

A Strategic Management Framework for Leveraging Knowledge Innovation

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Abstract

The field of knowledge management (KM) has emerged strongly as the next source of competitive advantage. However, as to how knowledge management (KM) can be harnessed for the pursuit of innovation has yet to be firmly established. This article discusses the significance of knowledge by describing the transition from 'information revolution' to 'knowledge revolution' – which enables various forms of knowledge assets to be absorbed, assimilated, shared and utilised. Next, it highlights the practice of knowledge management (KM) and explains why KM could better enable knowledge innovations to evolve, and how information technology (IT) could be better exploited for this purpose. It proposes a strategic management framework for leveraging knowledge innovation (KI) by providing perspectives on knowledge-centred principles, knowledge-sharing infrastructures and knowledge-based initiatives, to offer an integrated view of employing knowledge management (KM) concepts for innovation management (IM). Finally, it outlines the future challenges of knowledge innovation (KI) for organisations to better exploit its benefits.

Statement of Contribution:

The article contributes a conceptual framework for strategic management considerations to leverage knowledge

innovation (KI) as a source of competitive advantage. By conceptualising a systematic and structured framework for analysing an organisation's state of knowledge management (KM) practice in three areas: knowledge-centred principles, knowledge-sharing infrastructures and knowledge-based initiatives, an integrated scrutiny of how knowledge innovation (KI) could be strategically managed is fostered. It is expected to be of interest to corporate leaders, managers and specialists who are involved in IT planning, implementation and practical issues related to innovation management and knowledge management.

Keywords: Knowledge innovation (KI), knowledge management (KM), innovation management (IM), knowledge-centred principles, knowledge-sharing infrastructures, knowledge-based initiatives, information and communication technologies (ICT).

Introduction

Emergence of Knowledge Management (KM)

In the last decade or so, with the significant role played by knowledge-intensive businesses in the economy, the term “knowledge management (KM)” has generated a lot of keen interest in the corporate sectors. However, with no

universally accepted definition for knowledge management (KM,) the term remains conceived with a broad context, for instance, as a process through which organisations generate value from knowledge-based assets (Barth, 2000; Amidon, 1997) [1]. Given that the Internet has been evolving steadily for over two decades since its origins in the US APRAnet project in the 1960s and now increasingly used as a KM tool, the field of knowledge management (KM) has strongly emerged as a 'hot discipline'. In the wake of a more knowledge-intensive business environment, many see it as the next source of competitive advantage. In fact, knowledge management (KM) has become increasingly critical to organisations in areas as diverse as R&D, defence, medicine, marketing and software engineering.

At the same time, "innovation management (IM)"- which is a field of discipline that deals primarily with issues relating to how the innovation process could be managed effectively, has attracted much attention too (Goh, 2004; Harkema and Browaeys, 2002; Giget, 1997) [2]. With technological innovations as the mainstay of today's business, innovation management (IM) has become one of organisation's core functions. However, research on how well knowledge may be captured, managed, and applied for innovation pursuit has been less forthcoming. Both KM and IM represent areas of management that seemed to reside in separate spheres of influence, with almost no impact on one another. Yet, one major area of management concern confronting today's organisations lies in making efficient use of knowledge-based assets to create better, faster and more cost-effective innovations.

Integration of KM and IM

The immediate concern, as global competition intensifies, appears to be more

than just dealing with KM or IM issues separately. Rather, it involves acquiring the ability to harness KM practices for IM processes as a strategy that would bring about a higher level of organisational performance. In the past, organisations, which rely on the success of new innovations to sustain organisational performance, often ask themselves: "How can innovation improve our organisational performance?" With KM being a source of competitive advantage, some organisations are now asking the question: "How can the pursuit of knowledge innovation enable us to sustain our long-term competitive advantage in the new business world?"

To provide insights into the strategic management of knowledge innovation (KI), the two streams of thinking behind knowledge management (KM) and innovation management (IM) need to be drawn closer. To deepen understanding, common strategic issues on KM and IM are explored to shed light on how they can be integrated, with the aim of elucidating perspectives centred on strategic management considerations. With this purpose in mind, the subsequent sections offer viewpoints to give a more profound appreciation of the role of knowledge innovation (KI). The basic objective is to recommend a strategic management framework as a conceptual model for organisations to assess how knowledge management (KM) can be more effectively deployed for knowledge innovation in a more holistic, inclusive and co-ordinated manner. Figure 1 gives a pictorial view for the potential integration of the two disciplines, namely: innovation management (IM) and knowledge management (KM) to introduce a strategic management approach towards leveraging knowledge innovation as a source of sustainable competitive advantage.

