The importance of incentive systems to knowledge sharing in manufacturing environment

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Abstract: The aim of this paper is to demonstrate the importance of interaction between Knowledge Management (KM) processes and other measures in order to support competitive advantages resulting from business flexibility, knowledge accumulation and capability to innovate. The automotive sector has been chosen as an example of how knowledge is created and shared. The paper demonstrates necessity to blend proper tools, balanced incentive systems and strong leadership in order to support knowledge sharing in production plants.

Keywords: knowledge management, incentives system, knowledge sharing, automotive

1 Introduction

Although there has been evidence of large use of KM practices and processes, with around approximately 80% use among large corporations (KPMG, 2000), there has not been clear analysis of success factors that would lead to effective implementation of KM tools and processes. With respect to variety of individual organizational needs as well as critical importance of knowledge for cmpetitiveness, the implementation of knowledge management is very complex, therefore, it deserves more attention related to success validation.

The aim of this paper is to discuss the importance of incentive systems to knowledge sharing within manufacturing environment. Included case study demonstrates possibilities for integrated incentive systems and tools fostering open communication and sharing of knowledge in order to shorten product cycles, increase organizational performance, satisfy the customer and achieve quicker returns.

2 Critical dimensions for knowledge management implementation

Many researchers have attempted to define a few critical success factors that would allow for better success validation of knowledge management functions within companies. Helm, Meckl, and Sodeik (2007) being some of them, have examined 39 studies focusing on success factors of knowledge management. While discovering broad ways of knowledge management interpretation, they realized that factors that seemed to be critical can be aggregated into three main areas: human beings, organization and technology. These three dimensions seemed to not only be strong influencers of organizations but also be significantly tied to each other (interdependent).

The figure below summarizes identified success factors that have been aggregated into three main dimensions. *Human being* dimension presents set of prerequisites, which include authority scope (leadership, financial support, soft skills, motivation, etc). *Organization* dimension covers aspects resulting from organization and its structure or framework, such as training mechanisms, establishment of knowledge management goals, , communication channels, time management allocated to knowledge management processes, roles and responsibilities of managers and space for networking and knowledge sharing. Last, dimension *Technology* takes into account technological support systems important for application of knowledge management within companies. It is necessary that these support systems are not only integrated within existing IT infrastructure but also that they are used, thus require user friendly interfaces understandable and easy to use and maintain as well as clearly defined.

Potential Success Factor	Description
Dimension Human Being	
Top management	The Top management is the initiator, sponsor and promoter of KM. It provides enough financial resources and time.
Personality	Emotional barriers must be taken away to secure the success of KM. The staff members must be open to KM and have the desire to promote it themselves.
Dimension Organization	
Personnel Development	The staff members must be sufficiently qualified through training and coaching to secure KM. This includes interaction with KM as well as with different KM techniques (e.g. debriefing)
Meta-Communication of Knowledge Management	The goals of KM will be made transparent and the applied strategy communicated with the stake holders through open communication and internal marketing.
Goal System of Knowledge Management	The goal of KM must be in accord with the company goals and must also be measurable as well as communicable.
Process of Knowledge Management	KM must be integrated in the present organisational operations. The process of KM must be clearly defined and be integrated in existing processes, e.g. to save time for the staff members.
Delegation / Participation	Responsibility and competence must be clearly defined, e.g. CKO, knowledge manager or Subject-Matter-Specialist. The executive staff carries the responsibility for KM, the areas dealing with KM, for those where staff members are experts but everyone should stay in their own area of competence.
Staff Member Motivation	Through stimulating systems, staff members should be motivated to participate, both through award systems e.g. to raise knowledge transfer and indirectly through KM itself e.g. problems have better and faster solutions
Social Nets / Relationships	There has to be direct communication and contacts should be provided to find common solution to problems. Furthermore, networks have to be set up for regular Face to Face meetings e.g. to encourage knowledge exchange
Knowledge encouraging corporate culture	The dominating corporate culture should never be in contradiction with KM. The staff members must be willing to share their knowledge. Furthermore, there must be trust between the co-workers to secure the acceptance of the available knowledge.
Dimension Technique	
ICT / Application System	A supporting system raises the success of KM. The system cannot be independent but must be integrated in the available IT-infrastructure.
System	The usability of the systems must be guaranteed, which means that it must be easy to use and have the necessary functions.
KMS – Content	The guide lines for the content of the system must be clearly defined. There must be standardized definitions and a clear system available for the setting up of the contributions. A verification process of the quality and actuality of the available knowledge must also be existing.

