

Does knowledge management play a critical role within open innovation?

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Keywords

Knowledge Management; Open Innovation

Abstract

This research aims to: Understand the level of Open Innovation inside the Egyptian organizations namely the Hospitals; Look at the impact of Knowledge Management on Open Innovation; and Build a model for knowledge Management Roles on Open Innovation. The research study is an empirical research whereby the hypotheses were tested on the Egyptian Hospitals. A number of 350 questionnaires were distributed across 10 Hospitals on employees and a total of 300 valid and complete questionnaires were returned. The questionnaires were distributed over the e-mail and through field visits to these companies among a period of six months.

The approach described here consists of analysing, assessing and managing the implementation of open innovation in order to enhance perceived quality and final received quality by including requirements for successful application. The research study consists of empirical research applied to Hospitals in Egypt. Practitioners and researchers should find value in this unique comparative study.

Introduction

Global revolution in marketplaces and business firms has become a vital concern for effective managers (Fry, 2001; Drucker, 1995) and employees, as has the management of knowledge (Fry, 2001; Coulson-Thomas, 1997; Davenport et al., 1998; Fahey & Prusak, 1998; Teece, 1998; Broadbent, 1997) besides for instance its particular direct influence on creativity and innovation. Innovation is a term which is now used in many situations to describe anything that is moderately novel (Brooker et. al., 2012; Hjalager, 2010). It needs be stressed, however, that innovation is a knowledge process (Kari, 2012; Nonaka & Takeuchi, 1995; Tidd et al., 2005). Open innovation' is one term that has emerged to describe '[...] the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively' (Minshall, et. al., 2010; Chesbrough et. al., 2006).

Correspondingly, open innovation (OI) is an emerging concept in innovation studies and constitutes a major trend in practice which attracts attention from academics, policy makers and practitioners. It refers to 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation and to expand the markets for external use of innovation' (Fu, Xiong, 2011; Chesbrough et al., 2006).

It is also true that a great deal of knowledge is routinely distributed around the world. Enterprises need to tap into this in order to fuel innovation and sustain their competitive advantage (Luis et.al, 2010; Doz, Santos, & Williamson, 2001). Rather than attempting to innovate alone, firms now innovate in networks (Kari, 2012). Consequently; open innovation implementation dowers numerous experiments for management. Deliberating to Reed (2012); Chesbrough's (2003a) inspiring work moved the concept on to include a variety of ways to capitalize on innovations both externally and internally. In other words; open innovation as a prototype swing from creating and notice innovations internally to retrieving and incorporating external knowledge. The latter is based on one of his key principals of "not all the smart people work for us." Thus; Open innovation models are based on a fundamental statement that invention and innovation do not essentially to be at the same location for instance they are being transformed into new products and then commercialized (Inauen & Schenker-Wicki, 2012). Consequently; open innovation concept suggests that enterprises value creation is through 'greater use of external ideas and technologies in their own business, while letting their unused ideas be used by other companies.' This has been widely hailed as a powerful antidote to the 'not-invented-here' syndrome that stifles innovation in many mature companies

(Muller, 2012; Chesbrough, 2003). Also, the concept of open innovation includes customer input, crowd-sourcing, open-source projects, patent acquisitions, soliciting external insights, supplier integration, venture investing, and joint development projects. The myriad options for engaging external partners can be daunting, so leaders need a guide to getting started in open innovation that matches the needs of their firm (Muller, 2012).

Therefore; enterprises should start to implement OI as a necessary managerial alteration to changes in the environment (Chesbrough, 2003) through opening up innovation processes in two dimensions (Lichtenthaler & Ernst, 2007); 1) *Inbound open innovation*, which refers to inward knowledge acquisition and to leveraging the discoveries of others because firms need not rely exclusively on their own R&D (Chesbrough & Crowther, 2006); and 2) *Outbound open innovation*, which refers to outward technology transfers (Chesbrough & Crowther, 2006). Generally, enterprises can join both technology exploitation (inside-out OI) and technology exploration (outside-in OI) in order to create maximum value from their technological capabilities or other competencies (Lichtenthaler, 2008).

Literature Review

This section aims to shed light on open innovation and knowledge management in the previous literature.

