explains an additional 1.2% of variance in internal competitive capability and partially supports Hypothesis 5b.

In Model 5 the direct effect of TL on ECC and ICC is tested. LT has a negative significant effect (TL: $\beta = -0.087$, $p < 0.05$) on ECC and a positive significant influence (TL: $\beta = 0.132$, $p < 0.001$) on ICC.

Models 6 and 7 test hypotheses H6a and H6b, which suggest respectively that transformational leadership (TL) has moderating effect on the relationships between the elements of Intellectual Capital (RC, HC and SC) and external and internal competitive capabilities (ECC and ICC).

In Model 6, whereas the interactive effect between TL and RC and between TL and SC are positive and statistically significant (TL x RC: $\beta = 0.196$, $p < 0.01$; TL x SC: $\beta = 0.444$, $p < 0.001$) on ECC, the effect between TL and HC on ECC is negative and also statistically significant (TL x HC: $\beta = -0.539$, $p < 0.001$); with $\Delta R^2_{ECC} = 0.051$. These results account for an additional 5.1% of variance in external competitive capability, hence supporting Hypothesis H6a.

Model 7 also supports Hypothesis H6b. Like H6a, all three interaction effects on ICC between TL and RC, HC and SC are significant. However, the directions of interactions are split. Unlike H6a, two interactions are negative (TL x RC: $\beta = -0.715$, $p < 0.05$; TL x HC: $\beta = -0.129$, $p < 0.20$) and one interaction is positive (TL x SC: $\beta = 0.179$, $p < 0.05$); with $\Delta R^2_{ECC} = 0.015$. Thus overall, TL's interaction with RC, HC and SC explained an additional 1.5% of variance in internal competitive capability, and hence supports Hypothesis H6a.

DISCUSSION

The purpose of this study has been to investigate the relationship between intellectual capital and the competitive capabilities of software firms, and hence their influence on firm performance. There have been numerous studies in extant literature supporting the proposition that the various facets of intellectual capital are important in a firm's acquisition of knowledge and hence their impact on its outcomes (e.g., competitive capabilities and performance) (Nevis, DiBella and Gould, 1995; Lyles and Salk, 1996; Edvinsson and Sullivan 1997; Michael et al., 2001; Chetty and Wilson, 2003; Crossan and Berdrow, 2003; Krishnan, Martin, and Noorderhaven, 2006; İpek et al., 2009; Bustinza et al., 2010; Chia-Ling et al., 2010).

Table 6 represents a summary of the hypotheses and the outcome of the study. It shows for each hypothesis, our findings from this study, our conclusion and related works that investigated comparable relationships.

Hypotheses	**Finding**	**Conclusion**	**Related Works**
H1a: The relational capital of a firm is positively with its external competitive capabilities	Yes: (RC: $\beta_{ECC} = 0.146$, $p < 0.005$).	Supported	Bustinza et al. (2010); İpek et al. (2009); Chia-Ling et al. (2010)
H1b: The relational capital of a firm is positively associated with its internal competitive capabilities	No: Not significant	Not supported	
H2a: There is a positive relationship between a firm's structural capital and its external competitive capabilities.	Yes: (SC: $\beta = 0.156$, $p < 0.01$)	Supported	Edvinsson & Sullivan, (1997); İpek et al. (2009); Arthur, 1994; Kelly, 1994; Huselid, 1995; Delany and Huselid, 1996; Ichniowski, Shaw, and Prennushi, 1997; Black and Lynch, 2001.
H2b: There is a positive relationship between a firm's structural capital and its internal competitive capabilities			
H3a: There is a positive association between the human capital of a firm and its external competitive capability	**Yes:** ($\beta_{ECC} = 0.365$, $p < 0.0005$)	Supported	Sullivan, 2000; Mohan & Mark, 2005
H3b: There is a positive association between the human capital of a firm and its internal competitive capability	**Yes:** ($\beta_{ICC} = 0.599$, $p < 0.0005$)	Supported	
H4: There is a positive relationship between the competitive capabilities of a software firm and its performance			Adnan Kalkan, Oya Erdil and Özlem Çetinkaya (2011)
H5a: Management Commitment moderates the relationship between the elements of intellectual capital and firm external competitive capability.	Partially: (MC x RC: $\beta_{ECC} = 0.210$, $p < 0.01$; MC x HC: $\beta_{ECC} = 0.162$, $p < 0.10$; MC x SC: $\beta_{ECC} = -0.050$ (ns))	Partially Supported	Yaping et al. (2009)
H5b: Management Commitment moderates the relationship between the elements of intellectual capital and firm internal competitive capability	**Partially:** (MC x RC: $\beta_{ICC} = 0.234$, $p < 0.001$); MC x HC: $\beta ICC = -0.080$, (ns); MC x SC: $\beta_{ICC} = -0.005$ (ns))	Partially Supported	
H6a: Transformational Leadership moderates the relationship between the elements of intellectual capital and firm external competitive capability.	Yes: (TL x RC: $\beta_{ECC} = 0.196$, $p < 0.01$; TL x SC: $\beta_{ECC} = 0.444$, $p < 0.001$) (TL x HC: $\beta_{ECC} = -0.539$, $p < 0.001$);	Supported	Jung et al. (2008); Rabia et al. (2009); Wilderom, (2000)
H6b: Transformational Leadership moderates the relationship between the elements of intellectual capital and firm internal competitive capability.	**Yes:** (TL x RC: $\beta_{ICC} = -0.715$, $p < 0.05$; TL x HC: $\beta_{ICC} = -0.129$, $p < 0.20$); (TL x SC: $\beta_{ICC} = 0.179$, $p < 0.05$);	Supported	