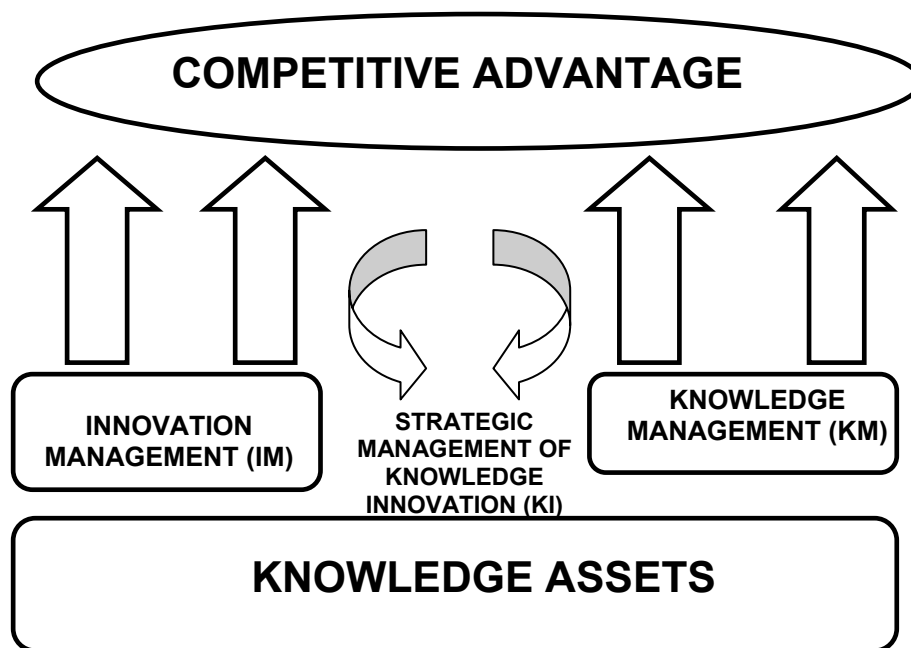


Figure 1: Knowledge Innovation (Ki) As A Competitive Tool

The Significance of Knowledge

Transition to Knowledge Revolution

In the new economy, knowledge is the primary resource for economic development; and land, labour and capital – the economist’s traditional factors of production – do not disappear, but they simply become secondary (Drucker, 1994). Traditional factors of production are limited by a threshold of scale and scope as every marginal increase in land, labour or capital results in diminishing returns on the additional investment. By contrast, the returns from knowledge are governed by a different law of economic returns: investment in every additional unit of information or knowledge created and utilised results in a much higher return [3]. The ‘what’ that impacts on traditional types of innovation has shifted from the “tangibles and physical assets” to “processes wherein various forms of knowledge are absorbed, assimilated, shared and utilised with the objective of creating knowledge innovation”. Under such a scenario, knowledge capital

becomes as a source of competitive advantage for enhancing organisational performance.

While innovation practitioners recognise the importance of knowledge, the apparent confusion between the value of ‘knowledge’ and ‘information’ has caused organisations to sink billions of dollars in information technology (IT) investments that have yielded marginal economic results (Strassman, 1997) [4]. This prevailing disconnect between IT expenditures and the firms’ organisational performance could be attributed to an economic transition from an era of competitive advantage centred primarily on information to one based on knowledge creation (Malhotra, 2000a; 1997). In fact, the rising interest in knowledge innovation as a strategic lever of organisational performance is not entirely new. Back as the mid-nineties, support for knowledge innovation was already prevalent. For instance, British Petroleum’s CEO Sir John Browne said that: “anyone in an organisation who is not directly accountable for making profits should be involved in

creating, distributing and utilising knowledge that the company can use to make profits.” In other words, he advocates that all employees in an organisation must participate, directly or otherwise, in knowledge processes to innovate for economic gains - such a stance fundamentally places the role of knowledge innovation as important, if not more important, as the role of marketing, sales or any profit-driven activity.

Increasingly, it has become evident to organisations that the ‘information revolution’ has been superseded with ‘knowledge revolution’ as depicted in Figure 2. To succeed in the new knowledge

economy [5], organisations who are able to capitalise on the opportunities arising from the availability of knowledge-based assets and ultimately derive the most value from them will be the industry winners. However, to harness the most value from these assets, organisations must identify the types of knowledge assets that benefit businesses and understand how KM practices can be implemented effectively [6]. Hence, one important implication of KM research is to contribute new findings that would help practitioners develop, implement and improve the use of knowledge-based assets, regardless of the context or business objective.

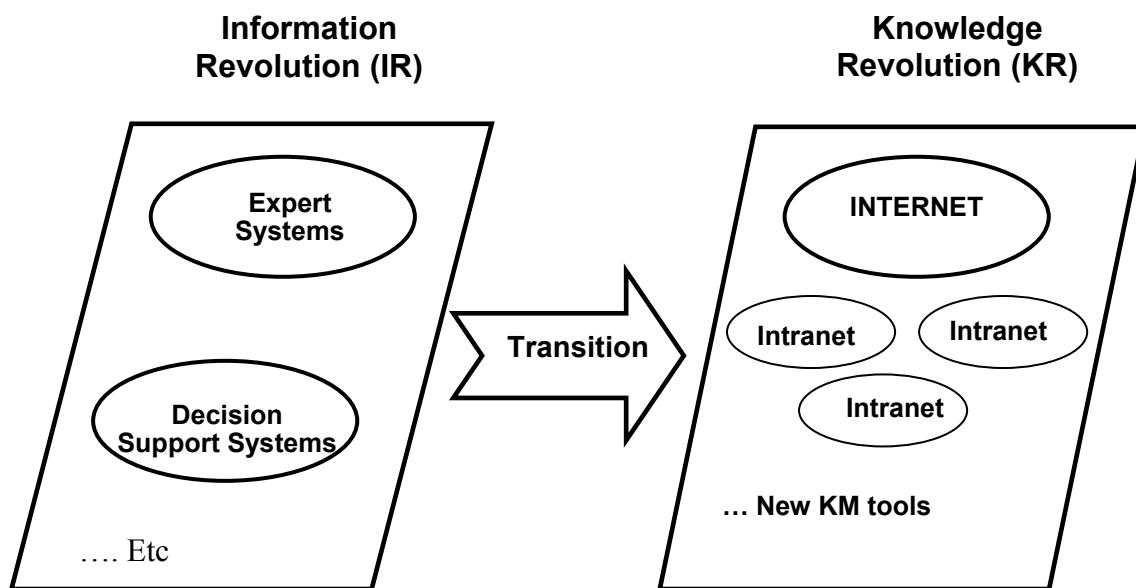


Figure 2: Towards A Knowledge Revolution

The Practice of Knowledge Management

Knowledge adds value to an organisation through its contribution to products, processes and people, while knowledge management (KM) transforms information, data and intellectual assets into