First; Open innovation; Schumpeter (1934, 1939) identifies innovation as a critical dimension of economic revolution and a stronghold for enterprises in an increasingly competitive environment. He defines five core types of innovation; new products, new production processes, new sources of supply, the exploitation of new markets and new ways of organizing business. Since 1980s, innovation models have highlighted the interactive character of the innovation process, suggesting that innovative companies rely heavily on innovation systems (Lundvall, 1992; Edquist, 1997) and on regular interaction with customers and lead users (von Hippel, 1988; de Jong & von Hippel, 2009), suppliers (Lambert & Cooper, 2000; Walton et al., 2006), universities (Loof & Brostrom, 2008; Buganza & Verganti, 2009) and competitors (Inauen & Schenker-Wicki, 2012; Gassmann & Zeschky, 2008; Enkel & Gassmann, 2010).

In 2000; Sawhney & Prandelli introduced originating the term open innovation. Chesbrough (2003) has developed open innovation as a paradigm that assumes that firms can and should use external as well as internal ideas and internal and external paths in order to advance their control of technology (Sloane, 2011). Chesbrough saw open innovation as a paradigm shift from creating and hoarding innovations internally to accessing and integrating external knowledge. Open innovation can be defined as 'the permeability of firms' boundaries where ideas, resources, and individuals flow in and out of an organization' (Jarvenpaa & Wernick, 2011; Dahlander & Gann, 2010). It has three main forms: firm controlled, third-party controlled, and community controlled innovation (Reed, 2012). Gassman et al. (2010) see open innovation as being based on different research streams which can be organized into nine perspectives: spatial, structural, user, supplier, leveraging, process, tool, institutional, and cultural. Ngvarsson & Hallbrant (2012) identify four different dimensions from the work of previous scholars; formal, informal, physical, and structural.

The open innovation concept encompasses various different dimensions, and most of the studies agree on identifying both inbound and outbound dimensions (Bigliardi et al. 2012). Open innovation models mainly focus on interactive processes through the accumulation of knowledge and technologies to facilitate the flow inwards and outwards over enterprises boundaries. Though inside-out open innovation is an efficient strategy for increasing competitiveness, few studies have been conducted that have increased our understanding of this kind of innovation (Inauen & Schenker-Wicki, 2012; Lichtenthaler, 2008, 2009). While, inside-out open innovation strategies in particular have not been analyzed in depth yet (Inauen & Schenker-Wicki, 2012).

Besides; Phillips (2011) describes four different types of open innovation: 1) *Suggestive/participative* refers to a form of enterprise that will encourage anyone to submit an idea and to review and rank ideas from others; 2) *Suggestive/invitational* refers to a sponsoring enterprise that will invite specific individuals, teams or companies to contribute ideas in very broad topic areas; 3) *Directed/invitational* refers to situations when an enterprise invites specific individuals or partners to respond to specific challenges or requests; and 4) *Directed/participative* refers to when anyone can submit suggestions for very specific challenges.

Second; Knowledge Management; Knowledge in enterprises has emerged in the strategic management literature (Alavi&Leidner, 2001; Cole 1998; Spender 1996a, 1996b; Nonaka&Takeuchi 1995). This perception shapes upon and extends the resource-based theory of the firm initially promoted by Penrose (1959) and expanded by others (Alavi&Leidner, 2001; Barney 1991; Conner 1991; Wernerfelt, 1984). Therefore; during the 1990s, there was a major shift in enterprises focus from learning to knowledge management in both applied and theoretical contexts (Alvesson&Kärreman, 2001; Easteby, Crossan&Nicolini, 2000; Scarbrough& Swan, 2001). Knowledge management systems (KMS) sought to facilitate the sharing and integration of knowledge (Alavi&Leidner, 1999; Chait, 1999; Gravelli, Gorgoglione&Scozzi, 2002). Thus; KM is the process of creating value from ideas and making this value available for the entire organization (Nonaka, 1991; Nonaka& Takeuchi, 1995). The shift in focus of KM studies reflects the birth of a new perspective that views knowledge as an object instead of a process (Sveiby, 1997; Zack, 1999). By adopting this belief of KM, the following definition of KM is suitable. "Knowledge Management caters critical issues of organizational adaptation, development for survival and competence in face of increasingly environmental changes". From this definition it's obvious the value of knowledge sharing, which could be summarized in the following points; Learn how to learn (Sense, 2007); Creates shared understanding (Niderson& Zenger, 2004); Prevent reinventing the wheel (Bender &Fish, 2000); Turns individual learning into organizations learning (Nonaka, 1994); Reduces uncertainty (Tushman, 1978); and Knowledge transfer should not necessary be "Just-in-time" (Davenport, Glaser, 2002).