Table 6: Survey Findings

Findings

Altogether 12 hypotheses were investigated in this study, out of which 9 were fully supported, 2 were partially supported and 1 was not supported.

On relational capital, the findings of this study partially corroborated with hypothesis H1, as it demonstrated that relational capital has positive significant relationship with the external competitive capability (ECC) of software firms ($H1_a$), but does not have significant relationship with their internal competitive capability ($H1_b$). The latter result, even though contrary to the expectation of this study, contributes to the understanding of the increasing important role of relational capital and its

interaction with a firm's structural and human capital in creating corporate wealth and growth (Ming-Chin, 2004, Lev and Zarowin, 1999). The result is also a reflection of the emphasis on market oriented capabilities rather than on intra-organizational relational capabilities. Thus, it supports the extensive body of empirical evidence regarding the value relevance of investments in advertising, brand, industry and customer relationship management (Cañibano et al., 2000) capabilities of firms, particularly in partnership formation (Chia-Ling et al., 2010), where trust building, interaction through social networking, and transparency have been identified as three key dimensions of relational capital that determine the amount of knowledge a firm acquires through alliance. Moreover, it also demonstrates that it is not enough to acquire external knowledge through interaction with business partners. Assimilating and translating that knowledge into new capabilities within the firm through human capital and structural capital enhancement (Zhu, Kraemer and Xu, 2006) is a bigger challenge, which, when realized, enriches a firm's assets and skills base and thus serves as a platform for enhancing its potential for wealth creation (Seleim et al., 2004).

Consistent with hypotheses H2a and H2b, a firm's structural capital was also found to have significant positive association with its competitive capabilities (external and internal). As the structural capital of a firm constitutes its codified knowledge base, "it reflects the firm's ability to translate the innovation and energy of its human capital into corporate asset, while capitalizing on that innovation to create wealth" (Seleim et al., 2004, pp 333). A firm's competitive capability is thus in good stead when its structural capital is enhanced, as confirmed by the findings of this study. According to Michalisin et al. (2000), its strategic importance rests on its being a form of know-how that is available only to the firm, and serves as the main driver of the firm's capabilities and growth.

The findings on human capital's relationships with the external and internal competitive capabilities of firms were supportive of hypotheses H3a and H3b, respectively. Even though contrary to our proposal, the finding that Internal Competitive Capability (ICC) has a negative effect on firm performance does not support hypothesis H4b, it supports the prior work of Michael et al. (2001) against the backdrop that human capital explains more than 58% of the variance in internal competitive capability. Michael et al. established a curvilinear relationship between human capital and firm performance (2001). They argued that early investments in some forms of human capital such as those found in software and other knowledge intensive industries, particularly in developing markets, may not produce enough benefits in the beginning to offset the costs (Schwab, 1993; Michael et al., 2001), as the human capital in such industries are usually costly.

On the moderating effects of management commitment and transformational leadership, the findings provided mixed results. While it provided evidence that transformational leadership has a moderating effect on the relationship between all three elements of intellectual capital and both competitive capabilities (thus supporting H6a and H6b), it only partially supported our proposal that management commitment has a moderating effect on the relationship between intellectual capital and firm competitive capability (H6). The interaction between MC and SC was negative and quite weak, and hence had no effect on ECC. However, the interactions between MC and RC and between MC and HC were both positive and had significant effects on ECC. This partially supported $H5_a$ and the generally documented positive and significant effect committed management has on relationship between human capital and firm performance (Yaping et al., 2009). However, much would depend on the kind of commitment that the management exhibits as committed management have been found to be of two kinds, affectively committed management and continuance committed management (Yaping et al., 2009). Whereas affective commitment is a desirable management attribute, because it enhances administrative efficiency and effectiveness (Ostroff, 1992; Yaping et al., 2009), continuance commitment is often assumed to be undesirable because it has been frequently reported in extant literature to be negatively associated with job performance, if not unrelated to it (Meyer, Stanley, Herscovitch, and Topolnytsky, 2002; Sinclair et al., 2005; Yaping et al., 2009).