enduring value by identifying “useful knowledge” for management actions (O’Dell, 1996). In recent years, particularly, theory development relating to knowledge management (KM) practices has evolved to be of considerable interest to management writers, strategy thinkers and industry

practitioners. Coupled with organisational need to innovate, this interest on knowledge management (KM) has been propelled alongside that of innovation management (KM). With better recognition placed on the value of knowledge management (KM) to business, organisations are beginning to invest in ad-hoc project initiatives to leverage on knowledge for business use.

So far, the contribution made by knowledge management (KM) practices, to improve organisational performance, has been significant. One example of the escalating intensity of knowledge in products is the intelligent car, whose engine management systems can monitor the functions of vital engine parts and 'knows' in advance which part needs servicing and thus improves the car performance. Another example of knowledge in processes is the sharing of best practices, such as in high-tech semiconductor fabrication plants, which can bring about huge savings in capital investments. In the case of people, the "skilled knowledge" of experienced individuals in commercial transactions (e.g. multi-billion dollar contract negotiations)

often contributes to whether knowledge-intensive businesses would succeed or fail.

With knowledge management (KM) practices seen to be of significant impact to organisational performance, it resulted in a proliferation of KM tools such as expertise access tools, e-learning applications, Web portals, discussion and chat technologies, electronic message boards, synchronous interaction tools, and search and data mining tools. While the benefits of KM correlate directly to bottom-line savings, there is a risk associated with investments in knowledge management (KM), as they do not necessarily lead to expected benefits due to implementation failures (Lindgren and Henfridsson, 2002; Storey and Barnett, 2000; Fahey and Prusak, 1998). Nevertheless, the economic impact of KM practices to business is manifested in three areas of any organisation. They are, namely: products like patents or technology licences (intellectual capital), processes like financial procedures or manufacturing methods (structural capital) and people like skilled manpower or specialised talents (human capital) as shown in Figure 3.

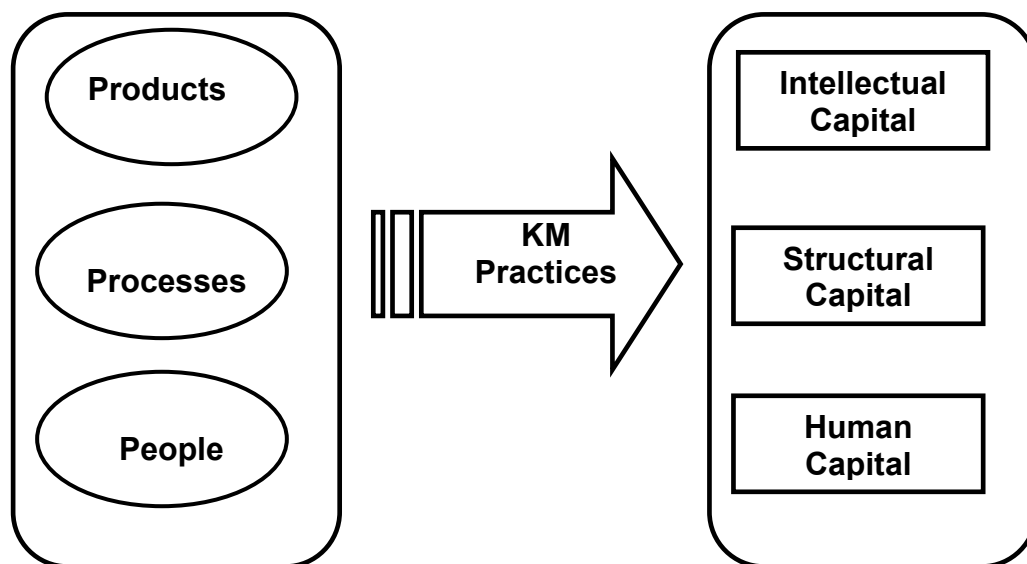


Figure 3: Benefits of Km Practices

Evolution of Knowledge Innovation

Today's organisations are in an unending struggle to differentiate themselves from relentless competitors, as markets become saturated with new innovations all the time. The ability to differentiate depends on the use of knowledge-based assets and how organisations employ KM practices to harness the value of these assets. As a result, many organisations have been trying to differentiate themselves based on unique production processes, rare and distinct skills, creativity, and now on management initiatives such as supply chain management and customer relationship management (Gold, Malhotra & Segars, 2001).

As global competition intensifies in most corporate sectors, knowledge management (KM) would have to play a more pivotal role in innovation pursuit. With mounting pressure to acquire KM capability for innovation management (IM), organisations are also fast working towards being recognised as an exemplar of knowledge management (KM) practices. For instance, ad-hoc knowledge-based initiatives are implemented such as setting up a corporate Intranet or initiating communities of KM practices or redesigning a core business function around knowledge sharing. However, a majority of these KM programmes are still predominantly centred on building computerised databanks or electronic repositories for documenting, storing and disseminating best practices.

