

Process-Oriented Knowledge Innovation in E-business

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Abstract. Knowledge-intensive business process is vital for an organization to become more flexible and adaptive in an ever changing environment. Knowledge innovation is considered as one of the solutions to make business processes more knowledge-intensive. In this paper, a business process-oriented knowledge innovation diagram is proposed, which illustrates the relationship between knowledge innovation and business processes. Two models including “push” model and “pull” model are introduced in the diagram. Then, the models are expounded mainly from resource-based view and market-oriented view, respectively. UML, especially use case diagram, is used in business process analysis, and the method of Norm Analysis which is adopted from Organization Semiotics is utilized to analyze knowledge requirements in business processes. In the end, some conclusions are given. An e-business case of Haier EC is examined for interpreting the models.

1 Introduction

With the emergence of knowledge economy, knowledge has become the primary economic resource and determines organizational strategic advantages [5]; [11]. The process-based view argues that business processes are also an important source for creating and sustaining a competitive advantage [2]; [4]. Further, business processes are believed the most appropriate conceptual level for delivery of the strategic intent so that knowledge should be analyzed and conceptualized at this level [4]. As the core component of knowledge management, knowledge innovation should be analyzed, together with business processes.

Knowledge can be provided for value adding activities within business processes, and knowledge innovation behaviors have to be adapted to and serve business processes [10], 2003; [9]. When knowledge is embedded and incorporated into the business processes, as well as their products and services, knowledge in business processes is accumulated and optimized continuously which will improve business performance. In the meantime, business process execution generates new knowledge and enriches the knowledge

repository. For e-business, knowledge innovation can also enhance its business processes, such as increasing the speed, improving the efficiency and extending the services.

The next section reviews the related work. Then a process-oriented knowledge innovation diagram is proposed and analyzed. Two models including “push” model and “pull” model are presented later from two different process-based views. UML and Norm Analysis are adopted for business processes analysis and knowledge requirements analysis, respectively. An e-business case of Haier EC is examined for explaining the model.

2 Literature Review

Knowledge innovation (KI) is a new term compared with knowledge management (KM), which is stated as “the creation, evolution, exchange and application of new ideas into marketable goods and services for the success of an enterprise” [1]. In this paper, knowledge innovation is still considered as one of the components of knowledge management. However, it focuses on knowledge creation and especially its application in business processes.

The research of process-oriented knowledge innovation is mainly based on the research of knowledge-intensive business processes and process-based knowledge management.

2.1 Knowledge-intensive Business Processes

Employees need domain-specific knowledge including process-control knowledge, skills about machines, contingency plans for fault occurrences, and other experiences in order to perform their tasks effectively [7]. Business process can be characterized in terms of its knowledge intensity [15]. Knowledge-intensive business processes compose knowledge-intensive organization, which has the following characteristics: (a) most valuable asset is intellectual capital; (b) gathering and applying new information and knowledge is essential for the success; (c) it is flexible and adaptive [14].

2.2 Process-based Knowledge Management

The theory of process-based knowledge management (pKM) is proposed to integrate knowledge management and process management. PKM initiatives are designed to provide employees with task-related knowledge in organizations’ operative business processes, and its strategy addresses the integration of the resource-based view of an organization with the market-oriented view [8]. The idea of pKM gives much inspiration of knowledge innovation. However, this theory has two major weaknesses. First, business process management not only requires a level of process knowledge but also the up-to-date and newly created knowledge of the business context. Second, it is very difficult to provide business processes with targeted knowledge in pKM.

3 Process-oriented Knowledge Innovation

3.1 Process-oriented Knowledge Innovation (pKI) Diagram

Process-oriented knowledge innovation (pKI) diagram is introduced to overcome the two weaknesses. In pKI diagram (Fig. 1), there are two dimensions, including time and knowledge innovation. Within the coordinate, the upper level focusing on knowledge creation shows knowledge repositories (KR), in which knowledge is created, being created or to be created. The lower level focusing on knowledge application describes two kinds of business processes consisting of “as-is” and “to-be”. Two models called “push” model and “pull” model are showed in the middle level, which are about how knowledge is distributed in business processes and how knowledge serves them [10]; [12]; [9].