Thus; Parlbay (2000) found numerous enterprises still face serious problems in managing knowledge, namely; difficulty of capturing tacit knowledge, lack of KM policies, lack of methods for mapping knowledge, and knowledge overload. Consequently; current improvements in the emerging field of computing and high-speed communications have increased enterprises concern of KM. Nevertheless; enterprises prerequisite is to manage the creation and flow of intangible assets like ideas, information, innovations, knowledge.... etc., to accomplish superior efficiencies, and increase customer satisfaction, loyalty, but it also wants to enhance profit, reduce cost, to reach the maximum level of customer share. Although; when achieving these aims enterprises prerequisite is to share information so they must invest in KM technologies to enhance the value and performance. Increased attention needs to be paid to assessing how well a KM model performs to provide value to stakeholders and the organization as a whole in both quantitative or qualitative measure well be used to address multiple and varied stakeholders needs concerns and to measure organizations success.

Purpose and Theoretical Approach

This research aims to:

Understand the level of Open Innovation inside the Egyptian organizations namely the Hospitals;
Look at the impact of Knowledge Management on Open Innovation; and
Build a model for knowledge Management Roles on Open Innovation.

Therefore; this research would cover the following questions;

Does Knowledge Management play a critical role in Open Innovation; such that all of its relevant activities must be congruent with corporate strategy?
How organizations acquire their capabilities and resources for knowledge management? and Finally;
What are the prerequisite dimensions affecting the progression of open innovation in supply chains?

Research Hypotheses

The following hypotheses would be tested in this study:

(H₁): There is a relationship between Knowledge Management and Open Innovation dimensions

Research Methodology

The research study is an empirical research whereby the hypotheses were tested on the Egyptian Hospitals. A number of 350 questionnaires were distributed across 10 Hospitals on employees and a total of 300 valid and complete questionnaires were returned. The questionnaires were distributed over the e-mail and through field visits to these companies among a period of six months.

The Hospitals in Egypt selected for the research study are the Hospitals and the usage of advanced technologies and an environment of innovation potentials and a culture that fosters employees' motivational performance.

This research study was developed over a period of twelve months, starting in January 2012 and ending in December 2012. The questionnaires were distributed over the e-mail and through field visits to the Hospitals in Cairo, Egypt among a period of six months. The statistical analysis, completion and the final revision of the contents were developed over a period of six months.

Scales and Measurement Tools Used for this Study:

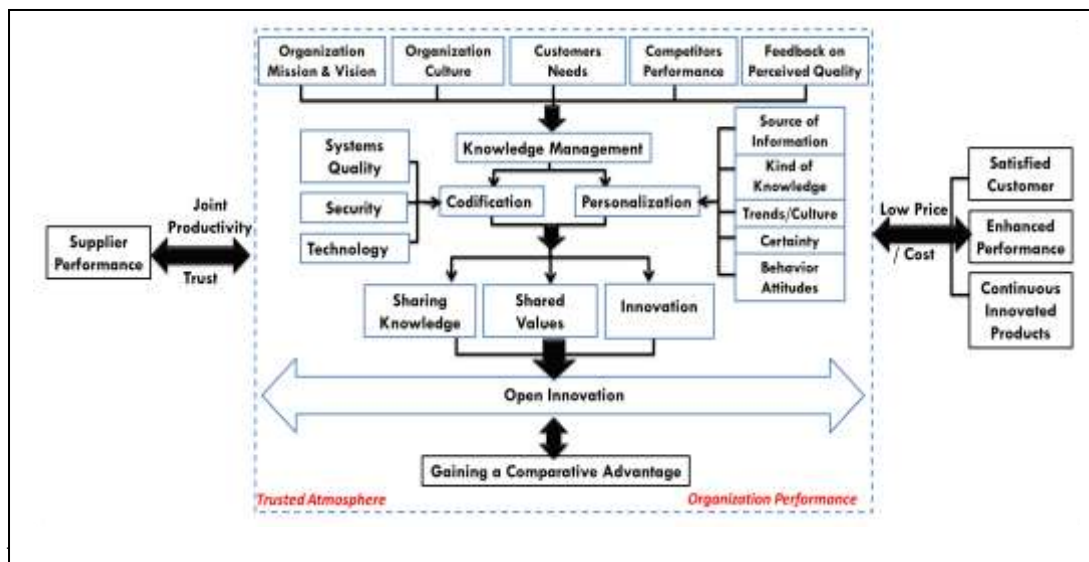
First; Knowledge Management; to measure knowledge management this study implemented a modified version from APQC (2002)-American Productivity & Quality Center- and Newman & Conrad (1999) measurement. Lickert Points Fifth Rating Scale was used in order to instruct the respondents.