Figure 1. Potential success factors in knowledge management (Helm, Meckl and Sodeik 2007)

3 Knowledge and productivity – what do they have in common?

General belief says that there are two predominant intersections of knowledge-related issues and productivity. First, both phenomena can be described at three basic levels. Whereas Demeter et al. (2011) depict operational, business, and macro level of labour productivity, Bureš (2009) distinguishes basic level of knowledge oriented activities, namely management of knowledge level, organisational level, and national level. Not surprisingly, when analysed deeper, these levels correspond with each other.

Second, the rapid growth of output and labour productivity across countries has largely been driven by advances in Information and Communication Technology (ICT) (Ceccobelli et al., 2012). Establishment and quick spread of knowledge-related issues within mentioned levels is also closely related to deployment of ICT (Bureš, 2006b).

Knowledge management is an area that has received significant attention in the last few years. Researchers have spent significant steam on improving our understanding of how to manage the knowledge better. Yet a McKinsey survey of executives from 40 companies in Europe, Japan and the US showed that many of them think that knowledge management process is only about IT and how getting the right tools is the key to achieving knowledge management success (Hauschild et al. 2001). Yet a McKinsey survey of executives from 40 companies in Europe, Japan and the US showed that many of them think that KM process is only about Information Technology and how getting the right KM tool is the key to achieving KM success (Hauschild et al. 2001).

There is not doubt that ICT has a large stake in productivity, what seems to have been underestimated is the individual contribution to successful knowledge management deployment. Implementing a knowledge

management tool involves many complementary changes that need to predate and accompany the system installation. ICT systems without properly trained and motivated personnel willing to gather, share, disseminate and store their knowledge, would simply not suffice.

From the research prospective, national and organizational levels seem to be examined the most. At the *national* level, labour productivity is studied from numerous sources and perspectives such as elasticity of substitution between capital and labour (Makin & Strong, 2013) or convergence behaviour of labour productivity (Herrerias, 2012). At the *organizational* level, productivity is considered in particular companies. For ex., Morariu and Bostan (2012) investigated the decision-making issue based on typical dichotomy – investing in new technologies and competencies, or diminishing the number of jobs – in steel companies.

Inspite of the fact the *individual* level is the initial source of knowledge management functioning, it seems to attract less attention compared to those turning their attention to IT platform deployment and support systems investments. The individual level covers issues related to personal or economic aspects of particular jobs or individuals. For instance, Kampelmann and Rycx (2012) investigated the relationship between pay differences among occupations, or McCarthy and Palcic (2012) explored how large-scale employee share ownership plans affect labour productivity. From the knowledge perspective the productivity at this level is closely related to training, creativity and proactivity. In order to share knowledge and work with new ideas, employees need to be trained. Polishing skills in out-of- the-box thinking, abilities to think critically, be able to differentiate root problems from symptoms and implement suggested solutions – all that contributes to better generation of new ideas and innovation. In some companies ICT managers work with people to create a uniform language for project specifications, aim of which is to smooth communication among divisions (Violino, 2002). People also need to be trained on abilities to realise differences between correlations and causalities, problem solving and willingness to disseminate and adopt new inputs. All that helps employees turn tacit knowledge into explicit knowledge and save it, for example for other employees, successors, or replacements (Bureš, Stropková, 2013).

4 Incentives systems for knowledge provision

The management of knowledge as a key factor to production can only be successful if individuals in the company are considered to be knowledge carriers (Jetter, 2006). It is the objective of incentive systems to achieve desired behavior, such as sharing of knowledge, however, what is that works the best? What makes people come out and help each other learn and share their hard earned knowledge? And what incentives and motivations might the firm provide that create a culture of knowledge sharing?

