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Alvin Cheung
National University of Singapore

Pan-Shan Ling
National University of Singapore

Jimmy Huang
University of Aberdeen

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Alvin Wan Kok Cheung
National University of
Singapore
wankokch@comp.nus.edu.sg

Pan Shan Ling
National University of
Singapore
pansl@comp.nus.edu.sg

Jimmy Huang
University of Aberdeen
j.huang@abdn.ac.uk

Abstract

By conducting an exploratory case study, this study aims to examine how a large Multi-National Corporation (GlobalMNC) transform their knowledge from their physical process into the virtual value chain utilising ERP as the main information infrastructure. In the study, we found that the success of the e-commerce infrastructuren the GlobalMNC lies in the underlying knowledge architectural design. The architecture comprised the key components of culture, channels and networks. These components had work inter-dependently together tosubtain the e-commerce infrastructure and renew itself together along with the pace of changes in technology. This paper concludes that a sound global e-commerce strategy has to fundamentally address the underlying knowledge architecture issue before it can be successful and sustainable.

Keywords: ERP, knowledge management, E-commerce

Introduction

E-commerce has been coined as the main growing phenomenon that has changed the way business is done in many industries (e.g. Evans and Wurster, 1999). Many multinational organizations have harnassed the e-commerce capabilities of the Internet to integrate its global operation (Anderson, 2000), and undertake initiatives to implement inter-operable technology, such as the Enterprise Resource Planning (ERP) systems (Davenport, 2000). Most organizations, having the ERP system already in place for data-exchanges, are moving further into planning infrastructure to support its core competence to enable new e-commerce capabilities (Kalakota and Whinston, 1997; Neef, 2000; Slywotzky, et al., 2000). While most ERP studies have focused on the critical success factors of initial and on-going factors (Communications of the ACM, 2000), this study takes a look at the post-implementation process of incorporating two e-commerce initiatives and alsoaddress the issues of knowledge sharing. In particular, the study argues that for any organization to exploit the virtual value chain, the organization must be able to effectively exploit and utilize its knowledge resources across the corporation (Rayport and Sviokla, 1995). By conducting an exploratory case study, this study aims to examine how a large multi-national transfers its competence from the physical realm into the virtual value chain with ERP as the main information infrastructure.

Research Methodology

The case study was done through employing several methods of data collection (Benbasat, et al., 1987). A period of six months of participatory observation (Argyris and Schon, 1991; Dickens and Watkins, 1999) was spent on site where information was collected about the development process.from the Asia Headquarters in Singapore. Primarily, semi-structured interviews and informal discussions were done within 4 independent departments (IT dept, TQM management, e-business and e-excellence) and 4 Business Units (BUs: Automation & Drives, Electronic Automated manufacturing, Communication Unit). From these groups, information about e-commerce implementation initiatives was collated. A period of four months was spent on-site to understand

the context of the business and social environment. Other tools include the use of online participation and browsing as a method of data collection to be in line with the implementations and global participants in an e-commerce setting.

In the research, the interpretivistic approach was used in the observation by building interviews and group discussion around the data-collected from previous observations. The Participatory observation was necessary to provides an inside view of the studied ERP environment where categorical data were established using interactive cyclic pattern matching (Kellehear, 1993). With the data collection and coding established, thematic analysis (Glaser and Strauss, 1968) was introduced to provide an inductive study of these themes. Multi source triangulation provides internal validity checks of the data. The external validity checks were done through participative discussions on the codified data and the analysis of the research.

In the case, we will be using GlobalMNC in place of the real name of the organization.

Case Study

GlobalMNC is recognized as one of the global leaders in electrical engineering and electronics. They have nearly a total of 447,000 employees in over 190 countries with its Asia regional office in Singapore. In order to be more competitive in the new business era, GlobalMNC advocated the implementation of SAP/R3 to manage the diversity of its business and enhance its computational capacity to cope with high electronic transaction. In particular, the ERP implementation is also seen as setting the groundwork for futher e-commerce enhancements through organizational restructuring and a shared service center, reinforcing common policies for standardization which stimulates coordination between BUs.

The ERP has often been seen as a bureaucracy to control information centrally, although it has been known to improved efficincies in some areas. In this case Study, the capacity and size of the organisation entailed significant customisation of the SAP/R3 4.6D system feasible. These customisation were made to ensure that the organisation own best practices would not be significantly impact. The new customised system was knighted as "Spiridon System".

