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Knowledge Conversion in Teamwork with usage of Quality Tools

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Keywords: knowledge management, quality management, quality tools, teamwork

Category: conceptual paper

1. Introduction

Knowledge is perceived as a source of competitive advantage of enterprises next to their material and financial resources. It is of particular importance in Quality Management since it allows recognizing inconsistencies in processes, prevents creation of faults and improves organization. Ineffectiveness of taken actions leads to problem formulation and the need to fill in the gaps of knowledge in the area of "what we know about the processes". This way, one may observe a transfer of actions from the executive area to the area of information and decision processes, including knowledge processing [3].

2. Quality Management vs. Knowledge Management

Finding analogy, between the concept of quality management and currently developing branches in the activity of enterprises, allows, in a completely new way, to look at the role and place of quality tools. An example of such a relation is the relation of quality management and knowledge management. Quality management, in its most developed form, emphasizes the balance usage of all the resources of a given enterprise – including those immaterial ones, defined as knowledge. In turn, one of the directions of the development of knowledge management is to work out such methods and techniques that would enable its efficient usage in an enterprise. This way, both these directions complement each other, becoming a characteristic element of enterprises based on knowledge.

Knowledge may be defined as an ordered, possessing inner structure, and coherent set of information, concerning particular branch, issue or a chosen part of reality. The above

stated definition describes explicit knowledge, expressed in formal language, which can easily undergo the process of knowledge management in an enterprise. This kind of knowledge can be easily localized, gained, disseminated, used and preserved. Formalized knowledge, included in documentation, available in the outer computer net of many companies (such as: constructional, technological, and of quality management system etc.) and in computer data bases of CAQ systems, can be divided into [1]:

- know – why knowledge which reflects accepted assumptions of company's actions (included, for example, in the established and accepted policy of company's quality);
- know - what knowledge – declaration knowledge, concerning products, process parameters, products descriptions, informing about input and output of processes;
- know - how knowledge – procedure knowledge, included mainly in procedures, instructions, technological cards – informing how to carry out processes;
- know – who knowledge – understood as a clear structure of competence, tasks, responsibilities and abilities – enabling description of knowledge "owners" and its range.

Background to the interpretation of available, in the information system, information is the production process (its arbitrary part). If the knowledge about processes is not sufficient, one should reach for advanced technologies (expert systems, decision aid system, etc.). However, they are not always good instruments in order to solve problems (e.g. they can only be used in narrow areas). In companies' practice, there is one more important source of knowledge –its workers.

All the employees possess so-called tacit knowledge. It is a personal (individual) knowledge, which consists of personal beliefs, a set of principles of an individual, intuition, feeling and attitude, usually having their roots in practice. Because of this reason, human being plays a double role in an enterprise, e.g. a "supplier" of knowledge and its usage. It is, so called, personal knowledge – having its roots in practice and being inaccessible for the rest of employees until it can be shared during problem solving in teamwork. Intuitional knowledge is a valuable complement of theoretical knowledge, practical skills and inter-personal abilities, necessary to work in a team.

3. Working together

In modern organizations, individual work model is given up in favor of teamwork. A carrier of teamwork is the team of workers. Teams are being given more and more important tasks and ventures. The idea of giving up individual work is based on the assumption that good team can reach goals which are not possible to achieve in the case of an individual person. A team which can share its duties, and which workers strictly cooperate with one another, after a time, works out so-called group behavior. It means it possesses characteristic skills, which none of its members has while working individually. Thus, a team can reach aims which are not possible to gain by employees while working separately. It means that it uses knowledge and specific abilities which none of the employees reveals when working individually (synergy effect).

However, such a team must possess several features [2]. First of all, each team must set a common aim to achieve, a challenge for the whole group. Aims should be precise, measurable, ambitious, concrete and with a deadline. So clearly stated aim can be easily transformed into tasks, and these can be assigned particular dates of implementation.

