



Research of Quality Improvement and Quality

Innovation Based on Knowledge Fermenting Model

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Abstract

Quality improvement and quality innovation are the important approach to enhance competitive force for enterprises. Quality improvement is a process of knowledge innovation in nature which must be actualized by organizational learning. This article starts from the relations among quality improvement, quality innovation and the ability of organizational learning, analyzes the knowledge moving rule in the interior process of quality improvement and innovation and expatiates on the creation, development and diffusion mechanisms of quality knowledge in the quality flow based on the knowledge fermenting theory of organizational learning. Furthermore, taking the quality control (QC) group as an example, this article analyzes the behaviors and functions of nuclear factors such as quality knowledge sourdough, quality knowledge matrix and quality knowledge enzyme in the process of quality knowledge fermenting, and these nuclear factors function mutually in the quality knowledge fermenting bar. This article also puts forward five types of quality knowledge fermentation and analyzes their characters respectively, points out the implementation of knowledge fermentation possesses meanings to enhance the level of quality improvement and quality innovation for enterprises.

Keywords: Quality innovation, Quality improvement, Knowledge fermenting, Organizational learning

1. Introduction

With the globalization of economy, quality information increases explosively and quality innovation emerges in endlessly. More innovations in modern large-size enterprises are from the intersection and integration of multiple knowledge and mutual endeavors of organizational members, which can not be provided by individual's ability, but needs the innovative abilities of organization ore colony, i.e. the ability of organizational learning. As viewed from this meaning, the quality improvement and quality innovation of enterprise are the process of knowledge innovation in essential. The ability of knowledge innovation is decided by the organizational learning ability, so to realize continual quality improvement and innovation of enterprises through organizational learning has become the important task in the domain of quality management and knowledge management.

Under this background, in this article we analyze the knowledge attributes in the process of quality improvement and quality innovation and study the mechanism of creation, development and diffusion of quality knowledge in the quality flow. Taking QC group as an example, we also research the types (including assimilation fermentation, adaptive fermentation, encounter fermentation, evolution fermentation and reforger fermentation) and characters of quality knowledge fermentation and point out the meanings of the implementation of knowledge fermentation for enhancing the level of enterprise quality improvement and quality innovation.

2. Relations among quality improvement, quality innovation and organizational learning

In fact, for the relation of quality and organizational learning, quality management master Deming had sparkplugged that it is a learning cycle through changing the step "check" in the cycle of PDCA (plan, do, check, act) put forward by him to "study" as early as in 1986. Another quality expert Juran emphasized that "TQM is a sort of learning movement which makes people want to study and development". Japanese quality master Ishikawa put forward the usage of quality cycle in the process of improving performance. The base of quality cycle is based on the following principles: unconstraint, self development, everyone participation, mutual development and durative. To work together for the team must base on the freewill sharing of durative latent knowledge. Ron Dvir analyzed the futures of quality management team and knowledge management, made these two aspects to affiliate, and proved that both sides had mutual stimulative relation from demonstration and reasoning again.

Quality management is correlative with knowledge management and organizational learning, which can be seen from the definitions of organizational learning and quality management. The organizational learning is defined as the process of enhancing improvement through better cognitions, which is very similar with the target and process of quality improvement. Another definition of organizational learning is the process of checkout and correction. Though these relations exist