The ERP implementation, however was supporting only certain functions, such as Finance(FICO) and Logistic(SD), while buying and selling across businesses on-line were still not possible. As it was not part of its ERP implementation strategy, new offerings from SAP (e.g. mySap.com and MySAP CRM) were not considered to address the issues. Managers, engineers and administrators noted that the system was not designed to support the diversity of e-commerce and knowledge capabilities across the whole company. as Aptly put by one manager, "I notice a lot of information is going into the system, whether we are sharing knowledge, I don't know."

With increasing global integration, the managers found that a flexible environment where relationship building through collaboration is fostered was necessary. At the same time, the significant increase in the number of highly customizable products and services has proliferated the use of specialized knowledge resources. GlobalMNC found that the new system was not able to cope with increasing requests and demands of its e-Businesses where knowledge sharing and global integration are key elements. Thus, the decision to develop a proper e-commerce infrastructure was seen as a significant step to address the issues that were not effectively managed during the ERP implementation. In order to further leverage the ERP system, GlobalMNC set up two functional units: e-Excellence and e-Business, as part of the e-commerce infrastructures upon which e-commerce components could be built on. The primary role of the e-Business units was to execute three e-Business strategies, namely "Transforming existing business", "Creating new business", and "Selling proven e-business solutions".

E-commerce Infrastructure and Projects

With the e-Excellence team building the foundation for e-Commerce, the e-Business center focused on identifying potential strategic links between the BUs through the infrastructure to ensure the successful rollout of its global e-Commerce initiatives. One of the most complex problems, hightlighted by the e-business manager, was to build a global mindset and changing the way individual functions. For instance, during the implementation, he found that there was resistant to the new practices because of pre-defined and expected mindset. Such a mindset, originated from the dominating corporate culture of "follow procedures".

The e-Commerce infrastructure and initiatives have created spontaneous strong responses for knowledge offerings among the BUs. The BUs was providing internal offerings in the form of enabling other BUs and to external organization through the various services. GlobalMNC call such practices "Selling of e-Business" where proven projects were sold internally and externally through subscription base or service offerings.

Most of the services offered within the organization integrated the differentchannels and operations by introducing expert services across BUs functions. Many of these projects were replicated across the organization through the infrastructure units. with each successful implementation, they are replicated and used globally. Among the implementations, two of the implementations stand testimony to the E-commerce successes in GlobalMNC: Sharenet and Enterprise Relationship Management (ERM).

The Sharenet Initiative

Sharenet was the e-commerce initiative developed by the Communication division, which stimulated a pool of knowledge resource dispersed across the organization. Its objective was to link its global operation channels through the use of a shared knowledge network. Since the introduction of Sharenet in January 1999, it now has more than 6,000 registered users from 48 countries, and some 15 different companies participating in the Sharenet to ensure that critical content mass and expertise comes from external sources. Furthermore, the Sharenet was used for the coordination of sales project, technical support and resolving customers' problems.

Sharenet does not merely represented a diversity of viewpoints from users nor just an enablement of linkages between various knowledge bases. More critically, Sharenet helped to decentralize headquarters' control and encouraged global integration of local innovations. Sharenet was thus valued by employees as a critical e-commerce tool for gaining customer feedback and establishing global contacts intra- and inter-organizationally.

The ERM/CRM Initiative

A global Customer Relationship Management implementation (CRM) was started in the Industrial Electronic Automation Assembly BU to integrate its field service and sales forces globally. Better known as Enterprise Relationship Management (ERM) to the internal BUs.,the objective was to bring about e-marketing and e-collaboration through inter-service and inter-division exchanges. The implementation was targeted at a combined install base of 900 users globally.

The enabling communication channels were used for information gathering and rolling out of a global project where they interacted neither location nor time exisit as a barrier for collaboration. The implementation now has a common strategic development (e.g. global team selling, global customization). The CRM tool was utilized to document and store the content templates used by employees for worldwide customers and vendors across business functions and related departments via a common global platform.

Subsequently, the CRM approach replicated the development of the GlobalMNC Business Service (GBS) BU through collaborative deployment. With the successful developed competence in CRM it was re-packaged and replicated to other BUs and even sold to external customers as a service.