Extrinsic and intrinsic incentives are two opposite ways how to motivate employees. While *extrinsic* motivation deals for ex. with financial rewards, bonuses, nice cars, expensive houses – all things outside ourselves and outside our passions, or personal self-esteem, *intrinsic* rewards come from inner feeling, joy in work, challenge, learning and all the things people do that satisfy them internally.

Intrinsic incentives are, without any doubts, immaterial, however, extrinsic incentives can be both material and immaterial. Immaterial extrinsic incentives comprise, above all, social incentives and incentives associated with career development and training (Jetter, 2006). Semar (2004) says immaterial incentives are characterized by six features: career, corporate culture, personal environment, leadership, working environment, and qualification. It is necessary to mention that it is demanding to apply immaterial incentives as they often depend on a current situation, different people have different receptions of it, and they are difficult to control.

On ther other hand, material extrinsic incentives can be monetary (e.g. fixed salary, social benefits, bonuses, etc.) or non-monetary (e.g. company car, company housing, etc.). Design and implementation of incentive systems has to reflect specific needs of every company and needs to involve properly set system of measuring employee performance using one or several interrelated indicators. The managerial challenge is how to set up properly balanced incentives system.

Wharton management professors Grant and Singh (2011) argue that managers should pay greater attention to intrinsic rewards providing opportunities for development of skills, opportunities to make choices and build meaningful relationships. They believe that financial rewards lead to unethical behavior. Aiming to achieve them, often employees facing strong financial incentives cross ethical boundaries, find the shortest and easiest ways and make excuses for harmful decisions.

Based on findings of motivation psychology, Semar (2004) defines seven issues that are required for an incentive system:

What is wanted	*What it means*
Transparency	Show the connection between motivation for action and the usefulness action. Ensure frequent feedback of participants' performance
Individuality	Appeal to the individual's specific motives for performance
Sustainability	Adapt to the participants' motivational structure, step by step
Qualification	Ensure the participants' qualification for taking part in the knowledge management system. Learning components such as tutorials and courses should be applied.
Flexibility	Adapt the system to changing conditions and circumstances, i.e. the motivational instruments have to meet changing motivational structures.
Performance	Make performance results quantifiable on the basis of adaptable measurement. Fit rating of participants' results to their performance, i.e. achievement, outcome, and conditions.
Economy	Ensure balance of input and output, i.e. introduction and maintenance of incentive components must not require more effort than the success they generate.

Figure 2. Requirements to an incentive system (Semar, 2004)

Jetter (2006) discusses the design and implementation of incentive systems for knowledge management, particularly in small medium enterprises. Using the case of HEAD Acustics, she argues that there are four central design areas for incentive systems:

- Definition of knowledge goals,
- Determination of application area,
- Selection of incentive tools, and
- Evaluation of employee performance

Building a well balanced incentive system that would motivate employees towards efforts to common goals accomplishment remains to be a daily challenge for all HR managers. Companies may have really good extrinsic incentives and yet may not completely benefit from their human capital in case people are not intrinsically motivated. Organizational culture presents set of prerequisites for inner employee motivation and successful sharing of knowledge. If incentives are formulated to promote knowledge sharing, however, yet, the organization demonstrates competitiveness, knowledge sharing will hardly succeed.

5 Knowledge Sharing and Incentive Design in manufacturing environments

Firms design compensation systems, and more broadly human resource systems, to attract and retain certain types of employees, and to give them incentive to provide the level and mix of services the firm prefers (Hwang, Erkens, Evans, 2007). Compensation systems are a subject to continuous development in order to find the best fit with the workforce companies need to hire. For ex. over 25 years one of the responses of U.S. manufacturing plants to increased competition was shift from compensation policies based on fixed hourly pay to variable compensation. Under the new compensation arrangements, some production workers are paid exclusively based on their individual input (e.g., number of hours worked), while others receive both pay based on input measures and also compensation based on their individual and/or group output.