With respect to hypothesis $H5_b$, which suggests that MC's interactions with RC, HC and SC have effects on ICC, the findings supported it to a very little extent. Only the interaction with RC had positive and significant effect on ICC. These results may be indicating efforts on the part of management to internalize the knowledge and skill gains from firm interactions with partners and other industry players.

Implications for Research and Practice

Research Implications

The contribution of this study to intellectual capital management research is the validation of the base theoretical models proposed by Seleim et al. (2004), which provides a second level analysis beyond the Oval Model. The study, through the proposed enhanced model, provides a better understanding of the intricacies of the performance of firms in the software industry in the ECOWAS region, relative to the industries of the 3I nations. Its empirical testing highlights the extent to which the intellectual capital sub-constructs investigated by the model explain variances in the internal and external competitive capabilities of software firms in West Africa, and the effect management commitment and transformational leaders have on the relationship between these sub-constructs and firm competitive capabilities. Moreover, it adds to the existing body of knowledge on intellectual capital management, particularly for software firms, by examining how the elements of the intellectual capital separately impact external and internal competitive capabilities, hitherto investigated together. The study also showed that acquisition of knowledge through partnership and alliances does not necessarily translate to internal competitive capabilities. It thus calls for a review in organizational learning research to include research on how external knowledge acquired through partnership and alliances can be disseminated and assimilated internally to build internal competitive capability.

Policy and Industry Implications

Given that the goal of this study has been to provide concrete theoretical and practical basis for software industry policies and strategies in ECOWAS, several implications can be drawn from the findings for industry practitioners as well as policy makers in governments of developing countries. Particularly, policy makers in government of countries wishing to venture into the global software business should first assess the level and quality of the human capital at their disposal, as human capital is critical for the success of firms in the software industry. The results of this study indicate the significantly positive association between human capital and competitive capability of software firms; suggesting that firms and industries that have high level of human capital have high competitive capabilities. In practice, this has been proven by the software firms and the software industries of the 3I nations. These findings do not only call for a review of the training and educational systems in prospective software producing nations, where they fall short, but also calls for a review of their education policies and standards to encourage public private partnership in training of high quality human capital, particularly in the science and engineering disciplines (as pertains in the 3I nations), as well as in management. Beyond having adequate high quality human capital, the study also highlights the importance of structural and relational capital. Human capital becomes ineffective if it operates in poorly resourced environments (Bontis, 2002a).

Limitations and Future Research

This study undoubtedly has some limitations. First and foremost, the sample consisted of only firms registered with national software trade industries of the three selected countries. Thus the result cannot be generalized beyond the membership of these trade associations without further research. Also we focused on firms involved in commercial software production and did not consider firms producing software in-house. Given that governments can also play and have played proactive roles in the factors cited as success factors of the software industry (Carmel, 2003), intellectual capital inclusive, we ought to consider the moderating effect of government commitment on the relationship between intellectual and firm performance. In addition, the amount of variance of firm performance explained by the main effects of intellectual capital variables through the mediating variables was quite high (38.4%), considering that firm performance is a determinant of many variables; endogenous (e.g. internal cost of capital, costs of operations, facilities, and equipment) as well as exogenous variables (e.g. competitiveness in the industry, the health of the economy, good governance, industrial policy, and investment climate) (Michael et al., 2001). Thus, for the two competitive capability variables backed by the three intellectual capital variables to have explained 38.4% of the variance in firm performance indicate their significance. Moreover, the negative effect

of ICC on firm performance should be explored further, even though it could be attributed to the curvilinear effect human capital has on performance. In ECOWAS, the economic and regulatory regime, as at the time of the study, was not fully harmonized, hence variations in policy environments could also contribute to variations in firm capabilities and performance. So there is still the need to explore further how intellectual capital impacts on firm performance under a homogenous regional policy environment.