Second; Open Innovation; to measure open innovation, this study used the instrument developed and validated by Shamah&Elsawaby (IP). As they argued three dimensions for elaborating the existence of open innovation as follows; innovation, shared values, and shared knowledge as there is no valid tool could be used.

A reliability of 0.7 or higher is sufficient for our cause. The Cronbach's Alphas results from the analysis show that the output of the survey is reliable and consistent as demonstrated as follows; Knowledge Management (KM) 0.944; and Open Innovation (OI) 0.961.

A Model for Knowledge Management Roles in Open Innovation:

Globalization and rapid technological change has increased the pressure on enterprises, because of the increasing competition from new competitors with better-cost bases. On the other hand, manufacturing relies on process efficiencies to improve its overall effectiveness (Gunasekaran et al., 2002; Noke&Hughes, 2010). Thus; the key to competing successfully is to determine customer needs, then direct efforts toward meeting customer expectations. Employees, departments and/or organizations can improve productivity through enhancing performance, which leads to value being added for stakeholders. Therefore; open innovation transactions could be translated in terms of the functions presented in figure (1).



In order to apply open innovation, enterprises need to change their vision from a market-share mindset to a competence-based mindset (Later et. al., 2010; Chesbrough, 2003). This is because the enterprises themselves no longer have the necessary knowledge to create the innovations that are now required (Grotnes, 2009). Hence, external ideas, knowledge and technology in the innovation process are at the center of the open innovation model and open innovation is almost by definition related to establishment of ties with external actors (Hällbrant&Ingvarsson, 2012; De Jong et al., 2008). There is now a need to acquire knowledge from other sources (Grotnes, 2009) such as customers, supplier, and competitors; which require a smooth flow of information between parties, along with integrated activities and trust.

Therefore; enterprises must start within a clear mission and vision e.g. 'If you don't know where you are going; any road will get you there'. Indeed, management should first decide what it intends to accomplish

in the organization and then develop strategic plans based on this overall vision. The organization could then establish its mission by indicating the boundaries of its activities (Etzel et al., 1997). Enterprise's vision and its sense of mission shape its culture, which establishes its identity. An organization's culture is a set of values and beliefs that affect its staff's behaviour in various ways. In many ways, the biggest challenge facing organizations is changing the composition of their workforces (Daft, 1997). Indeed, organizational culture is related to valuing differences, prevailing value systems and cultural inclusion. Managers who wish to change their organizational culture cannot do so by edict but must do so by edification. They need to try to get their staff to behave differently, knowing that such changes will lead to a better set of results. One of the challenges of implementing open innovation is that it requires people to share knowledge, and to believe in the same basic values. Thus, managers must create a clear vision for guiding people towards making the right choices. Moreover, they need to recognize the nature of their enterprises and set up choices between the following characteristics: exploitive, bureaucratic, consultative, participative, and highly participative.

Enterprises should also be able to compare their performance with that of their competitors. A firm's competitiveness depends on its ability to perform well in areas such as cost, quality, delivery, dependability and speed; besides innovation and flexibility; in order to adapt itself to variations in demand (Carpinetti et al., 2003). Consequently, to compete well, enterprises need to establish: 1) *Quality which is higher than that of the competition*; 2) *Technology which is more efficient than that of the competition*; and 3) *Costs at a level below that of the competition* (Comm et al., 2000; Watson, 1993). Hence, continuous improvement is the key to an organization enhancing its competitiveness and ensuring continuous improvement is a companywide process of focused and continuous incremental innovation (Bessant et al., 1994).