Findings and Analysis

As seen in the case, e-commerce initiatives (e-transformation) were developed after the ERP implementation. Such an approach is similar to what was described by (Christensen, 1997; Dhillon, et al., 2001)as disruptive technological change and this impact changes on mainstream activities. In our case study, we have explored the knowledge architecture embedded in the implementation process of e-commerce initiatives.

Knowledge Architecture and Its Key Components

The organization has spent considerable resources in developing a conducive ERP environment vital for e-commerce implementation which in many cases was found not inadequate (Barbara, 2001). An excellent environment for data and information sharing (Davis, 2000; Ferrando, 2000) are developed in most cases but knowledge sharing are often neglected. This view is reinforced by Jan (2001) who argues the need for a data and information infrastructure before a knowledge architecture can be built. According to our findings, we conclude that a knowledge architecture serves as an important mechanism for knowledge sharing and is vital in implementing global e-commerce initiatives and allows capabilities to be nurtured. Three key components of the knowledge architecture underlying the e-commerce implementation are outlined as follows:

Knowledge Sharing Culture

As evident in the case, cross-functional knowledge sharing was not a common culture and practice prior to ERP implementation. This is reflected during the interviews most perceived that most legacy systems were based on an isolation model and the organization mindset thus evolved around this limitation of the legacy systems. ERP on its own is effective in facilitating information sharing and management, but insufficient in encouraging knowledge sharing cross-functionally, as evident in the case prior to the implementation of e-commerce initiatives. Such limitation was overcame by the establishment of the knowledge architecture which encourages the development of knowledge sharing culture. The development of knowledge sharing culture was found to be a critical element in enabling the introduction of "creative chaos" (Nonaka, 1994). Such chaos, as shown in the case, was reinforced by the increasing turbulence of the e-commerce era, and an organization's need to reshape its culture to cope with its environment was made more prominent.

Moreover, the findings suggest that nurturing knowledge sharing culture is an ongoing process and requires the development of trust amongst members of staff. This coincides with other empirical studies that commonly argue the intimate relationship between trust and knowledge sharing (e.g. Cerny, 1996; Farhoomand and Tuunainen, 2000; Majchrzak, 2000). Our findings suggest that GlobalMNC' approach to build trust was through spontaneous membership and participation where everyone is given automatic rights to share knowledge. For instance, they introduced concepts, such as "e-communities" and "organizational citizenship", to their e-commerce implementation initiatives. Such initiatives were found critical not only for ensuring the nurturing of trust across BUs, but also ensured the development of knowledge sharing culture to ensure the success of e-transformation.

Knowledge Channel and Access

The implementation of the ERP system has provided a common infrastructure to enable the free flow of information (Anderson, 2000), and evident as a vital mechanism for managing information in the e-commerce era (Thomas, 2000). While ERP is evident to effectively facilitate information sharing across the organization, it is still limited in encouraging knowledge sharing. In particular, the lack of flexibility of the ERP systems, as reflected in its orientation towards efficiency (Davenport, 2000), has inevitably inhibited the establishment of knowledge communities across the organization. As a result, the organization had to have the e-commerce infrastructure intertwined with the knowledge architecture to overcome the limitation caused by the ERP system.

The organization's e-transformation thus was found to facilitate overcoming such limitation through building global knowledge channels by which local staffs are given access to customers, experts and support dispersed globally. Employee's accessibility to strategically valuable knowledge reinforces Peter and Martin's (1999) argument which suggests the need for creating knowledge channels to enable organizational members in searching for complimentary knowledge. Such a need further indicates how organizations can mobilize and integrate its knowledge, often being localized (Sunny, 1999), at a global scale.

Following the same argument, we suggest that allowing organizational members in gaining access to knowledge and encouraging participation within knowledge community are two fundamental elements in ensuring the free flow of knowledge within the knowledge channel. The need to ensure the free flow of knowledge within the channel is further amplified within the e-commerce context. This mirrors what Wenger (2000) reported earlier that the social embeddedness of knowledge could create difficulties in sharing its richness within e-communities. Armstrong (1996) notes that e-communities evolve through their needs, such as the need for social interaction. However, many e-commerce implementations do not take into account the community's needs and often result in failure. In the case, Sharenet not only provides the context for knowledge exchange, but also create a knowledge-enabling context (Von Krogh and Cusumano, 2001) where more than 6000 registered users' needs for socialization were satisfied.