CONCLUSION

This study is of great significance. In this paper we have proposed a theoretical model for evaluating the performance of software firms, placing emphasis on their human capital, structural capital and relational capital. Drawing on concepts from the Intellectual Capital Theory, the Resource-Based and Knowledge-Based Views, the study has proposed a second level model on Software Industry performance, focusing on the influence of top management commitment and transformation leadership on intellectual capital and its relationship with firm performance. To validate this model, a field survey was conducted involving 83 software firms in the West African region. The findings of the study demonstrate emphasis on market oriented capabilities rather than on intra-organizational relational capabilities. It also demonstrates that it is not enough to acquire external knowledge through interaction with business associates, assimilating and translating that knowledge into new capabilities within the firm through human capital and structural capital enhancement is a bigger challenge. These findings would change target groups' understanding of the software industry, as the study has established the true determinants of success in the software export business and highlighted the issues and challenges facing the infant software industry in this region.

REFERENCES

Adler, M. and Ziglio, E. (1996). The Delphi Method and its Contribution to Decision-Making, in Erio (Ed.), *Gazing into the Oracle: The Delphi method and its application to socia l policy and public health*, London, Jessica Kingsley Publishers, 3.

Adnan K., Oya E. Özlem Ç. (2011). The Relationships between Firm Size, Prospector Strateg y, Architecture of Information Technology and Firm Performance, Procedia Social an d Behavioral Sciences 24 (2011) 854–869, 7th International Strategic Management Conference

Al-Gahtani, S. S., Hubona, G. S. and Wang, J. (2007). Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT, *Information & Management*, 44, 681-691.

Amit, C. P. (2008). Software Industry Detail Analysis; retrieved November 30, 2009 from http://www.scribd.com/doc/17832547/ Software-Industry-Detail-Analysis

Amit, R. and Shoemaker, P. J. H. (1993). Strategic Assets and Organisational Rent, *Strategic Management Journal*, 14, 1, 647-659.

Andrews, K.R. (1971). *The concept of corporate strategy*. Homewood, IL, Irwin.

Ansoff, H. I. (1965). *Corporate strategy: An Analytic Approach to Business Policy for Growth and Expansion*, New York, McGraw-Hill.

Appleton, S. and Teal, F. (1998). African Development Report; retrieved August 15, 2011 from http://www.afdb.org/fileadmin/uploads/ afdb/Documents/Publications/00157612-EN-ERP-39.PDF

Arthur, J. (1994). Effects of Human Resource Systems on Manufacturing Performance and Turnover, *Academy of Management Journal*, 37, 670-687.

Ashour, A. S. (1997). Building intellectual and emotional capital of organizations: reinventing human resources development in organizations, Keynote Speech to

Conference on Training in the Middle East: Achievement and Challenges, El Bahrain, December.

Ashour, A. S. (2000). Knowledge capital management. Reinventing management paradigm in the 21st century, Proceedings of the 12th International Conference on Training and Management Development towards Arab Learning Organizations, Cairo, April 25-27.

Auer, T. (2004). Benchmarking Intellectual Capital, *Wissensmanagement, Das Magazin für Führungskräfte*, 04/2004.

Barney, J. B. (1986) Strategic factor markets: Expectations, luck and business strategy, *Management Science*, 31, 1231-1241.

Barney, J. B. (1991). Firm resources and sustained competitive advantage, *Journal of Management*, 17, 99-120.

Baruch, Y. (1999). Response Rate in Academic Studies – A Comparative Analysis, *Human Relations*, 52, 4, 421-438.

Becker, G. S., Glaeser, E. L. and Murphy, K. M. (1999). Population and Economic Growth, *American Economic Review*, 89, 2, 145-149.

Benhabib, J. and Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data, *Journal of Monetary Economics*, 34, 2, 143-173.

Black, S. E. and Lynch, L. M. (2001). How to Compete: The Impact of Workplace Practices and Information Technology on Productivity, *Review of Economics and Statistics*, August, 83, 3, 434-445.

Bontis, N. (1996). There's a price on your head: managing intellectual capital strategically, *Ivey Business Journal – Business Quarterly*, Summer, 40-47.

Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models, *Management Decision*, 36, 63-76.

Bontis, N. (1999). Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field, *International Journal of Technology Management*, 18, 5-8, 433-462.

Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital, *International Journal of Management Reviews*, 3, 1, 41-60.

Bontis, N. (2002). *World Congress of Intellectual Capital Readings*, Elsevier Butterworth-Heinemann KMCI Press, Boston, MA.

Bontis, N. (2002a). Managing organizational Knowledge By Diagnosing Intellectual Capital: Framing and Advancing the Field, *The Strategic Management of Intellectual Capital and Organisational Knowledge*, Chun Wei Choo and Nick Bontis (Eds.), Oxford University Press.

Bontis, N. (2003). Intellectual capital disclosure in Canadian corporations, *Journal of Human Resource Costing and Accounting*, 7, 1/2, 9-20.