Greater efficiency and effectiveness can be achieved through a reasonable use of existing resources. However, it is important for enterprises to examine the differences between its competitors to determine the causes of these differences, and to propose alternatives for eliminating these differences. The main obstacle in learning has been overcoming resistance to change in order to implement benchmarking. Some enterprises do not think they can learn from others. Other issues, which have been identified as barriers, are time constraints, competitive barriers, and lack of personnel resources (Comm et al., 2000; Rogers et al., 1995).

Hence; knowledge management strategy is related to organizational culture, managerial style, atmosphere and the criteria adopted in an organization for work division (Gravelli, Gorgoglione & Scozzi, 2004). According to Shamah (2008) knowledge being referred to depends on two overlapping dimensions of managing and sharing. These are essential to identify whether an enterprise is capable of capturing knowledge to encourage enhanced usage and innovation they can be identified as codification and personalization.

Codification refers to the way that knowledge is codified, stored and then reused independently of its source and its context. The main aim of codification is to put organizational knowledge into a form that makes it accessible to those who need it. The difficulties in doing this involve not losing the knowledge-distinctive properties and turning them into less vibrant information or data (Sense, 2007; Hansen 1999). Conferring to Shamah (2008), codification depends on three main categories:

- 1) *Systems Quality*: the software used to manage the data and ways of processing it into information;
- 2) *Security*: the implementation of most high-performance management practices (Sharkie, 2005; Pfeffer & Vega, 1999; Locke, 1995) and
- 3) *Technology*: the kind of hardware used to support the data transfer through the system.

Personalization involves focusing on the dialogue between individuals rather than on knowledge objects in a database. It views the individual as a means of transferring experiences to others, and thus enables knowledge to be exposed and shared with others. It also requires space and time to enable the 'getting together' of people to perform such personal exchanges and to develop interpersonal networks, which needs 'to have a system that allows people to find other people' (Sense, 2007; Hansen 1999). According to Shamah (2008); personalization depends on five elements:

- 1) *Source of Information*: refers to an external or an entered way employees or the department and/or the organization could gather the Information;
- 2) *Kind of Knowledge*: refers to the fundamentals of analyzing all the data needed;

3) *Trends/Culture* refers to what employees believe within an organization and ways of thinking;
4) *Certainty*: One of the most important items for sharing knowledge is gathering & analyzing the right information needed and

5) *Behaviour/Attitudes*: This describes the main types of relationship existing in organizations. Two main types can be identified: cooperation and competition. (Ring & Van de Ven, 1992).

Indeed; an effective and efficient management of knowledge would lead to creativity and produces innovative ideas and products. Hence; innovation is a complex concept. The Oslo Manual (OECD 2005, p.46) defines innovation as the implementation of any new or significantly improved (*goods or services*), operational process (*methods of production and service delivery*), any new marketing methods (*packaging, sales and distribution methods*), or new organizational or managerial methods or processes in business practices, workplace organization or external relations. Innovation is identified as the main driver for companies to prosper, grow and sustain high profitability (Elmquist et. al. 2009; e.g. Drucker, 1988; Christensen, 1997). Moreover; the innovation process is the implicit way of identifying an opportunity and creating an accompanying business model (Muller, 2012).

Furthermore; various studies have initiated the perceived relative advantages of innovation. Innovation is a process through which new ideas, objects and practices are created, developed or reinvented (Rogers, 1993, 1995; Kimberly, 1981). It is one of the best predictors of the rate of adoption of innovations (Tornatzky and Klein, 1982; Rogers, 1983; Onkvisit and Shaw, 1989; Robinson, 1990). A significantly negative influence on the probability of adoption is found to be exerted by the perceived complexity of innovation (Tornatzky and Klein, 1982; Rogers, 1983), Therefore, expectations are growing around the globe that service organizations should and will innovate to enhance performance.

However, innovation processes can be divided into three main stages through which elements of business models can be conceived and elaborated: 1) *Idea-generation* refers to the process of gathering insights about consumers and their needs, and then generating or identifying potential ideas: new products, services, or technologies that address these insights; 2) *Idea-development* transforms the most promising of these ideas into market-ready business opportunities by refining the five key business model elements and 3) *Commercialization* is the process of testing early hypotheses with regard to the opportunities they present, adjusting the business model based upon new insights, and scaling the opportunities for launch.