Knowledge Channels for Collaboration

Building upon the above argument, it is clear that Sharenet and ERM/CRM serve as critical solutions for developing cross-functional collaboration on a global scale through the creation of a joint pool of knowledge which synthesizes local expertise to form the foundation of global solutions. In Sunny's (1999) study, knowledge channels are as vital and valuable for collaboration within the organization. Through building formal channels across organization boundaries, Sharenet and ERM/CRM are seen to leverage collaboration. More importantly, development and design of products are no longer limited within Munich (GlobalMNC' HQ).

Collaboration is evident even in the initiation of e-commerce projects, through early user involvement within the implementation of e-commerce projects. The ability to collaborate using these knowledge channels changes how business requirements are delivered. Scott (2000) argues that IT has made barriers more permeable for knowledge to be leveraged. This is particularly

effective where locally specific knowledge of the products solution was leveraged into the system and incorporated within the global designed considerations of the automation products. This is important for automation products where a high degree of customization is required.

The Sharenet and ERM/CRM solutions are seen as vital channels for collaboration. The implementation of e-commerce has provided a channel where information is collected through customer feedback. The ERM/CRM creates value and new competence through the incorporation of customers' feedback into the products in the designed process. The ERP tools were far too constrained from centralized bureaucracies and technically controlled best practices (e.g. the engineering modules), were not adequately integrating its existing channels for collaboration.

The implementation of knowledge channel is seen as vital in an environment of flexibility and to accommodate the fast pace of change (Bahrami, 1992). Knowledge channels are thus critical to span through organizational structures and boundaries for information and knowledge gathering, and to provide collaboration support for the knowledge architecture.

Knowledge Transfer

Replication of value is seen as a major objective of the knowledge transfer. Replication provides the development of common standards for the organization's e-commerce infrastructure. Both the Sharenet and ERM/CRM are important products of the Communication BU which have been successfully replicated. Knowledge Transfer within GlobalMNC is seen as creating and re-applying technology and capabilities whilebest practices and effective technical implementations are transferred globally. The knowledge transfer mechanism that the organization has developed was native to the network. Those BUs, which do not participate in the knowledge transfer, will face the problem of creating competence in the e-commerce area due to the lack of knowledge of the evolving infrastructure. They were inevitably forced within the mechanism in order for them to create and support the corporate e-commerce standards.

The process of knowledge transfer was vital in the full utilization of knowledge within the organization, as seen in the corporate culture "of not reinvent the wheel" but to identify value. The organization was seen in many ways a leader in being able to identify key values in its business and effectively transfers valued practices. Knowledge transfer mechanism allows transfers within the knowledge network and leverage value across multiple industrial boundaries and BUs. Large joint implementations and high participation are key mechanism for knowledge transfer. Robert (2000) sees that such collaborative approaches are important for tacit knowledge transfer. As e-commerce standards changes at an unpredictable rate, knowledge transfer has to be efficient and simple to reduce effective Senge et al (2001) argues that methods of sharing must fit within the "economic realities" of the organization to be successful.

Conclusion

E-commerce is said to leverage on organizational competence in many areas. Given the successes of GlobalMNC in many industries and its diverse and complex structures, there are several implications which we can learn from its global e-commerce implementation.

In the study, we found that the success of the e-commerce infrastructure in GlobalMNC lies in the knowledge architectural design. The designed architecture comprises of key components of culture, channels and networks. They are components that work inter-dependently together to make the e-commerce infrastructure that sustain and renew itself with the speed of changes in technology.

The theoretical contribution of the paper is to identify components within the knowledge architecture that was necessary to create a sustainable global e-commerce infrastructure. The study extents Von Krogh and Cusumano's (2001) work of managing fast growth through identifying three components of the knowledge architecture model where the strategies for growth and learning strategies (e.g. growth, duplication and granulation) can be implemented.. The paper concludes with the findings that global e-commerce strategy has to fundamentally address the underlying knowledge architecture issue before it can be successful and sustainable.

In this paper, we have studied the architecture of knowledge phenomenons. The process of understanding knowledge phenomenon in ERP will provide the future study of introducing knowledge components. The contribution of this set of research findings builds a information and knowledge landscape within the business environment for future research into the enterprise systems aspect knowledge management.

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