For organisations to earn a sizeable payback for their KM efforts, the real payoff lies in applying knowledge to innovation. To cite an example, Nokia, an organisation that has consistently applied KM practices in its business, has yielded considerable benefits in innovation-related and product development functions. Nokia makes use of KM practices extensively to understand

market trends and customer requirements and puts useful knowledge into action for its innovation pipeline. It is thus not surprising that industry analysts reported that Nokia continually delivers a new mobile communication product every 25 days! Clearly, the ability to evolve knowledge innovations continuously would enable organisations to gain a sustainable competitive advantage in the long run.

Exploiting IT for Knowledge Management

As early as in the 1980s, there were great expectations that knowledge-based computer systems (e.g. expert systems or decision support systems) should be exploited as a knowledge management (KM) tool to solve business problems. For close to two decades, the search for KM tools was centred on stand-alone information systems (IS) such as CASE tools or commercial expert system shells. But in retrospect, part of the problem was that system developers have focused too much, perhaps overly so, on developing 'thinking machines', rather than designing these 'machines' to augment human thinking". Seemingly, it was felt that the roles of information management and knowledge management should be separated and played by machines and humans respectively.

Increasingly, the dominant view on how IT should be exploited for knowledge management (KM) has also changed over the years. For instance, researchers also came to realise that only human beings can take the central role in knowledge management, not computer systems even with the most powerful information-processing capabilities [7] (Stewart, 1991; 1993; 1995; Nonaka, 1991; Nonaka and Takeuchi, 1995). It was clear that the effective exploitation of IT for knowledge management (KM) should help individuals in an organisation to develop the

requisite competencies needed for innovation; and not replace individuals by “thinking machines”. To this end, three kinds of physical IT systems are necessary for KM to be effective, namely: capture tools (e.g. intelligence databases), communication tools (e.g. distributed networks), and collaboration tools (e.g. interactive web pages).

A Strategic Management Framework

Motivation

Currently, the mainstream KM literature relating to innovation management does not deal adequately with the strategic management of KI as an area of concern. On the one hand, most writers concerned with knowledge management (KM) issues, unlike innovation theorists, tend not to exhibit the same degree of understanding on the economic significance of innovation. On the other hand, innovation writers are often less able to articulate how KM practices can be applied as an effective strategic management tool. Nevertheless, virtually every organisation is now grappling with the opportunities presented by KM, including new ways to acquire, assimilate and share knowledge in innovation pursuits. By now, it is evident that the emergence of knowledge innovation is not only offering immense potential for organisations to gain a sustainable competitive advantage over rivals, but also providing viable avenues to improve organisational performance [8].

Instead of investigating “what goes into the bolts and nuts of knowledge innovation” - which is dependent on business context and is industry-specific, it is more appropriate to concentrate on the strategic management of knowledge innovation (KI) along the vein of thinking: “which strategic aspects of management should knowledge innovation focus on?” Understanding such issues may

provide new insights into how knowledge innovation can be better managed in areas like knowledge-sharing implementation or utilisation of knowledge-based assets. Hence, a strategic management framework is proposed to guide organisations on aspects of management that would strategically affect the evolution of knowledge innovation.

So far, the lack of an integrated view of knowledge innovation (KI) has led to a certain degree of confusion. To better understand the evolution of knowledge innovation, strategic perspectives of knowledge management (KM) applicable to innovation are necessary. In particular, two areas of literature on KI have yet to be addressed. Firstly, a definition of knowledge innovation (KI) needs to be specified to put in perspective of its impact on the success of enterprises, economy and society; and to identify the key elements that underscore the importance of knowledge-based assets and the management actions required for innovation pursuit. Secondly, since a comprehensive model for understanding the strategic aspects of KM practices in innovation is not yet apparent in extant literature, integrating KM and IM within the strategic management framework would be required. However, two pertinent questions remain to be answered: One, what are knowledge-based assets? Two, what does a knowledge innovation really constitute?

What are Knowledge-Based Assets?

Not all information can be considered as ‘knowledge-based assets’. Very often, organisations determine what information qualifies as knowledge-based assets, depending on the context and business objective. In general, knowledge-based assets fall into two categories: explicit or tacit. Included among the former are patents, trademarks, business plans and marketing research – any information that can be

documented, archived and codified, often with the help of information technology (IT). In the case of the latter, it is much harder to grasp as the information is contained in people's heads and the real difficulty is figuring out how to document, share and manage it effectively. Hence, it means that an integrative view to managing the processes for creating, classifying, storing, disseminating and utilising knowledge-based assets for innovation, should be adopted (Amidon, 1997; Drucker, 1988). Even if technologies like electronic mail, groupware, and instant messaging tools can be used to manage tacit knowledge, identifying it is itself a major hurdle in most organisations.

What does a Knowledge Innovation really constitute?

Notably, it was Drucker in the 1950s who first coined the term 'knowledge worker', but it was only until fairly recent that corporate leaders, policy-makers and

entrepreneurs began to strongly acknowledge that successful innovations are increasingly knowledge-intensive. Amidon (1997) has aptly described 'knowledge innovation' as the creation, evolution, exchange and application of new ideas into marketable goods and services, leading to the success of an enterprise, the vitality of a nation's economy and the advancement of society. In gist, two key elements are present in the definition. One, it recognises that knowledge is a key component of innovation - not technology or finances. Two, the actions associated with managing the flow, use and handling of knowledge in an innovation process is another key component. However, it is less clearly delineated as to what extent the literature between KM and IM, as represented in Figure 4, can be drawn as insights into the strategic management of knowledge innovation (Harkema and Browaeys, 2002; Miller and Morris, 1999; Rogers, 1995).