On the other hand; Shared Value refers to the extent to which partners have common beliefs about what forms of behaviour, goals, and policies are important or unimportant, appropriate or inappropriate, or right and wrong (Morgan and Hunt, 1994). In line with organizational behavior literature, partners tend to commit themselves more to their relationships when they have shared values (Morgan and Hunt, 1994). When supply chain members have the same perceptions about how to interact with one another, they can avoid possible misunderstandings in their communications and have more opportunities to exchange their ideas freely (Yeh&Tu,2008; Tsai & Ghoshal, 1998).

Shared values contribute to the development of inter-organizational relationships and help to encourage supply chain members' trust each other, because they enable one member to understand other member's behavior and goals more clearly (Dwyer et al., 1987; Anderson and Weitz, 1989; Sahay, 2003). Nevertheless, when supply chain members are in a relationship of co-operation and need to maximize their own interests, their willingness to share competitive knowledge may be limited. In other words, for supply chain members, having shared values and considering knowledge as a source of competitive advantage may diminish the extent of their knowledge-sharing behaviour (Yeh&Tu, 2008; Tsai and Ghoshal, 1998; Jap, 1999).

Enterprises therefore need to consider trust as being a prerequisite for knowledge management then for applying open innovation. Shamah&Elssawaby, (IP) see trust as indispensable on two different levels. *The first level Internal Trust (IT)*; formulates the internal supported atmosphere for sharing knowledge and innovative ideas. *The second level External Trust (ET)*; relies on connecting parties -customers; suppliers; and competitors- for supporting the smooth flow of information between them.

Finally, when trust is built between all parties joint productivity could accrue. Hence; joint productivity has been articulated as the attribute of the entire process of computing which delivers ultimate value to the end-user (Sterling; 2004). Despite this, productivity gaps have continued to increase and manufacturing bases have been eroded in many countries, resulting in a drive for change within the sector (Noke, and Hughes; 2010). The productivity of supply chain suppliers directly affects the ability of

service providers to meet customer needs. Shamah (2012) and Gro'nroos&Helle (010) suggest the use of joint productivity, which refers to measuring the integration of productivity for both firms and customers. This concept is developed and the relationships between values created to help both the customer and the firm and to increase productivity

If enterprises succeeded in applying this model they would, in turn, achieve customer satisfaction, enhance the entire supply chain performance; and provide a continuous stream of innovative products.

Discussions and Findings:

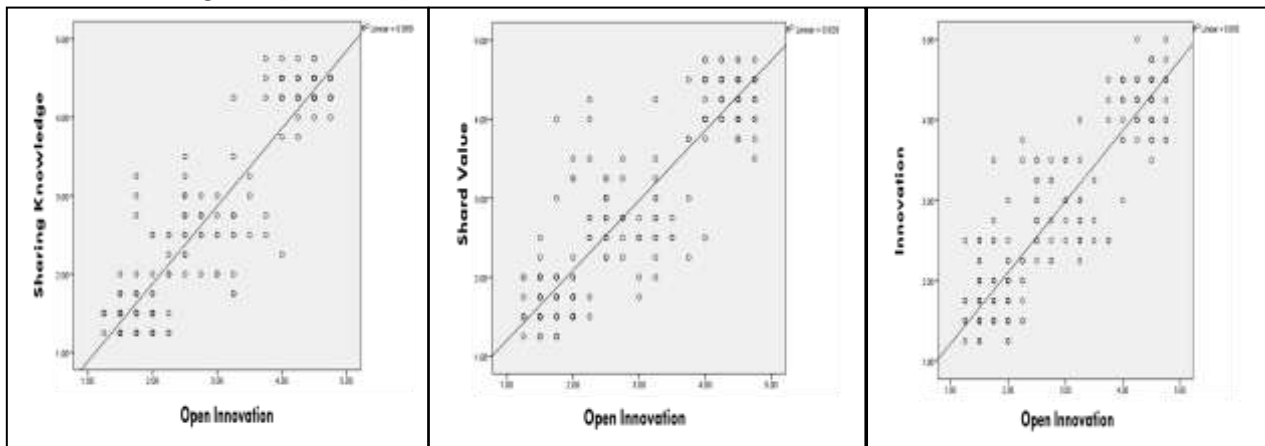
Testing hypothesis 'H₁': There is a relationship between Knowledge Management and Open Innovation dimensions. Linear Pearson correlation coefficient was used to test the exchange relationship between Knowledge Management and Open Innovation dimensions. The results are shown in table (1)