The significant portion of diversity in production employees' remuneration can be justified by the extent of employees' specific knowledge and the value created when employees share this knowledge. Wruck and Jensen (1994) believe that when specific knowledge is shared among individuals, assigning decision-rights to a team of employees rather than to an individual, improves specific knowledge. Both researchers and managers have paid significant attention to studies on how specific knowledge and value of knowledge sharing affect manufacturing plants performance.

The automotive industry is one of possible examples of how knowledge sharing is critical for the success of a company. It clearly shows interrelation between productivity and knowledge-based approach within highly complex environment characterized by neccesity for innovation, reduction of development time and costs being the main drivers of decision making within the automotive sector. This industry segment contains huge amount of information, therefore its integration has become the major challenge over the last decade (Zilber, 2007).

What is so unique about automotive, why is knowledge so crucial within this sector? The answer is more complex than 'to build more cars faster and cheaper and make more money'. Car production and assembly involves production of life-critical systems, such braking, power-steering, fuel, etc, where quality failure or malfunction may result into death or serious injury to people, severe damage to equipment, or environmental harm. Consequences of quality failures may be fatal for both customers and manufacturers. For ex., in spite of being popular for its history of quality management, Ford Motor Company has recalled over 24 million vehicles for varous malfunctions since 2004. General Motors recalled 1.9 million vehicles in March 2010 alone. In September 2011, Honda made one of the largest global recalls – 1 million vehicles with electrical problems which could cause fire hazards (Quality Management System, n.d.). Thus, the logical sequence 'better knowledge – less quality failures – more satisfied customers' is more than obvious.

When it comes to knowledge creation, know-how and knowledge sharing, the most prominent inhibitors and risk factors include all kinds of documents, including those in the form of simple e-mails up to complex project descriptions developed by process engineers (Bures, Stropkova, 2014).. Dissemination of corporate knowledge runs throughout the company in various ways. While some managers try to capture knowledge by simple 'write it down', the process of recording knowledge is more complex and requires interaction-based and learning culture-based methods. That is how tacit knowledge is captured; often referred to as 'know-how' or even 'know-who', yet remaining to be the highest-value knowledge. Some of the approaches how to transfer knowledge include document repository, incorporating retirees, mentoring and organisational learning and training. Both structured and unstructured forms are critical carriers of lessons learned from past experience.

So, how to support knowledge creativity, knowledge sharing and innovation? Levine and Gilbert (1998) believe that employees should receive incentive pays for generation of new ideas or improvements. It has become common that employers award their people contributing by valuable ideas with monetary benefits. In fact, companies should have developed structures promoting such initiatives and provide opportunities for experiments that may evolve into valuable ideas or innovations. Possible forms include voluntary suggestion programs where adeas are evaluated on a regular basis with (usually) financial incentive, however opponents claim that this generates quantity rather than quality. Other formal forms include quality circles or brainstorming meetings, where employees have the opportunity to share experience and create ideas. It is crucial that companies learn from past experience, learn from it and take it into consideration successes, failures, analyse their causes and record learned lessons in an accessible place (Levine, Gilbert, 1998).

6 Case study: knowledge sharing in automotive production

The manufacturing plants, within automotive in particular, use a borad spectrum of managerial tools which support knowledge sharing in production processes on a daily routine basis. In many of them we can find combination of both intrinsic and extrinsic incentives. Due to strong link to employee remuneration system it looks like extrinsic motivation prevails, however, experience says that people are mostly motivated when they feel challenged, have the opportunity to learn and share and be part of knowledge sharing culture under strong leadership.