between organizational learning and quality management, but there are few researches for the integration of them. Maric C., Ferguson Amores et al put forward the hypothesis that complete quality management and learning organization not only can not be dissevered, but also can complemented each other, compared both characters through literature summarization and case analysis, and validated in which aspects they can complemented each other. QC group is an important organizational conformation in quality management, some scholars has realized the importance of organizational learning in QC group. Qu, Kunru pointed out the creation and development of QC group was a process syncretizing western and eastern cultures and continually implementing quality management and knowledge innovation, and to follow this process self-consciously must promote the knowledge innovation of enterprise. Liuyu used MIT professor Peter M. Senge's five strategies to discuss establishing innovative QC group and making it possess the ability keeping innovation from five aspects such as fostering innovative character, activating innovative motivation, building innovative team, inspiring creativity of colony and training innovative thinking. Long, Yuzhen pointed out that the establishment of learning team can fully promote the sustainable developments of QC group, and discussed how learning organization utilizes the sustainable innovation, high efficient operation and efficient communication of QC group from the characters of learning team. With regard to learning methods, Liu, Zhaoyan deeply analyzed the application of learning organization in quality management from two aspects including "single-loop learning, double-loop learning" and "study how to study, study map" on the 1st Proseminar of Learning Organizational theory leading and Application Tendency.

From above researches, we can see that foreign and domestic academe and enterprise industry have begun to attempt affiliating quality management with organizational learning. However the results are limited. Though they emphasized the important functions of organizational learning in quality management, but there are few systematic researches how relative theories of organizational learning improve the development of quality management. The domain of quality management has not definitely and self-consciously adopted the theory view of organizational learning to study quality management, which is first embodied in that the present popular quality standard system has not taken organizational learning as the golden rules and method of quality management, and in practice large numbers of quality operators also lack the concept of organizational learning. Under this situation, the principle of organizational management contained in the standard and frame of quality management can not be easily and truly understood and implemented.

To explain the mechanism of the creation, development and diffusion of quality knowledge in quality flow by means of introducing knowledge fermenting model also offers clear approach for quality improvement and quality innovation.

3. Knowledge fermenting model of organizational learning

- (1) The development of organizational knowledge is always from a sort of "initial knowledge" which is also called knowledge sourdough.
- (2) The development of knowledge depends on "knowledge matrix" with definite quality. The knowledge matrix includes three aspects. The first one is active (reactive) knowledge, i.e. people who participate in the process of the research from knowledge innovation to knowledge fermentation. They can continually complement knowledge "nutrient" to initial knowledge through mutual communication. The second one is the passive knowledge which includes knowledge and information such as file, data and audio-video data obtained from various channels. This knowledge needs be selected and exerted by people, and it also can offer knowledge "nutrient" for knowledge fermentation. The third one is the knowledge enzyme, which can assimilate knowledge boundaries, promote knowledge integration, evolvement and communication.
- (3) The knowledge fermenting bar is a place which can implement knowledge "colony affinity". In knowledge fermenting bar, under the "nourishing" of knowledge matrix and materials of knowledge and information, the initial knowledge can obtain developments and multiplying through the catalysis of knowledge enzyme.
- (4) The environment means rich and colorful objective phenomena and things. It can offer various resources of knowledge, information and intelligence including various contradictions people face and practical checkup standards of knowledge. The intelligence resource and knowledge information resources are obtained from environment.
- (5) Knowledge and information tools (such as IT and communication technology) help people to acquire various knowledge in initial knowledge and knowledge matrix.
- (6) The results of knowledge fermentation are continual increase of organizational knowledge. The level of knowledge environment and knowledge technology will influence the efficiency and effects of knowledge fermentation.

4. Analysis of quality improvement and quality innovation based on knowledge fermenting model

From the knowledge fermenting model, we can see that the knowledge fermentation mainly emphasizes several factors influencing knowledge increase such as "knowledge sourdough", "knowledge matrix", "knowledge enzyme in knowledge matrix" and "knowledge fermenting bar". Taking QC group as an example, we will expatiate on the functions of QC group in organizational learning.