Bontis, N. (2004). National Intellectual Capital Index: a United Nations initiative for the Arab region, *Journal of Intellectual Capital*, 5, 1, 13-39.

Bontis, N., Keow, W. C. C. and Richardson, S. (2000). Intellectual capital and business performance in Malaysian industries, *Journal of Intellectual Capital*, 1, 1, 85-100.

Brooking, A. (1997). Management of intellectual capital, *Long Range Planning*, 30, 364-365.

Bunge, M. (2000). Systemism: the alternative to individualism and holism, *Journal of Socio-Economics*, 29, 147-157.

Bustinza, O. F. Molina, L. M. and Arias-Aranda, D. (2010). Organizational learning and performance: Relationship between the dynamic and the operational capabilities of the firm, *African Journal of Business Management,* 4, 18, 4067-4078.

Cantrell, S., Benton, J. M., Laudal, T. and Thomas, R. J. (2006). Measuring the Value of Human Capital Investments: The SAP Case, *Strategy and Leadership*, 34, 2, 43-52.

Carmel, E. (2003). The New Software Exporting Nations: Success Factors, *Electronic Journal on Information Systems in Developing Countries*, 13, 4, 1-12.

Cañibano, L. and Araceli. M. (2000). Evaluating the statistical significance of de facto accounting harmonization: a study of European global players, *The European Accounting Review*, 9, 3, 349-369.

Chaminade, C. and Roberts, H. (2003). What it means is What it does: A comparative Analysis of Implementing Intellectual Capital in Norway and Spain, *European Accounting Review*, 12, 4, 733-51.

Chetty, S. K. and Wilson H. I. M. (2003). Collaborating with Competitors to Acquire Resources, *International Business Review*, 12, 1, 61-81.

Chia-Ling, Eunice, L., Pervez, N.G. and Rudolf, R. S. (2010). Understanding the impact of relational capital and organizational learning on alliance outcomes, *Journal of World Business*, 45, 237-249

Chin, W. W. (1998). The partial least squares approach for structural equation modeling, In George A. Marcoulides (Ed.), *Modern Methods for Business Research*, Lawrence Erlbaum Associates, 295-336.

Chin, W. and Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares, In R. Hoyle (Ed.), Statistical strategies for small sample research, Thousand Oaks, Sage, 307-341.

Chin, W.W., Marcolin, B. L. and Newsted, P.R. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study, *Information Systems Research*, 14, 2, 189-217.

Coleman, J. S. (1990). *Foundations of Social Theory*, Cambridge, Belknap Harvard.

Cronbach, L. J., (1951). Coefficient alpha and the Internal Consistency of Tests, *Psychometrica*, 16, 297-334.

Crossan, M. M. and Berdrow, I. (2003). Organizational Learning and Strategic Renewal, *Strategic Management Journal*, 24, 1087-1105.

Davenport, T. H. and Prusak, L. (1998). *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston, MA.

David, P. A. (1985). Clio and the Economics of QWERTY. *American Economic Review* (Papers and Proceedings), 75, 332-337.

Delany, J. and Huselid, M. (1996). The Impact of Human Resource Management Practices on Perceptions of Performance in For-profit and Non-profit Organisations, *Academy of Management Journal*, 39, 4 (August), 949-969.

Dierickx, I., and Cool, K. (1989). Asset stock accumulation and the sustainability of competitive advantage, *Management Science*, 35, 1504-1513.

Dooley, E. (2000). Intellectual capital in the software industry: an empirical test, PhD dissertation, College of Business Administration, University of Washington, Tacoma, WA.

Ducharme, L. (1998). *Measuring Intangible Investment: Main Theories and Concepts*, OECD, Paris.

Durkheim, E. (1982). *The Rules of Sociological Method and Selected Texts on Sociology and its Method*, in Steven Lukes (Ed.). The Macmillan Press Ltd.

Edvinsson, L. and Malone, P. (1997). Developing a Model for Managing Intellectual Capital, *European Management Journal*, 14, 4, 56-68.

Edvinsson, L. and Sullivan, M. S. (1997a). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*, Harper Business, New York, NY.

Ehrlich, I. (1990) The Problem of Development: An Introduction, *Journal of Political Economy*, 98, 5, 2, S1-11.

Fornell, C. and Larcker, D.F. (1981). Evaluating structural equation models with unobservable and measurement error, *Journal of Marketing Research*, 18, 39- 50.

Frazier, P. A., Tix, A. P. and Barron, K. E. (2004). Testing Moderator and Mediator Effects in Counseling Psychology Research, *Journal of Counseling Psychology*, 51, 1, 115-134.