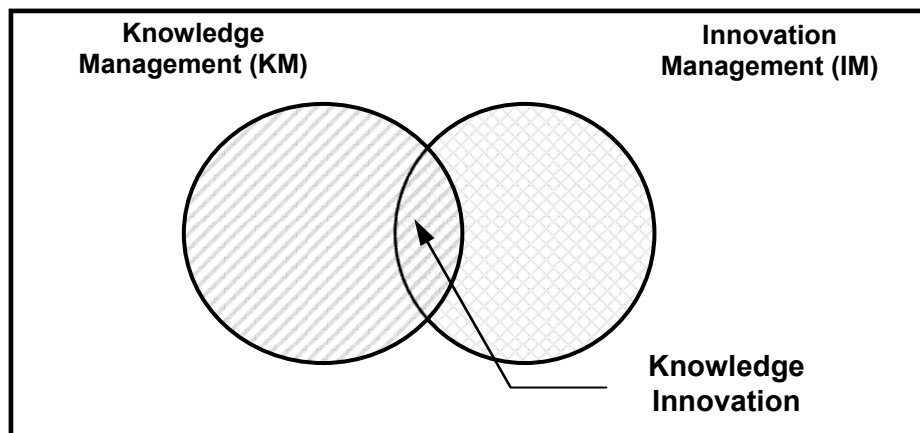


Figure 4: Management of Knowledge Innovation

Strategic Management of Knowledge Innovation

Because of the tacit nature of an organisation's knowledge-based assets and the long-term requirements for continuous innovation, current thinking points to the strategic management of knowledge innovation (KI) as an effective competitive tool to support organisational performance (Gupta and McDaniel, 2002; Clarke and Rollo, 2001; Probst, Raub and Romhardt, 1999). Given the wide range of KM tools available, organisations are racing to revolutionise their approaches to utilise knowledge for innovation. However, applying available KM tools alone that ran the gamut from standard, off-the-shelf computer packages to sophisticated software systems designed to support knowledge management (KM) activities is hardly inadequate. Insofar as knowledge innovation (KI) is concerned, it involves unique and highly professional skills – which are difficult to be trained, learned and assimilated. Focusing on strategic management issues is more appropriate because knowledge innovation is never stagnant but adjusts in response to changing environments and market conditions. Despite the relevance of knowledge-based assets to innovation management (IM), one wonders why has there been so little literature written on knowledge innovation (KI) in the first place. Recognising that knowledge innovation (KI) is strongly guided by knowledge-centred principles, with the necessary knowledge-sharing infrastructures required to fully facilitate knowledge-based initiatives, the implementation of knowledge innovation (KI) ultimately depends on the inputs of decision-making, human responses, technologies and experience sharing.

A strategic management framework constitutes a normative quest to provide a better understanding of knowledge

innovation (KI), as illustrated in Figure 5, in terms of perspectives on principles, infrastructures and initiatives – as a tool for organisations to analyse whether their roles in strategic aspects of management, have been fulfilled. Because the framework extends beyond isolated KM practices, tools and physical systems, its conceptual development is therefore based on a comprehensive overview of KM literature applicable to innovation management (IM). Furthermore, while the actual KM implementation may be firm-specific and technology-dependent, the strategic management framework nonetheless offers an integrative scrutiny of how knowledge innovation (KI) could be strategically managed in an organisation.

Knowledge-Centred Principles

If knowledge management (KM) practices were to be incorporated into innovation management (IM) processes as a competitive tool for supporting knowledge innovation, organisations must re-examine their role within a larger management framework, built on a mindset of knowledge-centred principles for the entire community of knowledge workers. To make headway along this line of new emergent thinking, knowledge-centred principles that typify new approaches of managing knowledge capital for innovation pursuit, have to be identified.

Through a distillation process of contemporary literature, six knowledge-centred principles, in contrast with other areas of management, seem to have distinguished themselves between managing knowledge innovation (KI) from the other conventional management approaches as summarised below (Harkema and Browaeys, 2002; Davis and Botkin, 1999; Miller and Morris, 1999; Skyrme and Amidon, 1997, Davenport, 1993).