3.2 The Push Model

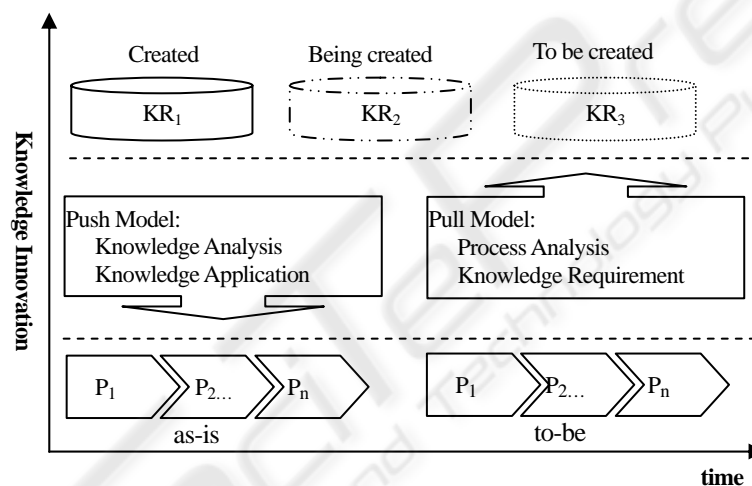


Fig.1. Process-oriented Knowledge Innovation

At the heart of the “push” model is knowledge repository. Liebowitz and Beckman (1998) define it as an “on-line computer-based storehouse of expertise, knowledge, experience, and documentation about a particular domain of expertise” [6]. Four knowledge innovation processes (**ISAE**) can operate on knowledge repository, which combine to support the generation and exploitation of the firm’s knowledge repository [9].

(a) *Identification* of knowledge that is not currently part of the firm’s knowledge repository, but may be important in the future.

(b) *Selection* of the knowledge that the firm needs for its future products and services.

(c) *Acquisition* of the knowledge that has been selected (for example, by R&D, licensing, purchase of equipment, hiring of staff and acquisition of firms).

(d) *Exploitation* of the knowledge that have been acquired (for example, by incorporating into products and services and licensing).

The link between the above four steps and core business processes is very important, as these are the means for ensuring sustainable productive output of the firm. In “push”

model, as is showed in Fig. 1, new knowledge is created and stored in knowledge repository through the former three steps of ISAE. Then, the knowledge is applied in “as-is” business process directly. However, some new knowledge requires correspondingly new processes to implement its application. Hereby, some “to-be” business processes are constructed.

In e-business, order management process is one of the most important business processes. Customer demands change very fast so that a firm should identify and select the new knowledge about their requirements to meet these demands. Most importantly, the knowledge must be created or acquired in the shortest time, which is vital for any e-business corporate. Compared with traditional business, e-business firms depend much more on their response abilities and speed. Therefore, they must build good relationship with different parties which can make it easier for them to get new knowledge. Similarly, new products or services must be provided through related business processes as soon as possible.

During the process of incorporating new knowledge into business processes, organization learning is an indispensable step by the methods of training, group learning and self-learning. For the employees in e-business firms, they must be capable to learn and use knowledge faster.

In conclusion, “push” model is very popular in firms. However, this model looks like pKM rather than pKI and is discussed by many literature. Thus, this paper will emphasize on another model--“pull” model.



3.3 The Pull Model

The aim of “pull” model is to build up a holistic understanding of potential knowledge requirement in and about each business process [3] (Fig. 1). Two stages are required in the model including business process analysis and knowledge requirement analysis. To introduce this model, a case of Haier is used, which is the first Chinese enterprise group with its independent e-business firm. In this paper, e-commerce company of Haier is called Haier EC.

3.3.1 Business Process Analysis

The objectives of business process analysis are to describe how the firm works, to show who is responsible for the functions, and to express how actors communicate with each other. Process analysis is the basis of knowledge requirement analysis. UML (Unified Modelling Language) is adopted to facilitate business process modeling, which includes three steps.

