Research of Knowledge Supply Chain Coordination Mechanism based on the View of Fuzzy Demand

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Abstract

In Knowledge Supply Chain, The fuzzy uncertainty of knowledge requirement will expand gradually. It will have a huge impact on the quality and stability of knowledge dissemination in the transfer process of the supply chain, so does the product research-development and customer satisfaction . To address this question, a knowledge dissemination model is established in the paper, and the analysis of all aspects of the transfer process of knowledge in the supply chain in the view of fuzzy demand at the same time. Then analyze the effect that the subtle change of user demand on customer satisfaction, and how to improve to meet greatest degree of satisfaction of users and end with a case to simulate the model.

Keywords: *Supply chain; Knowledge dissemination ;Transfer coefficient; Satisfaction degree*

1. Introduction

With the efficient allocation of global resources, The resource value of knowledge is increasingly prominent, more and more enterprises are fully aware of the role of knowledge, and began to explore the method of acquiring knowledge in the organizational model. Under such circumstances, knowledge in the supply chain becomes increasingly important. The diversification of market and user needs, making the node enterprises in the supply chain can not be stable and accurate market demand, thereby it is difficult to clear the production of new product development, and thus lose their competitive advantage in the market. Therefore, the paper analyzes knowledge supply chain coordination mechanism and knowledge transfer efficiency and quality of knowledge supply chain under fuzzy demand based on building knowledge transfer model and simulating the above model in a case.

2. Knowledge supply chain model and knowledge dissemination model

Knowledge supply chain is built around the core business, through the control of information flow, logistics, capital flow from procurement of raw materials, intermediate products and final products. Then the sales network to deliver products to consumers .It is a network function chain structure that can make supplier, manufacturer, distributors, retailers, until the end-users as a whole. Knowledge supply chain is a kind of supply chain in where knowledge is transferred . knowledge is offered by other companies, individuals or research institutions to meet the knowledge requirement of core business in the development process. knowledge supply chain is a series structure of the knowledge transfer process. Therefore, a general knowledge supply chain model is established as shown in Fig.1.

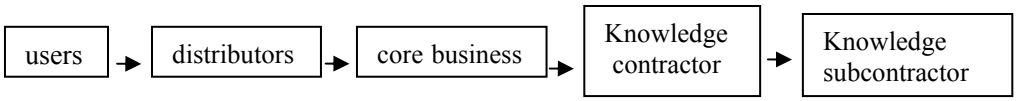

Fig.1 A general knowledge supply chain model

The most important problem of knowledge transfer process is uncertainty and diversity of the market demand. Knowledge transfer process begins with the survey of users' fuzzy demand, then expand the functional requirements, analyze each part to make sure which part the company can take in, identify knowledge gap, and find the right knowledge contractors to fill the knowledge gap. Knowledge contractor classifies knowledge gap, contracts to various knowledge sub-contractors. Knowledge dissemination model is shown in Fig.2.