Galunic, D. C. and Rodan, S. (1998). Resource Recombination in the Firm: Knowledge Structures and the Potential for Schumpeterian Innovation, *Strategic Management Journal*, 19, 1193-1201.

Gibson, B. (2004). The Value of Intangibles in Privately Held Firms; retrieved December 15, 2009 from http://www.kmu.unisg.ch/rencontres/RENC2004/Topics/Gibson_Renc_2004_Topic_A.pdf

Granovetter, M. (1973). The Strength of Weak Tie, *American Journal of Sociology*, 78, 1360-1380.

Granovetter, M. (1985). Economic action and social structure: the problem of embeddedness, *American Journal of Sociology*, 91, 3, 481-510.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm, *Strategic Management Journal*, Special Issue, 17, 109-122.

Greenley, G. E. (1995). Market Orientation and Company performance: empirical evidence from UK Companies, *British Journal of Management*, 6, 1-13.

Guthrie, J. and Petty, R. (2000). Intellectual capital: Australian annual reporting practices, *Journal of Intellectual Capital*, 1, 241-51.

Habersam, M. and Piper, M. (2003). Exploring intellectual capital in hospitals: two qualitative case studies in Italy and Austria, *European Accounting Review*, 12, 4, 753-779.

Heeks, R. and Nicholson, B. (2002). Software Export Factors and Strategies in Developing and Transitional Economies, University of Manchester, Institute for Development Policy and Management, Paper Number 2002-12; retrieved June 15, 2011 from http://idpm.man.ac.uk/wp/di/di_wp12.htm .

Huselid, M. A. (1995). The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance, *Academy of Management Journal*, 38, 3, 635-672.

Ichniowski, C., Shaw, K. and Prennushi, G. (1997). The effects of Human Resource Management Practices on Productivity, *American Economic Review*, 87, 3, 291-313.

Jaworski, B. J. and Kohli, A. K. (1993). Market Orientation: Antecedents and Consequences, *Journal of Marketing*, 57, 7, 53-70.

Jung, D., Wu, A. and Chow, C. W. (2008). Towards Understanding the Direct and Indirect Effects of CEOs' Transformational Leadership on Firm Innovation, *The Leadership Quarterly*, 19, 582-594.

Keane, B. and Richardson, I. (2005). Quality: Attitudes and Experience within the Irish Software Industry, Software Process Improvement: 12th European Conference EuroSPI 2005, 49-58.

Kelly, M. (1994). Information Technology and Productivity: The Elusive Connection, *Management Science*, 40, 1406-1425.

Khan, R., Rehman, A. U. and Afsheen, F. (2009). Transformational leadership and organizational innovation: Moderated by organizational size, *African Journal of Business Management*, 3, 11, 678-684.

Krishnan, R., Martin, X. and Noorderhaven, N. (2006). When does trust matter to alliance performance?, *Academy of Management Journal*, 49, 5, 894-917.

Lev, B. T. S. and Zarowin, P. (1999). The boundaries of financial reporting and how to extend them, *Journal of Accounting Research*, Autumn, 37, 2, 353-385.

Li, M. and Richard, Y.L. (1999) Information technology and Firm Performance: Linking with Environmental, Strategic, and Management Contexts, *Information & Management*, 36, 1, 43-51.

Lippman, S. A. and. Rumelt, R. P. (1982). Uncertain Imitability: an Analysis of Interfirm Differences in Efficiency Under Competition, *Bell Journal of Economics*, 13, 418-438.

Lusch, R. F. and Laczniak, G. R. (1987). The evolving marketing concept, competitive intensity and organizational performance, *Journal of the Academy of Marketing Science*, Fall, 15, 1-11.

Lyles, M. A. and Salk, J. (1996). Knowledge acquisition from foreign parents in international joint ventures: An empirical examination in the Hungarian context, *Journal of International Business Studies*, 27, 877-903.

Marr, B. and Mustaghfir, K. (2005). Defining Intellectual Capital: a three-dimensional approach, *Management Decision*, 43, 9, 1114-1128.

Marti, J. M. V. (2003). In Search of an Intellectual Capital General Theory, Academic Conferences Limited, www.ejkm.com.

McEvily, B. and Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities, *Strategic Management Journal*, 20, 1133-1156.

Meyer, J. P., Stanley, D.J., Herscovitch, L. and Topolnytsky, L. (2002). Affective, continuance, and normative commitment to the organization: A meta-analysis of antecedents, correlates, and consequences, *Journal of Vocational Behavior*, 61(1), 20-52.