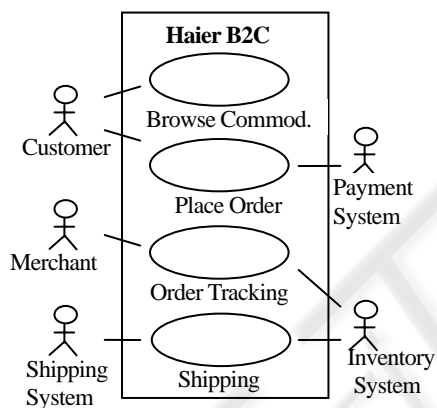


Fig. 2. Use case diagram for an order processing business system (Adapted from: Chang et al., 2000)

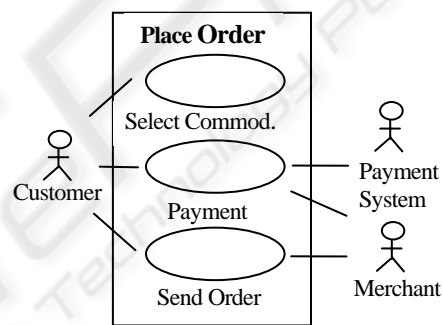


Fig.3. The business area of placing order

Step 1: The first step is the domain analysis. In order to capture the context of a business process, use case diagram is utilized to describe the internal functions of a firm, each use case representing one function, all of which compose the whole business domain. For example, Fig. 2 shows a use case diagram of the B2C order processing system in Haier EC, which includes four use cases such as browse commodity, place order, order tracking and shipping. And there are five actors in this diagram, which consist of customer, merchant, shipping system, payment system and inventory system. The responsibility relationship between actors and use cases is also illustrated by the lines linking them.

Step 2: To deeply understand the order process, each use case can also be further detailed in another use case diagram. Fig. 3 describes the detail information of use case of “place order”. It is showed that another three sub-use cases implement the functions of order tracking, namely, select commodity, payment and send order. Similarly, each sub-use case can be decomposed into many activities.

Step 3: To help to understand knowledge requirement of each business process, the interactive communication among different actors is very important, because information exchange can be the source of knowledge. During this process, a sequence diagram can help to break a process into many activities. In the meantime, their relationship is expressed [12]. Since payment is an essential process for any e-business, it is exemplar here. In Fig. 4, customer, Bank and Haier EC are the related actors in payment process. First, when a customer selects the commodity and puts it into the shopping basket, he/she will lead into an appointed bank’s website. Then the bank account and password are needed to be checked in. When the bank receives and confirms the customer’s information, it will help the customer fulfill this transaction. After the money is transferred to Haier EC’s account, the process of placing order is completed.

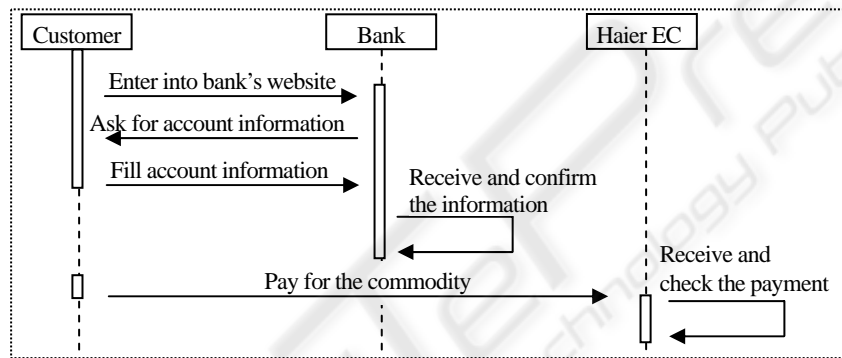


Fig. 4. Payment process

3.3.2 Knowledge Requirement Analysis

After business process analysis, we have a holistic and detail understanding about the whole business, and we still need to find their knowledge requirements. In Fig. 4, information exchange among the three actors represents some knowledge requirements of business process or activities. To describe knowledge requirements more clearly, the method of Norm Analysis is adopted. Norm is one term in semiotics theory, which is similar to “rule”, “constraint” and is also one kind of knowledge. Generally, Norm Analysis comprises four stages (table 1), including responsibility analysis, information identification, trigger analysis and norm specification [13].