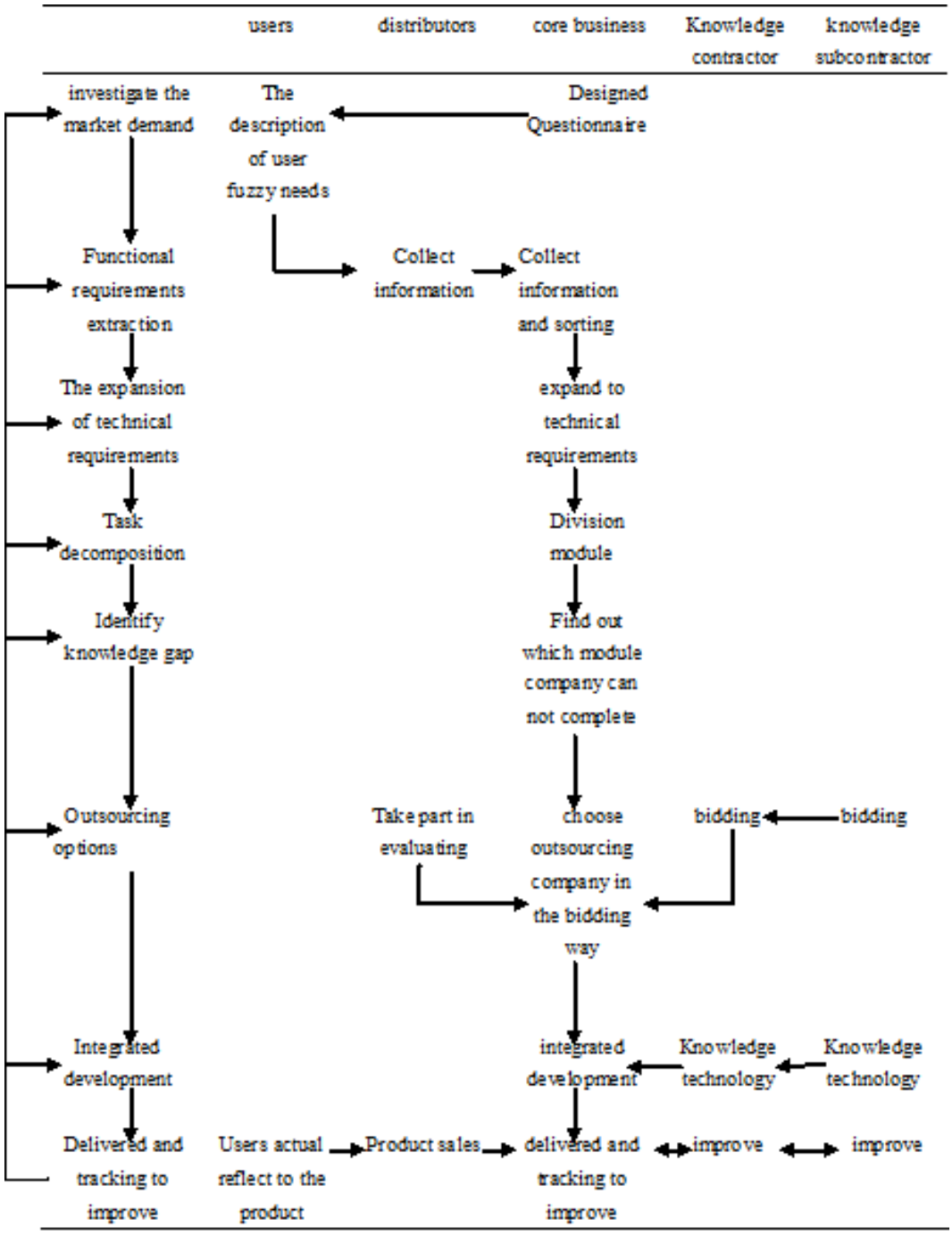

Fig.2 knowledge dissemination model

3. Quality analysis of knowledge dissemination in the transfer process

Knowledge transfer rate is not 100% in the above process, so you need to analyze the quality and efficiency of knowledge in each session. Extracted from a survey of market demand to functional requirements, the user only can give emotional awareness and product requirements. Technology needs to expand to the task decomposition and then to identify knowledge gaps, based on the technical categories of the technology which as a whole is classified as a knowledge module, and then find their own businesses do not have knowledge of these modules, this process is a data management process and therefore do not

consider the imperfection of knowledge transfer. Only to analyze the following aspects of knowledge dissemination.

We select a representative group of users when we finish a market survey, but the user needs information which can not fully reflect the expectations of the market by developing products, thus demand may not fully reflect or incomplete transfer. In order to express this incomplete transfer, we define a transfer coefficient θ（θ is the digital value between 0-1）。Assume that the real needs of the market (the real functional requirements of the custom, the form of a matrix) is R0，survey on user needs and functional requirements obtain after the extraction of functional requirements R，R=[r1,r2,…,rn] is the various functional requirements。

$$R = \theta R^0 \qquad (1)$$

Values of θ can be set based on the reputation of the history of products or the related types of products in the customers words and a reflection of the market .

Functional requirements and technical specifications is as one-to-one relationship, definition of technical indicators matrix A， A=[a1,a2,…,an]. where ai represents the various technical indicators.

Technical indicators correspond to R of the functional requirements，Each ai corresponds to ri. Satisfaction of the technical indicators for the functional requirements still failed to meet fully needs. We define a coefficient matrix B， B=[b1,b 2,…,b n] ， each coefficient bi represents the satisfaction of the corresponding technical specifications of functional requirements（bi take a number between 0-1）, Then define each functional requirement in the overall functional requirements of the weights as wi. Satisfaction of the technical indicators A and functional requirement B is as shown in the following formula.

$$(\sum_i b_i w_i)R \longrightarrow A \qquad (i = 1,2,...,n) \qquad (2)$$

bi can be determined by the internal professionals according to the enterprise technical capabilities, whether it can achieve the degree of customer requirements or not. The proportion of the customer's various functional requirements can be analyzed through the results of market surveys，wi thus can be determined.

When knowledge supplier is selected, there will be the supplier's stock of knowledge and business knowledge gaps can not be an exact match, only to select the matching degree of better suppliers of outsourcing. Knowledge gap of knowledge providers and enterprise is defined as α（α takes a number between 0-1）.The first level of knowledge suppliers part the knowledge gap of sub-block, And some technical module sub to the second level of knowledge suppliers, such a transfer process still exists at lower levels on a superior knowledge of demand satisfaction. Define coefficient αj is the meet degree ， αj represents j +1 level of supplier satisfaction of the knowledge needs of the j-tier suppliers. Integrated development is a process that all the knowledge come together and integrated into the product. In the actual production, due to the gap between theory and practice, there will be a more or less knowledge defeating part, In this process, due to the complexity of the impact of human factors and the level of knowledge, there will be a value-added knowledge value, therefore define a knowledge-loss coefficient β and the value added coefficient γ to represent the knowledge loss and the ratio of value added. In summary, the final knowledge transfer model presents as follows:

$$\omega = \theta \sum_i b_i w_i \left[(1-\varepsilon) + \alpha\varepsilon \prod_j \alpha_j \right] (1-\beta)(1+\gamma) \qquad (3)$$

ω is the overall level of satisfaction；ε is the ratio of the knowledge gaps in the knowledge needs；Subtle changes from the customer needs to the final product gradually enlarge in a knowledge transfer process, this paper analyzes the impact on the follow-up aspects of the entire supply chain, when a variety of causes of users' needs change. The determination of each coefficient can be reflected in the next case.