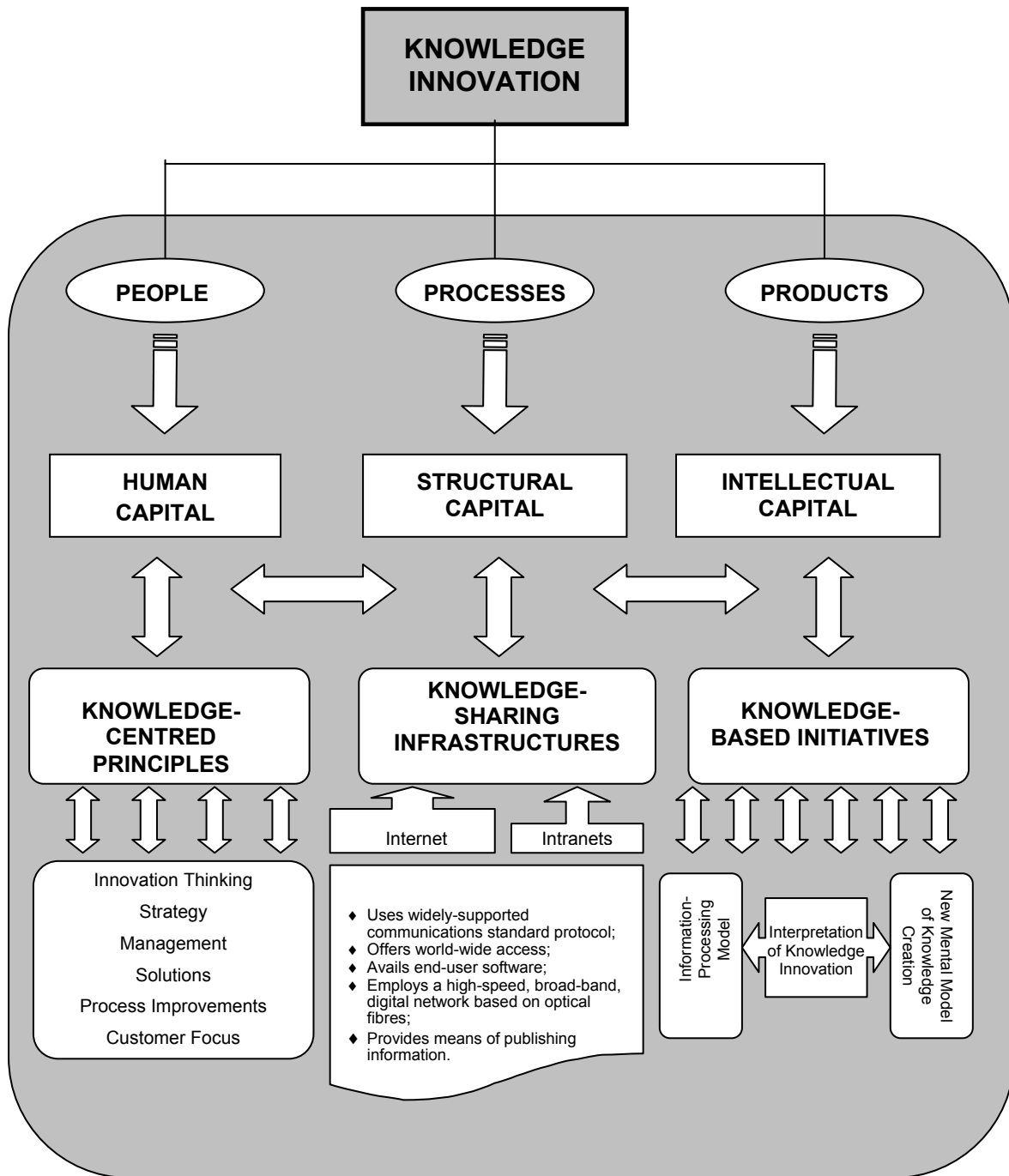


Figure 5: An Integrated Management Framework

- Understanding Innovation Value System (not Value Chain) - Value chain thinking is linear and static, while the innovation value system consists of non-linear and dynamic knowledge processes and represents interdependent relationships that need to be understood, considered and developed for successful knowledge innovation;

- Formulating Collaborative Knowledge Strategy (not Competitive Information Strategy) - Competitive information strategies create win-lose scenarios due to competition for a share of the same information pie, while collaborative knowledge strategies encourage win-win situations through symbiotic relationships by sharing knowledge assets and growing the knowledge pie for all.

- Developing Strategic Knowledge Networks (not Strategic Business Units) - Strategic business unit management tends to apply isolated islands of information assets, while the strategic knowledge networks foster the flow of knowledge assets between partners, customers, suppliers, internal and external units and other stakeholders, including competitors, in the innovation process.

- Constructing Hybrid Human-Technology KM solutions (not Machine-based KM solutions) - Human beings are better at 'knowledge skills' while computers are more adept at 'information tasks' such as collecting and categorising highly structured information that changes rapidly. To interpret knowledge within a broader context or to combine it with other types of information, or to synthesise unstructured knowledge, humans and machines must complement each other.

- Fostering bottom-up knowledge process improvements (not top-down 're-engineering' of knowledge management approaches) – Highly creative and useful knowledge work carried out by autonomous knowledge workers often require less top-

down intervention and more bottom-up spontaneity.

- Focusing on Customer Success (not Customer Satisfaction) - Customer satisfaction meets today's needs only, while a deliberate focus on customer success helps identify future requirements and unmet needs, which form the competitive forces for firm growth and business expansion.

Notwithstanding the recognition given to these knowledge-centred principles, many knowledge management (KM) tools such as electronic knowledge databanks could also facilitate, to some extent, the management of knowledge innovation (KI). But it must be emphasised that the management of KI should not be viewed as a technology-based concept. While technological tools may support its management, it should be borne in mind that management decisions relating to knowledge innovation are ultimately based on who (people), what (knowledge assets) and why (business objectives) [9]. It is thus more far-sighted and prudent to assess an organisation's current state of knowledge management (KM) practices before jumping into the bandwagon of "KM craze". Organisations which implement IT applications for knowledge innovation (KI) tailored to their business context instead of utilising off-the-shelf KM tools blindly are more likely to see better results in their knowledge management (KM) efforts.

Knowledge-Sharing Infrastructures

The driving force behind the rapid transformation to greater inter-connectivity, accelerated data transmission and reduced costs of communications is none other than information and communication technologies (ICT). Undoubtedly, the greatest benefit of ICT is its reach and one of its most important roles in KM is its knowledge sharing

advantages. Currently, of the ICT available at today's workplace that have the most profound impact on KM practices is that of the Internet and related technologies – which offers an incredible information source direct to the end-users without the need to involve an intermediary such as information professionals (CIO, 1996).