Table 1. Four stages of Norm Analysis and its outcomes

Tasks	Outcome	
Responsibility Analysis	Identify responsible agents for the Start/finish of “ <i>an instance</i> ”	
Information Identification	Select type of key information required by “an instance”	
Triggers Analysis	Activities/actions effecting the Start/finish of “ <i>an instance</i> ”	
	Pre-conditions	Conditions for acting and invoking norm
	Post-conditions	Resultant after the successful execution of norm
Norm Specification	Norms specified in the standard construct.	

To explain the four stages of Norm Analysis and apply this method in E-business, payment process is still exemplified. As can be learned in Fig. 4, payment application and payment evaluation are two norms in payment process, for which the customer and the bank are responsible, respectively. In table 2, for the norm of payment application, the needed information is the sum of this payment, the account, the password and the merchant account. As the order processing determines the start/finish of this norm, it becomes the latter’s trigger. Only if the order is valid will the customer apply the payment. And when the payment application is finished, an application form will be produced. Therefore, the pre-condition and post-condition are both clear. Finally, the detail norm can be written out with specified format, such as the words when, if, then and permitted.

Table 2. Norm Analysis: payment application

Payment application		N ₁
Responsible Agent	Customer	
Info. Identification	Sum of the payment, merchant information, personal account	
Trigger (Conditions Pre/Post)	Order processing	
	Valid order	Application form
Detailed Norm	When the customer decides to buy a commodity in Haier EC’s e-shop IF the order is completed by the customer THEN the customer Permitted to issue the payment application	

In table 3, another norm is presented. Due to the length limitation of the paper, the analysis process is omitted. Many norms can be brought together, which compose a longer and more detailed norm (Table 4). The norm represents the knowledge requirements engendered from business processes.

Table 3. Norm Analysis: payment evaluation

Payment evaluation		N₂
Responsible Agent	Bank	
Info.Identification	Account, password, balance, merchant account	
Trigger (Conditions Pre/Post)	Evaluate payment	
	Valid payment application	Balance decrease
Detailed Norm	When the customer provides a payment application IF the account information is correct and the balance is enough THEN the bank Obligated to complete this transfer	

When these knowledge requirements are compared with knowledge repository, knowledge gap will be found which is the driving of knowledge creation. Thus, from knowledge application to knowledge creation, “pull model” provides another solution to knowledge innovation.

Table 4. Norm analysis expression

<p>N₁ Payment application When the customer decides to buy a commodity in Haier EC's e-shop IF the order is completed by the customer THEN the customer Permitted to issue the payment application</p> <p>N₂ Payment evaluation When the customer provides a payment application IF the account information is correct and the balance is enough THEN the bank Obligated to complete this transfer </p>

4 Conclusions and future work

Business process-oriented knowledge innovation diagram aims to improve business process performance through knowledge innovation, especially making them more knowledge-intensive. When an organization has enough knowledge-intensive business processes, it will become more flexible and adaptive. The deliverables of this paper can be concluded in the following:

- (a) Propose the integration between knowledge innovation and business process, and argue that knowledge innovation must serve business processes;
- (b) Put forward process-oriented knowledge innovation diagram which consists of “push” model and “pull” model. These two models explain the diagram mainly from

resource-based view and market-oriented view, respectively. In the end, they form a knowledge innovation cycle;

(c) Introduce the method of Norm analysis into knowledge requirement analysis. This makes it easier to understand the knowledge requirements in business processes.

This paper gives a simple outline of process-oriented knowledge innovation diagram. The future work mainly covers the research of knowledge representation, role responsibility analysis, the ways of knowledge creation and knowledge application, and knowledge innovation measurement.

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