Common aim stimulates team members to common action. Second of all, in each team, the method of work, accepted by all its members, should be established; so participation in meetings, discussions or work schedule etc. Teams must work out common approach towards conducted tasks themselves. All aspects: economic, social and administrative should be taken into consideration since contribution of each worker must be comparable. Creating common approach towards action means specifying individual tasks, assigning them, according to the abilities, and verifying them by analyzing work results. In so-called "effective teams", there are always employees who take social and leading roles, which are particularly helpful in the case of trust and solving conflicts. Moreover, each of the members takes different roles, depending on the situation. Due to this fact, unique motivational and mutual support processes are created, which ensure that the focus is thrown into reaching the main aim. Another feature of teamwork is the fact that workers must possess complementary skills:

- specialist; better effectiveness will be gained by a team of specialists of different branches,
- abilities of solving problems and making decisions; teams must be able to notice appearing problems and possibilities, evaluate various ways of conduct, and undertake decisions concerning further actions,
- interpersonal abilities; so having inclination towards risk taking, ability to constructive criticism and active listening, objectivity, expressing justified doubts, providing support and accepting affairs and achievements of others.

The number of members in a team is also of great importance. In the case of too many members, there are often communicational problems. Reaching an agreement in such cases like, for example, rules of work, becomes much more difficult. Smaller groups, aiming at the creation and implementation of a common plan, and maintaining team responsibility for the results, a more likely to achieve success in overcoming individual, functional and hierarchical differences. Big groups have to cope with logistics problems, like finding appropriate time and place for a meeting.

In a team, there is so-called "collective responsibility" for the work, faults/mistakes, and not keeping the deadlines etc. The whole team always takes the consequences, even if only just one person has failed. None group will be ever able to become a team unless it learns how to handle common responsibility. It consist in making honest promises, fulfilling of which requires mutual involvement and trust. Taking common responsibility equals the ability to express one's own opinion concerning each aspect of teamwork and the possibility of gaining constructive criticism. Common responsibility cultivates, or even improves, trust, on which teamwork is based.

4. Knowledge conversion in teamwork with quality tools

Depending on the direction of tacit and accessible knowledge processing, four ways of knowledge conversion can be distinguished [4]:

- socialization – transformation of tacit knowledge into tacit knowledge, e.g. due to observation, imitation, and practice;
- externalization – transformation of tacit knowledge into accessible, e.g. due to dialogue;

- combination – transformation of accessible knowledge into accessible in the processes of information conversion;
- internalization – transformation of accessible knowledge into tacit, e.g. as a result of learning due to common action.

Conversion of tacit knowledge into accessible, in knowledge management, is called as organizational knowledge creation (development). The model of knowledge creation/development was invented by Nonaka. Several constant elements can be listed in this process [4]:

- dissemination of tacit knowledge – development of personal interaction spheres due to which common way of thinking is created,
- looking for ideas – dialogue and common reflection; due to it, the concept of solution appears,
- idea confirmation – idea analysis and checking of authenticity, according to accepted criteria and verification of accepted solutions,
- model creation – study of prototype or action scheme, in production enterprises, this phase corresponds with the creation of product's prototype,
- leveling of knowledge – distribution of new knowledge, worked out in previous phases of creation in an enterprise and its surrounding, and activation of new process of knowledge creation.

Each of the phases of knowledge creation, in an organization, is inseparably connected with teamwork. Without mutual interactions between the members of the organization – creation would be impossible. At each step of the model, one can observe how important in knowledge management teamwork is. Phase one – **dissemination of tacit knowledge** – consists in sharing experience of an individual with other members of the organization. As it was previously mentioned, tacit knowledge is hard to communicate and express in words. So in order to disseminate it in an organization – common ground of communication between particular units, mutual trust, and analogical way of thinking, is needed. "The contact zone" therefore is needed, where units can have a direct contact with one another. Second phase – **searching for ideas**, consists in dialogue and common reflection, as a result of which, a new concept or solution of a problem is created. Disseminated mental model is verbalized due to words and sentences, and finally becomes a clear concept. Third phase – **idea confirmation**. Since knowledge, according to I. Nonaka and H. Takeuchi, is a confirmed belief, the created ideas of the former phase must be verified, following previously accepted criteria. An organization must undertake such a verification of ideas in order to ensure itself if the new idea or solution of a problem is favorable for the organization. Defining criteria, according to which the idea will be evaluated, is absolutely necessary. Fourth phase – **creation of model** – the chosen and accepted solution gains its material form, becomes a model. In production enterprises, this phase corresponds with the creation of a product's prototype. In this phase, teamwork appears again, since in order to create models, workers of different specialties and experts of various branches must be gathered together. Their task is, for example, to prepare documentation and construction (in the natural scale) of a new idea. The fifth phase – **levelling of knowledge**. It deals with dissemination of newly created knowledge, both in the organization and outside it (in its surrounding). A new spiral of knowledge is started since the process of organizational creation of knowledge never ends.