The following chart shows examples of tools available to support knowledge sharing in on one of the automotive suppliers based in Slovakia using combination of work activity and extrinsic incentive measures:

Item	Type	Frequency	Attendees	Description	Extrinsic effect
Daily Operations Meeting	Meeting	Daily	GM, QM, PTM, MT, HRM, LL, project engineers	Production reports from within 24 hours, production plan, inventory review, customer claims, quality failures + measures, issues to be solved moved to FRM, important announcements	Occasionally, upon quality failures may effect operators and LL bonuses
Fast Response Meeting (FRM)	Meeting	Weekly	GM, QM, PTM, MT, HRM, LL, PPE, + per request	Focus on mid-term solutions, improvements, operational problem remedies requiring longer time span, a lot of brainstorming, set deadlines	occasionally
Audit 5S	Audit	Weekly	GM, QM, PTM, MT, HRM, LL, ABT + per request	Audit in shopfloor: Watch for disorders/discrepanices related to efficiency and effectiveness: respecting layouts, safety measures, use of safety cloth, gloves, tools; organization of containers, labeling of boxes with spare parts, record keeping, update of boards, visualization boards, etc. Follow-up: record of findings + photo documentation, tasks/responsible assigned, deadlines for failures remedies. Findings stored at common network drive with possibility to edit & update	On a monthly basis shifts are expected to come up with min. 2 proposals for improvements in production process – effect on monthly bonuses for the whole shift
White Box	Mailbox	ongoing	Anyone	Opportunity to propose improvements how to cut costs, make things cheaper, shorten production cycle, reduce waste, etc	Best ideas receive non-monetary awards (special gifts at company Christmas party)
Multiskills matrix	Document	Ongoing	Handled by TR: QA, MT, LL, OP	Continuously upgrade skills (production – maintenance – IT – production software)	Better opportunity to substitute/move to another position
Skills matrix	Document	Ongoing	Handled by TR: OP, MT	Annual review of operators' progress; record of skills enhancement, 'substituability'; standardized levels of expertise	Better opportunity to substitute/move to another position
Etc.					

Notes: GM = general manager, QM = quality manager, PTM = production&technical manager, MT = maintenance staff, LL = line leader(s), PPE = product/process engineer(s), HRM = HR manager, ABT = Authorized Safety, QA = quality staff, OP = operators, TR = trainer

Figure 3. Examples of tools available for knowledge sharing in automotive. Source: author's own processing

Tools listed in the chart above are/must be seeded into proper organizational culture largely shaped by Quality manager setting high standard requirements, zero deffect tolerance and when necessary, proposes financial reprimands (maluses) for caused quality failures. The company operates under strong leadership of both the quality manager and general manager who clearly communicate that the customer satisfaction is the priority and that has become fully accepted as obvious aspect of the organizational culture.

Everyone, including non-technical staff, such as human resource personnel, understands they are a part of manufacturing entity. All meetings listed above take a place right at the shopfloor, in the open corner called 'Coffee house' normally serving to operators for quick refreshment breaks. That offers the opportunity to meet at the 'right' place, meet the right people right in the heart of manufacturing plant. People do not have much time to sit in the meetings, instead, they meet quickly and regularly and share knowledge from everyone's own point of view. Thus, these working mini groups present quality teams with very specialized knowledge of machine operators, quality and maintenance personnel to overcome significant operational bottlenecks.

7 Conclusion

Knowledge has emerged as the most important strategic resource for organizations (Nonaka, 1991). Regarding knowledge management and its influence on performance, one can argue that tools have been around since long time ago. Daily or weekly activities in manufacturing plants include quality circles, improvement measures (Audits 5S or Kaizen practices); key performance indicators are tied to incentives systems. Applying

all the techniques and methods fostering use of best knowledge turns effectively into smoother operations with less quality issues and quicker returns.

Sharing of knowledge is the key to success, which can only be experienced within properly set up environment. There is no ultimate incentive system, but there are various incentive systems which are specifically designed for the specific company. First of all, it is intrinsic motivation that strong leadership and organizational culture should promote in order to increase employee loyalty and awareness to openly communicate their best practices and experience. Extrinsic motives are more visible and easier to use (add or take away), however, it is intrinsic reward that leads to long term employee commitment to share. Both blended by open and customer-focused environment offering tools to express own ideas, extend suggestions for improvements, brainstorm and critique without being punished, contribute to better sharing of knowledge and enhancing organizational performace.

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