Michael A. H., Leonard, B., Katsuhiko, S. and Rahul, K. (2001). Direct and Moderating Effects of Human Capital on Strategy and Performance in Professional Service Firms: A Resource-Based Perspective, *The Academy of Management Journal*, 44, 1, 13-28.

Michael H. and Andreas M. K. (2004). A Beginner's Guide to Partial Least Squares Analysis, *Understanding Statistics*, 3, 4, 283-297.

Michalisin, M., Kline, D. M. and Smith, R. D. (2000). Intangible Strategic Assets and Firm Performance: A Multi-industry Study of the Resource-Based View, *Journal of Business Strategies*, 17, 2, 91-117.

Miller, D. and Shamsie, J. (1996). The Resource-Based View of the Firm in two Environments: The Hollywood Firm Studios from 1936 to 1965, *Academy of Management Journal*, 39: 519-543.

Ming-Chin, C. (2004). Intellectual capital and competitive advantages: the case of TTY Biopharm Company, *Journal of Business Chemistry*, 1, 1, 14-20.

Mohan, S. and Mark, A. Y. (2005). The influence of intellectual capital on the types of innovative capabilities, *Academy of Management Journal*, 48, 3, 450-463.

Muhammad, N. M. N., Bharu, K. K. and Ismail, K. K. A. (2009). Intellectual Capital Efficiency and Firm's Performance: Study of Malaysian Financial Services, *International Journal of Economics and Finance*, 1, 2.

Narayana, M. (2001). The Software Industry in India: Opportunities and Challenges, Infosys Technologies.

Narver, J. C. and Slater, S. E. (1990). The Effect of a Market Orientation on Business Profitability, *Journal of Marketing*, 54, 4, 20-35.

Nelson R. R. and Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*, Bellknap Cambridge Mass.

Nevis, E. C., DiBella, A. J. and Gould, J. M. (1995). Understanding organizational learning as learning systems, *Sloan Management Review*, Winter, 61-74.

Nicholson, B. and Sahay S. (2003). Building Iran's Software Industry: An Assessment of Plans and Prospects Using the Software Export Success Model, University of Manchester, Institute for Development Policy and Management, Working Paper Series, Paper Number 2003-15; retrieved from http://www.sed.manchester.ac.uk/idpm/research/publications/ wp/di/documents/ di_wp15.pdf

Nielsen, C. and Dane-Nielsen, H. (2008). The Emergent Properties of Intellectual Capital: A Conceptual Offering, Working Paper Series, Department of Business Studies, Aalborg University, 5.

Nunnally, J.C. (1978). *Psychometric theory* (2nd ed.), New York, McGraw-Hill.

Olaniyan, D. A. and Okemakinde, T. (2008). Human Capital Theory: Implications for Educational Development, *European Journal of Scientific Research*, 24, 2, 157-162.

OECD Joint CIBE-CSTP Forum (2004); retrieved June 2011 from http://www.oecd.org/dataoecd/3/1/34462868.pdf

Ostroff, C. (1992). The relationship between satisfaction, attitudes, and performance: An organizational-level analysis, *Journal of Applied Psychology*, 78, 693-974.

Pennings, J. M., Lee, K. and Van Witteloostuijn, A. (1998). Human capital, social capital, and firm dissolution, *Academy of Management Journal*, 41, 425-440.

Penrose, E. T. (1959) *The Theory of the Growth of the Firm*, Basil Blackwell, Oxford.

Pepper, S. C. (1926). Emergence, *Journal of Philosophy*, 23, 241-245.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y. and Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies, *Journal of Applied Psychology*, 88, 5, 879-903.

Porter, A. L., Roessner, J. D., Jin, X. and Newman, N. (2001). Changes in National Technological Competitiveness: 1990, 1993, 1996, and 1999, *Technology Analysis & Strategic Management*, 13, 477-496.

Porter, M. (1990) *The Competitive Advantage of Nations*, London, Free Press.

Psacharopoulos, G. and Woodhall, M. (1997). *Education for Development: An Analysis of Investment Choice*, New York Oxford University Press.

Quinn, J. B. (1992). The Intelligent Enterprise: A New Paradigm, *Academy of Management Executive*, 6, 4, 48-63.

Rastogi, P. N. (2003). The nature and role of IC: Rethinking the process of value creation and sustained enterprise growth, *Journal of Intellectual Capital*, 4, 2, 227-248.

Riahi-Belkaoui, Ahmed (2002). Intellectual Capital and Firm Performance of U.S. Multinational Firms: A Study of the Resource-Based and Stakeholder Views; retrieved from SSRN: http://ssrn.com/abstract=365580 or doi:10.2139/ssrn.365580.