Although the Internet has been growing in stature and impact, its knowledge-sharing considerations are almost entirely confined to its information role. Whether it really shares 'usable' knowledge for developing innovations is still subject to debate. While the cost of building national level knowledge-sharing infrastructures may be very high, there are also hardly any equally cost-effective technological alternatives. In countries where the knowledge-sharing infrastructure is weak (no optical fibre link to world's information superhighway, for instance), the dial-up access charges may be even higher than the Internet usage costs itself. But once the infrastructure has been established, the cost of propagation technology can be very low. Nevertheless, knowledge sharing continues to be impeded by the digital barrier unless there is a universal access to ICT in all parts of the world [10].

Internet heralds the way for collaborative sharing of knowledge-sharing assets. But to effectively implement knowledge-sharing infrastructures for KI, organisations should consider, at a minimum, ample support for the processes of codifying and storing knowledge, creation of knowledge maps (or corporate directories), sharing of best practices, and developing knowledge networks (Maryam and Leinder, 2001; Davenport and Prusak, 1998). For organisations to better exploit the use of the Internet in fostering knowledge innovation, an integrative approach to implementing its knowledge-sharing structures of ICT is

required. Viewed from KM perspectives, the knowledge-sharing infrastructures of the Internet and its related technologies should possess the following five characteristics (Barth, 2000; Miller and Morris, 1999; Strassmann, 1997):

- It uses a widely-supported communications standard protocol – which means that it is universally accessible from multiple locations and through different computer platforms;
- It offers world-wide access, with increasingly more international service providers (ISP) – which means that individuals, who travel a lot, can use the Internet like a corporate network without building an in-house option;
- It avails end-user software, such as electronic mail and browsers to be universally available at low cost (and often free) – which means that it is cost-effective to implement on an enterprise-wide basis;
- It employs a high-speed, broadband, digital network based on optical fibre cables with limitless bandwidth – which means that it provides quick access at an affordable cost;
- It provides a quick means of publishing information, through the World Wide Web, that can be shared world-wide – which means that the universal repository of information resources can be updated and widely shared at an attractive cost.

Additionally, due to the growing interest of organisations who want to share information, knowledge-sharing infrastructures have expanded to include the use of Intranets for better accessibility in a corporate environment. The advantages of using Intranets are similar to those that use the Internet in external information access and communications. Because end-users are familiar with browser interfaces, information can be shared across different local area networks and computer platforms, and published information is instantly available

over the whole network. Besides, information may be presented in different formats, like word-processed documents. Furthermore, Intranets can host transaction and database applications with the Web browser being the universal interface to different 'back-end' systems. Whatever the format and content may be, an Intranet facilitates the sharing of internal information, while the Internet gateways external information.

Knowledge-Based Initiatives

Differences in perception of KM issues exist in various business activities – for example, how much information should be involved before we consider a business activity as ‘knowledge-intensive’? Seemingly, what was more crucial is not whether information was utilised, but whether the business activity involves knowledge-based initiatives that produce intended benefits. For a knowledge-based initiative to occur, quantity rarely equals quality, and indeed, the objective of it is to identify ‘knowledge gems’ from a ‘sea of information’. Whether a knowledge-based initiative contributes to an innovation process depends largely on the interpretation of knowledge innovation (KI). There are two distinct interpretations of KI that give rise to various knowledge-centred initiatives, which eventually can be translated to knowledge capital through value creation. The first interpretation, which centres on the traditional information-processing model of knowledge management, assumes a problem as given and the solution as based upon a pre-specified notion of the business environment. The second interpretation, which revolves around human imagination and creativity as a new mental model of knowledge creation, constructs the definition of the problem from the knowledge available at a certain point in time and context

(Malhotra, 2000a; 2000b; 1997; Yoneji, 1990).

Based on a review of current literature on KM practices centred on organisations which host information in the Internet, nine knowledge-based initiatives have emerged to be of considerable significance to knowledge innovation in products, processes and people (Amidon, 1997; Skyrme and Amidon, 1997; De Long and Davenport, 1996; Skyrme, 1991) are listed below:

Products

- Structuring and mapping knowledge – such as developing typologies or synthesising different knowledge types;
- Developing knowledge databases – documenting best practices, expert directories, market intelligence and so on;
- Embedding knowledge in new products and services – such as the introduction of smart products.

Processes

- Capturing and re-using information as knowledge - such as utilising old project deliverables as source materials to develop specifications for a new project;
- Sharing of knowledge or lessons learnt about knowledge processes - from one part of the organisation to another, through distribution, dissemination or personal interactions;
- Measuring and managing the value of knowledge assets – such as attaching an economic worth to the ownership of patents or managing the rights of these patents.

People

- Creating knowledge or intellectual capital teams - to help identify and audit intangible knowledge assets using people from multiple disciplines and to develop new practices of knowledge management;
- Forming people-oriented knowledge centres - focal points for the development of knowledge skills, managing and enhancing knowledge databases and facilitating knowledge flow;
- Using collaborative technologies for knowledge exchange between people - the implementation of Intranets (internal Internet), electronic mail, Lotus Notes, groupware for multiple-user access.