Table (1): Pearson correlation between Knowledge Management and Open Innovation dimensions

	Open Innovation Dimensions		
	Sharing Knowledge (SK)	Shard Value (SV)	Innovation (I)
Codification (COD)	0.934	0.888	0.775
Personalization (PER)	0.911	0.897	0.955
Knowledge Management (KM)	0.943	0.878	0.925

****Pearson correlation coefficient is significant at (0.01)**

This hypothesis was tested and the results are elaborated in the following Scatter Diagrams. The scatter diagrams are used to identify the type of mathematical form of the relationship as well as the form and the direction of the relationship using (R-square) which reflects the determination coefficient. The results are shown in figures (2, 3, and 4).



The results as presented in figures (2, 3, and 4), show that the linear form categorized under the simple mathematical relationship is the prevailing mathematical form to explain this relationship. According to the scatter diagrams presented above in figures (2, 3, and 4) and the simple regression model, that explains the effect of the independent variables on the dependent variable, results show a positive relationship between knowledge management and all the open innovation dimensions

Table (2): Simple regression between knowledge management and open innovation dimensions.

Open Innovation Dimensions	Estimated Simple Regression Model
Sharing Knowledge (SK)	$Y_1 = 0.338 + 0.882X_t$ (4.505)** (38.444)** F= 1477.91, R-square=85.6%, Standard Error= 0.453
Shard Value (SV)	$Y_2 = 0.320 + 0.844X_t$ (3.842)** (34.723)** F= 1205.7**, R-square=82.9%, Standard Error=0.503

Innovation (I)	$Y_3 = 0.534 + 0.829X_i$ (6.285)** (31.890)** F= 1016.94, R-square= 80.4%, Standard Error=0.513
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Whereby:

- Y_1 denotes Sharing Knowledge
- Y_2 denotes Shared Value
- Y_3 denotes Innovation
- X_i denotes Knowledge Management
- ** denotes that F-ratio and T-test are significant at 0.01

The result shown in Table (2) show that the relationship between knowledge management and open innovation dimensions is positive and significant at 0.01. The relationship is in its strongest form between knowledge management and innovation dimension, followed by Sharing Knowledge; and shared value, dimensions, respectively. This is explained by the idea of management perception tend to trigger an inner knowledge and/ or creativity sense that actually change their views of the tasks in relation to their own values; this all explains why knowledge management have the strongest relationship with the innovation dimension. And with the adoption of shared values, the employees' evaluation process will directly impact the readiness to perceive common grounds between the organizational purposes and the values that they believed in. Accordingly, (H_1) is accepted.

Conclusion

Knowledge management is often a threatening and risky task. Without an autonomous model and/ or guideline of reference, attempts to associate knowledge management can be very confusing and fail to drive needed for open innovation. The model provides a mechanism for developing a balanced, high-level view that can be used to set the stage for deeper analysis, identifying the compelling and critical issues that warrant more careful examination. Once the picture is complete, the model can be used to identify the specific needs for open innovation. Thus; today's competencies may turn into tomorrow's core rigidities with unprecedented speed. Enterprises should have the capacity to exploit its resources and learning capabilities better than its competitors, if it decides to assume a given competitive strategy.

However, the strength of this study methodology lies in its comprehensive coverage of various aspects of the Service enterprises and its implementation at Hospitals as a service provider. It provides for both, as in-positivist researchers adopt a quantitative methodology and carry out surveys and questionnaires. Furthermore, interpretive researchers will adopt a qualitative methodology, carry out interviews and construct ethnographies.

However, the study period interval in data collection may have influenced the variance in responses and therefore should be considered a limitation. Also, due to many the incomplete responses that were received and how qualitative responses were sometimes estimated by being based on collected impressions, there is a minor influence on the accuracy of the estimates for 'key areas of weakness' in green implementation. Although these limitations outline potential areas of weakness in the methodology, it still has been possible to undertake a comprehensive approach successfully.

Open innovation in service enterprises survey can have a significant degree of impact on the awareness of the average employee who wishes to be an innovator. The need to formulate an overall strategy for a knowledge base to support innovation can thus be very strongly emphasized.

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