Ritzer, G. (1996). *Sociological Theory*, New York, McGraw-Hill.

Roos, G. and Roos, J. (1997). Measuring your company's intellectual performance, *Long Range Planning*, 30, 413-426.

Roos, J., Roos, G. Dragnnetti, N. C. and Edvinsson, L. (1997a). *Intellectual Capital: Navigating The New Business Landscape*, New York, NY, MacMillan.

Rubin, P. H. (1973). The Economic Theory of the Criminal Firm, in The Economics of Crime and Punishment, in S. Rottenberg (Ed.), Washington, DC, American Enterprise Institute, 155-66.

Rumelt, R. P. (1984). Towards a Strategic Theory of the Firm, in B. Lamb (Ed.), Competitive Strategic Management, Englewood Cliffs, NJ, Prentice Hall, 557-558.

Saxenian, A. (1994). Regional Advantage: Culture and Competition in Silicon Valley and Route 128. Cambridge, MA, Harvard University Press.

Schwab, S. J. (1993). Life-cycle justice: Accommodating just cause and employment at will, *Michigan Law Review*, 92, 8-62.

Seleim, A., Ashour, A. and Bontis, N. (2004). Intellectual Capital in Egyptian Software Firms, *Emerald*, The Learning Organisation, 11, 4/5, 332-346.

Seleim, A., Ashour, A. and Bontis, N. (2007). Human Capital and Organizational Performance: A Study of Egyptian Software Companies, *Emerald*, Management Division, 45, 4, 789-801.

Simmel, G. (1907). *The Philosophy of Money*, London, Routledge.

Spender, J. C. (1996). Competitive advantage from tacit knowledge? Unpacking the concept and its strategic implications, in Bertrand Moingeon and Amy Edmondson (Eds.), Organisational learning and competitive advantage, London, Sage Publications.

Stewart, T. A. (1997). *Intellectual Capital: The New Wealth of Organisations*, New York, Doubleday.

Straub, D. W. (1989). Validating Instruments in MIS Research, *MIS Quarterly*, 13(2),147-169.

Sveiby, K.E. (1997). *The New Organizational Wealth: Managing and Measuring Knowledge Based Assets*, San Francisco, CA, Berrett Koehler.

Sinclair, R. R., Tucker, J. S., Cullen, J. C. and Wright, C. (2005). Performance differences among four organizational commitment profiles, *Journal of Applied Psychology*, 90, 1280-1287.

Tayles M., Pike R. H. and Sofian S. (2007). Intellectual Capital Management Accounting Practices and Corporate Performance, *Accounting, Auditing and Accountability Journal*, 20, 4, 522-548.

Teece, D. (1982). Towards an economic theory of the multiproduct firm, *Journal of Economic Behavior and organization*, 3, 39-63.

Teece, D. J., Pisano, G. and Shuen, A. (1997). Dynamic Capabilities and Strategic Management, *Strategic Management Journal*, 18, 509-533.

Toffler, A. (1990). *Powershift: Knowledge, Wealth and Violence at the edge of the 21st Century*, New York, Bantam Books.

Tore, D. (2005). An Empirical Investigation of the Key Factors for Success in Software Process Improvement, *IEEE Transactions on Software Engineering*, 31, 5, 410-424.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness, *Administrative Science Quarterly*, 42, 35-67.

Wernerfelt, B. (1984). A Resource-Based View of the Firm, *Strategic Management Journal*, 5, 2, 171-180.

Wilderom, C. P. M and Berg, P. T. van den (2000). Firm Culture and Leadership as Firm Performance Predictors: A Resource-Based Perspective, Tilburg University, Center for Economic Research, Discussion Paper, 2000 No. 3.

Winter, S. G. (1987). Knowledge and competence as strategic assets, in Teece, D.J. (Ed.), The Competitive Challenge, Ballinger, Cambridge, MA, 159-84.

Yaping, G., Kenneth, S. L., Song, C. and Katherine, R. X. (2009). Human Resources Management and Firm Performance: The Differential Role of Managerial Affective and Continuance Commitment, Journal of Applied Psychology, Vol. 94, No. 1, pp. 263–275.

Zhu, K., Kraemer, K. L. and Xu, S. (2006). The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business, Management Science, 52, 10, 1557-1576.

İpek, K., Salih Z. İ. and Hüseyin, İ. (2009). The Relationship between Firm Intellectual Capital and the Competitive Advantage, *Journal of Global Strategic Management*, 06, December, 181-208.

Appendix A: The Emergent Properties of Intellectual Capital (Adapted from Nielsen et al., 2008)