3 .Case analysis

Through the market survey and mobile phone market circulation of situation, the demand can be divided into the following categories: much and stable function，easy to carry ， big screen ， more audio and video format support ， good-looking and so on .Market survey information is the fuzzy demand of customer, can only represent development direction of mobile phone roughly. So classfying customers' fuzzy demand into several categories.

R=[more Functions ， all kinds of software to use stability ， long standby time, high pixels ， s upport localization，support for a variety of languages，good-looking ， touch screen is large and small radiation ， wireless network ， cheaper prices].According to the mobile phone market and existing types, mobile phone reflects the historical information. We define θ=0.95. Then

A=[Systems and capacity requirements, operating environment stability, power and battery capacity, camera photos and video resolution, positioning, language version, size and color, screen, wireless network, low cost].R & D technical staff assess the coefficient, and the various technical indicators meet the functional requirements according to their own skill level and survey information of users' fuzzy demand. The company's R&D and technical staff take part in assessment. Each participant give a coefficient, then calculate the efficient in weighted scoring method. We can get the various functional requirements of the functional requirements of R in the proportion of the overall functional requirements by survey information.

$$B=[b_1,b_2,...,b_n]$$
$$=[0.95,0.90,0.8,1,1,1,0.8,0.85,1,0.7]$$
$$W=[w_1,w_2,...,w_n]$$
$$=[0.3,0.3,0.1,0.05,0.03,0.02,0.04,0.1,0.04,0.02]$$

Satisfaction of the technical indicators A is 0.906. The task decomposition divide the technology needs into three modules, the demand modules of software technology and hardware technology needs module and system demand module.Demand module of software technology includes photography, positioning, wireless networks and system software； Hardware technology needs include battery power, mobile phone shell, display, and front and rear camera .As shown in Table 1.Through the analysis of the stock of knowledge of company, we find knowledge gap is Phone system technology and Battery power, Phone shell and camera hardware technology. The proportion of the knowledge gaps in the knowledge needs ε=0.405. Company announced their demand for knowledge and selected the two suppliers by the way of bidding. Considering the expectations of users on the product features and price affordability, company decided to contract to the fiist suppliers.

Detailed assessment of specific skills and knowledge the supplier provided, the company's IT department define knowledge gap matching α， α=0.9Supplier classified contracted module, and contracted out to second-level knowledge of suppliers. The Satisfaction of The second level of knowledge suppliers to meet the knowledge needs of the first level of knowledge suppliersα1=1. When technical knowledge of knowledge suppliers at all levels reaches the company, based on knowledge of defeating part , the company's technical staffs decide the knowledge of the loss coefficientβ=0.16 After the company received knowledge providers' system technical knowledge and integrated into their knowledge, they write a new program and develop a new mobile phone system, this phone system is relatively high-end and can not be copied on the mobile phone market. It is the value appreciation process,through the evaluation system in all aspects of the features, the company technical personnel give a value coefficient γ=0.3 According to the model presented above, we are able to calculate the overall satisfaction ω =0.9170452.

Table 1 Expand technology on demand and modules classification

functional requirements R	technical indicators A	technology needs modules
more functions	Systems and capacity requirements	system technology
All kinds of software to use stability	operating environment stability	System technology software technology
long standby time	power and battery capacity	Hardware technology
high pixels	camera photos and video resolution	Software and hardware technology
Support localization	positioning	Software technology
Support for a variety of languages	language version	Software technology
good-looking	size and color	hardware technology
touch screen is large and small radiation	screen	hardware technology
wireless network	wireless network	Software technology
cheaper prices	low cost	

Production are put on the market after information of the users' experience is produces and collected, then we find out whether the product's features satisfy the users. At the same time we put forward a number of related improvements to make the interface of the mobile phone more beautiful and smooth and the size more in line with the size of the hand. In this way, the phones change more convenient.The company find the aspects need to be changed according to the suggestion provided by the users and transfer the knowledge needs to the supplier. The supplier consult with the next level of suppliers in the light of corporate knowledge needs and improve them. Suppliers recombine and classify the technical knowledge. Finally, the degree of knowledge gap matching α increase to 0.98. The overall level of satisfaction ω is 1.0743812.

We put the production on the market after improvement and the productions get a wide range of praise from users. At the same time, sales also increased significantly. As the data reflect that the higher the ω the higher the value and the greater the level of customers' satisfaction, then the enterprise can survive in competition of the market. The rapid response to the market and the timeliness of the

adjustment of the supply chain strategy are also significant reasons why the products occupy a certain status in the market.

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