4.1 Quality knowledge sourdough

How enterprises put forward exact requirement of quality improvement and quality innovation is the start that quality improvement and quality innovation can be created, and the process to find out this requirement can be called the process to find out knowledge sourdough. To timely and efficiently find this quality knowledge sourdough is the sign whether QC

group possesses thinking energy. Traditional QC group usually has fixed members who apply themselves to find problems in work and solve them together. If QC group can not systemically try to find new quality originalities and quality targets, it will induce disappearance of new ideas and new thinking methods, and finally go to deathly stillness. Therefore, in the developmental process, QC group should solve the problem of the origin and creation of “quality knowledge sourdough”, which include continual update of knowledge body, mechanism that new people participate and opening work methods. There are several channels can help QC group obtain quality knowledge sourdough.

- (1) Problem sourdough. It means the problems occurring in the movement of organizational quality management.
- (2) Standard sourdough. It means the quality management methods in excellent organizations.
- (3) Exterior brain sourdough. It means the diagnoses that quality experts or exterior quality auditor made to organizational quality management.
- (4) Inspiration sourdough. It means new ideas and new originalities in the movement of organizational quality management.

These quality knowledge sourdoughs are not produced without foundations, which are closely relative with organizational movements. The evocators of quality knowledge sourdough mainly include organizing routine quality movements, the quality movement evocated by special problems and the quality movement taking development as its aim. To organize routine quality movement means the originalities produced because of factors such as organizing quality management system, working habits, and seasonal knowledge convening process, such as seasonal quality group movement, quality meeting and so on. The quality movement evocated by special problems is that the organization adopts actions to solve certain quality problems, for example, the organization solves the quality problem produced by consumer’s opinions. The quality movement taking development as its aim is that the organization implements quality movement in order to further enhance quality, such as pursuing 6 σ , realizing zero deficiency and so on. Except for above evocators, all supplier, consumer, competitor, cooperator of the organization are the indirect factors to evocate quality knowledge sourdough. The organization should establish proper quality development strategy to create better environment for the creation of quality knowledge sourdough.

4.2 Identification and improvement of quality knowledge matrix

Aiming at the tasks or requirements of quality improvement, how can QC group realize the object of quality innovation? Obviously, random constituent QC group unnecessarily possesses the innovative ability. The buildup of QC group is the key of quality innovation. The concept of knowledge body is to put forward a sort of specific guideline and require group members’ knowledge composing and learning ability can fulfill the requirements to capture quality difficulty. In the process of solving problems, traditional QC group doesn’t consider whether group members possess the ability to solving problems, which restricts the functions of QC group. Therefore, QC group can improve the matrix of quality knowledge through many methods such as training, expert guidance and opening composing mechanism.

The matrix of quality knowledge includes active quality knowledge matrix, passive quality knowledge matrix and quality knowledge enzyme (because of the importance of quality knowledge enzyme, we will discuss it alone). The active quality knowledge matrix mainly means experts, scholars and personnel with quality knowledge in the organization, and they actively participate in quality improvement and quality innovation, communicate each other and continually complement and perfect initial knowledge by means of their own quality knowledge. The passive quality knowledge matrix mainly means the technical materials and experiment facilities about quality management in the organization. Quality knowledge matrix is the main body of quality knowledge fermentation which can directly influence the effects of quality knowledge fermentation. Therefore, the organization should try to improve quality knowledge matrix, and enhance efficiency and effects of quality knowledge fermentation. The improvement of active quality knowledge matrix can adopt many methods such as quality training, quality knowledge communication, talk and discussion, quality management consultation, and the introduction of quality talents. The improvement of passive quality knowledge matrix can be actualized by establishing quality knowledge repository.

4.3 Quality knowledge enzyme

Though having experts with different professional knowledge backgrounds and from different departments, but how to cooperate is another key to complete quality innovation aim for QC group. As learning QC group, it must need flat organizational structure which can be full of democratic spirits, fully mobilize everyone’s enthusiasm, so we can consider developing people with authority, ability, objectivity and backgrounds of management and psychology as the cadreman of organizational learning who can exert functions of elicitation, inducement and promoting to realize quality innovation. From past abortive lessons of QC group, some enterprises only externally studied other successful QC group, and they didn’t mobilize QC members’ enthusiasm and creativity, so QC group was only stay on the form.