While knowledge-based initiatives need not necessarily be implemented via the Internet, the relative ease of use of Internet technology, its cost-effectiveness and immediate availability to a global audience of users in more than 190 countries offer many advantages. Three advantages are cited here. Firstly, the Internet performs exceptionally well in facilitating remote and rapid access, through network connections and enhancing global communications at a low cost. Secondly, with major technological developments on the Internet occurring frequently, it offers quantum improvements in access efficiency using browsers, search engines and intelligent software that search the most relevant information for end-users. Thirdly, since knowledge management (KM) activities are no longer implemented through stand-alone point solutions, such as expert systems or group decision support systems, the Internet offers a means for enterprise-wide knowledge-based initiatives to be better accomplished through groupware systems like Lotus Notes and Intranets.

Future Challenges For Knowledge Innovation

While there may be extensive literature written in the two management areas, namely knowledge management (KM) and innovation management (IM) as separate areas of concern, limited research was done specifically on knowledge innovation (KI). This article integrates the two management areas: KM and IM, each having a momentum of its own, into one singular focus to foster new strategic thinking in sustaining competitive advantage through knowledge innovation. It suggests that to effectively manage knowledge innovation in any organisation, three strategic aspects of management should be looked into as a whole. A strategic management framework is thus proposed for organisations to better fulfil their roles in fostering knowledge innovation. One, organisations should embrace a mindset of knowledge-centred principles to better maximise the value of their knowledge capital for innovation. Two, organisations should implement knowledge-sharing infrastructures through the use of ICT to better enhance the knowledge-based assets required for the pursuit of innovation. Three, organisations should promote knowledge-based initiatives to better facilitate the creation of knowledge innovation. But to fully exploit the benefits of knowledge innovation (KI), three challenges that merit attention have been identified as follows:

Firstly, as knowledge innovation encompasses the use of various types of knowledge assets; and social, economic and other forms of tacit knowledge, the innovation process requires the assimilation of human imagination, intuition and creativity at all levels to achieve success. To unleash the potential of knowledge innovation, the challenge is to permeate

knowledge-based initiatives to various layers of society – industrial, organisational and humanistic structures. This would then enable organisations and individuals to utilise knowledge capital to participate in the core activities of knowledge innovation.

Secondly, although the objective of knowledge innovation is to improve organisational performance, it should not be viewed as the “magic cure” for ailing organisations. Paradoxical as it may sound, the fewer KM practices an organisation requires in its pursuit of innovation, is also a reflection that it has championed knowledge-centred principles adequately in its business. The challenge posed to organisations is to identify, create and acquire new knowledge assets all the time, and to make these assets readily available, transparent and freely mobile for individuals involved in knowledge innovation.

Thirdly, for knowledge innovation to flourish, it must be fostered within an enabling environment of collaborative enterprises. Since knowledge innovation constitutes the ‘discovery of new knowledge assets’, oftentimes based on competencies and talents inside and outside an organisation, collaboration between enterprises should be recognised, encouraged and valued. Ultimately, the challenge lies in strengthening the role of all stakeholders in a knowledge enterprise towards collaboration – embracing a knowledge-oriented culture and nurturing a knowledge-sharing ecosystem. After all, the success of any knowledge innovation depends on the extent of collaboration amongst individuals who have created the knowledge – the very trait that make knowledge useful, beneficial and valuable to society.

In conclusion, like any form of innovation, knowledge innovation, too, is often managed with a business objective in

the context of ‘imperfect conditions’. It must therefore be acknowledged that the ultimate goal of managing knowledge innovation effectively is perhaps one for all ‘knowledge workers’ to strive for, but never to be completely addressed. Clearly, an integrated management approach based on organisational context and business objective, to understanding knowledge-centred principles, knowledge-sharing infrastructures and knowledge-based initiatives, stands a better chance of success over the long-term.

Endnotes

- (1) KM also embodies the critical issues of organisational processes that seek synergistic combination of data and information processing capacity through the use of appropriate technologies, and the creative and innovative capacity of human beings (Barth, 2000; Amidon, 1997).
- (2) Like knowledge management (KM), innovation management (IM) has been consistently demonstrated to be a key value creator in organisational growth and business performance (Goh, 2004; Harkema and Browaeys, 2002; Giget, 1997).
- (3) This is often attributed to ‘externalities’ of the network, as the strength and utility of the network increases with increasing membership in the information or knowledge network (Yogesh, 2000).
- (4) IT economist Paul Strassmann concluded that there is no relationship whatsoever between computer expenditures and company performance (Strassman, 1997). John Seely Brown, director of Xerox Parc observed that despite more than

US\$1 trillion in technology investments over two decades, US industry has realised little improvement in the efficiency and effectiveness of its 'knowledge workers'.

(5) The OECD (1996) defines a knowledge economy as one in which the production, distribution and use of knowledge are the main drivers of growth, wealth creation and employment for all industries.

(6) Take for instance, an effective KM programme should enable an organisation to improve operational efficiency, reduce costs, achieve higher productivity and boost revenues.

(7) Nonaka and Takeuchi (1995) have emphasised that only human beings can take the central role in knowledge creation. They argue that computers are merely tools, however great their information-processing capabilities may be. While information generated by computer systems is not a very rich carrier of human interpretation for potential action, knowledge resides in the user's subjective context of action based on that information.

(8) In order to adopt knowledge innovation successfully as a competitive tool would require a focused business strategy that harnesses knowledge management (KM) in ways that offer a new approach to innovation strategies (Blumentritt, and Johnston, 1999; Skyrme and Amidon, 1997).

(9) Hence, organisations that went about installing a large-scale centralised IT

system or any advanced IT tools in the hope that they have thus established a successful KI programme may be very disappointed in the long haul.

(10) Currently, around 50 percent of all Internet users are in the United States, about 25 percent are in Europe, with 12 to 13 percent in Asia.

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