Conducting according to the described model indicates usefulness in the case of teamwork organization, in a number of quality tools [5] (table 1). It is mostly about organizational techniques, which can be described as innovative, directed into generation and management of ideas, concepts or information, and also problem solving. In this context, the usefulness of quantity tools, which serve for gathering and transforming data (connected with various aspects of quality), and are used in an individual work, seems to be of less importance.

Table 1. Place of quality instruments in knowledge creation/development (reference: self-work)

Stages of knowledge creation (development) in teamwork		*Quality instruments*	*Type of knowledge conversion*
1. Dissemination of tacit knowledge	1.1. Creation of ideas/concepts of solutions	1.1.1. Brainstorming	Externalization
		1.1.2. Quick Think Method	
		1.1.3. Discussion 66	
		1.1.4. Brainwriting	
		1.1.5. Metaplan	
		1.1.6. “Basket of ideas”	
		1.1.7. Morphological techniques	
	1.2. Ordering of solution concepts and ideas	1.2.1. Ishikawa diagram	Combination
		1.2.2. Affinity diagram	
	1.3. Description of relations	1.3.1. Relationship diagram	
		1.3.2. Matrix diagram	
2. Confirmation of solution idea/concept	2.1. Evaluation of ideas/concepts of solution	2.1.1. Force field analysis	Internalization
		2.1.2. Comparative sheet	
		2.1.3. SWOT method	
		2.1.4. „Object crushing”	
	2.2. Choice of solution idea/concept	2.2.1. ABCD method (Suzuki method)	
		2.2.2. TGN	
		2.2.3. Multivoting	
		2.2.4. Criteria importance sheet	
		2.2.5. Chessboard of criteria	
3. Creation of solution model	3.1. Specification of solution idea/concept	3.1.1. Diagram of sytematics	Externalization
		3.1.2. PDPC diagram	
4. Dissemination of knowledge	4.1. Visualization of solutions	4.1.1. Flowchart	Combination
		4.1.2. Arrow diagram	

Organization of teamwork is especially conductive to externalization of knowledge (table 1). It is a transformation process of tacit knowledge of workers, participating in teamwork, into accessible knowledge. “Revealing” of tacit knowledge can be performed due to quality tools, enabling generation of ideas, concepts and solutions. Internalization of new knowledge by team members - enables putting the concepts in order and pointing out their interrelations. This process is partially correspondent with combination which is a transformation of available knowledge into different, useful form. Instruments used in this phase of knowledge creation are diagrams, having ordering functions. During teamwork, part of knowledge, after its distribution, becomes a source of teaching for the team members (internalization). Acquired new knowledge is used in the evaluation process and choice of suggested solutions and concepts. Helping instruments, in this phase of work, are techniques, used for critical evaluation of the project, and voting techniques. The phase of concept’s details analysis is a return to the “revealing” process of team members’ knowledge. And instruments of its realization are techniques enabling detailed analysis of solutions (e.g. tree diagram, PCDC diagram). Knowledge distribution, in form of visualization of solutions, is enabled thanks to modeling techniques, including graphic modeling (e.g. flow chart, arrow diagram). Processes of knowledge conversion during teamwork, supported by quality instruments, are carried out together with the process of knowledge socialization, due to continuous observation, imitation and practice.

5. Summary

The presented model and examples of knowledge creation and development (using instruments of quality management) constitute a picture of knowledge processing in an enterprise on the level of an individual worker and teams. In order to use the effects in dispatched organization knowledge base, another process of knowledge management, e.g. knowledge integration, must take place. It is necessary to activate, here, mechanisms enabling transformation of team knowledge into organization knowledge that would be available to individual workers once more.

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