In organizational learning, the factor which has functions of organization, agency, harmony, communication and promoting is called knowledge enzyme. To promote quality knowledge fermentation, the organization should especially emphasize the cooperation and catalysis of quality managers, because the quality managers are the constitutor and executor of quality system and quality culture, the organizer of organizational quality movement and they can connect quality knowledge and their carriers in different spaces and different sorts, so the quality managers are the main form of quality learning (knowledge)

enzyme who have functions of agency and bridge. Outstanding quality managers in enterprise are the key to acquire successes for quality innovation. When many enterprises implement standards such as ISO9000 or HSE, they usually adopt outsourcing to solve the establishment problem of quality system, which is the classic example to enhance quality level through enhancing learning enzyme. The quality managers of the organization should realize their core function in catalyzing quality improvement and quality innovation, and promote quality innovation of enterprise through enhancing their own “livingness”. Their functions include layout of quality strategy (long term layout, middle term layout, short term layout), organizing movements of quality knowledge value chain (quality knowledge acquiring, quality knowledge sharing, quality knowledge innovation, quality knowledge protection, quality knowledge application), establishing quality system and rules and supervising implementation, proper promoting (promoting rules, locale promoting), evaluation and improvement, and quality culture construction (such as cultures making for quality knowledge sharing and innovation).

4.4 Quality knowledge fermenting bar

The quality knowledge fermenting bar means the place or mechanism that various factors in or out organization are gathered to implement “colony affinity” of quality knowledge. Except for personnel and knowledge, out of question, QC group also needs the support of material conditions such as flat organizational structure making for communication, base establishment and environment convenient for team communication, democratic decision-making mechanism, resource distribution, leaders’ support and emphasis. The gathering of these resources offers the place and opportunity to communicate for group members. Under different conditions, knowledge fermenting members have different aims and gatherings and form different fermenting forms.

(1) Assimilation fermentation. In the process when QC group extends experience and knowledge, the knowledge receivers need combine exterior experiences with their original knowledge and experience, chew and understand knowledge and achieve right operation to knowledge, which is assimilation fermentation. The introduction of learning organization and large numbers of relative researches fully indicate the important function of assimilation fermentation.

(2) Adaptive fermentation. QC group cannot simply and mechanically apply quality management experiences of other enterprises. It must establish an implementation standard combining the principle of quality management system and the practice of enterprise to realize the increase function of ISO9000 for enterprise. When knowledge is used in practice and the application object of knowledge changes, the adaptive evolutions are usually needed and take effect, which indicates the knowledge fermenting function has high adaptability.

(3) Encounter fermentation. QC group centralizes experts’ (supplier and consumer) knowledge of many subjects in the interior or exterior of enterprise to dig tackling tasks or problems faced by enterprise and produce new plan, new method and new knowledge, which is encounter fermentation. The encounter fermentation includes assimilation fermentation and adaptive fermentation.

(4) Evolvement fermentation. Just as sourdoughs will selecting the superior and eliminating the inferior with the change of environment, knowledge is evolving continually, and people can not isolate us on the experiences, technology and methods that we have already had for ever. If the implementation of ISO9000 is a sort of adaptive fermentation, so the update of ISO9000 such as from edition 94 to edition 2000 is a sort of process of evolvement fermentation.

(5) Reforger fermentation. The fermenting process can produce bran-new species and matters. Some essential innovations of QC group are also a sort of result of knowledge fermentation, for example, the introduction of ISO9000 belongs to innovative fermentation, though before it is introduced, the practice and theory researches has acquired quiet great developments about the establishment of quality system, but as a sort of new management technology and authentication system, its establishment realizes qualitative flight.

Table 1 is the character comparison of traditional QC group and the QC group with organizational learning, and it embodies the function of organizational learning to QC group. From analysis in the table we can see that the QC group after organizational learning has stronger innovative ability and is fitter for the competition with rapid changes.

5. Conclusions

Starting from the development rule of quality management, in this article we demonstrate the theory that the further development of quality management needs deep research of organizational learning. Based on past researches on the relation of quality management and organizational learning, we point out these researches were still staying on the stage emphasizing the importance of organizational learning to quality management. This article introduces the convening-fermenting model of organizational learning into quality management, takes QC group as an example, detailedly analyzes the existence forms of quality knowledge sourdough, quality knowledge matrix, quality knowledge enzyme and quality knowledge fermenting bar and their function mechanism to quality management, compares the character differences between traditional QC group and the QC group with organizational learning, offers references for further development of quality management.

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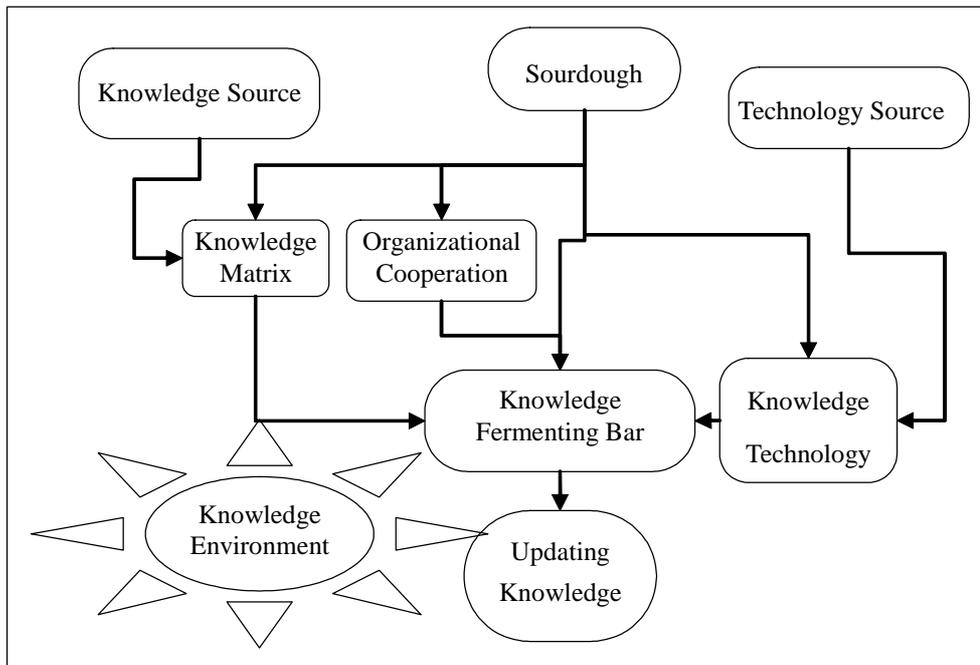


Figure 1. Knowledge Fermenting Model

Table 1. Characteristic comparison between traditional QC group and QC group with organizational learning

System	Subsystem	Traditional QC group	QC group with organizational learning
Time	Existent time	Middle/ Long term	Long term
Culture	Aim	Problem oriented	Ability oriented
	Value view	Development of enterprise	Mutual development of personnel and enterprise
	Will	Quality oriented	Extensive, not only limited in quality domain
Sourdough	Source	Mainly inner	Introducing new exterior ideas often
Knowledge matrix	Maturity	uncertainty	Maturity
	Knowledge needed	Professional quality knowledge	Comprehensive knowledge
Knowledge enzyme	Action mode	authoritative	Cooperative and communicational
	Mode of organizational cooperation	Organic, professional	Organic, incompact (based on mutual trust)
Knowledge bar	Boundary	Yes	No
	Learning method	Single-loop learning	Double-loop learning
	Layer	Static, more efficient on the operation layer	Dynamic, more efficient on the strategic and tactic layers
Ability	Quality guarantee ability	High	High