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Knowledge Sharing in Manufacturing SMEs: Survey Findings and Analysis

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Abstract: This paper reports on a study of European manufacturing SMEs in the metallurgical sector. The goal of the research is to ascertain the extent and nature of knowledge sharing that takes place within these organisations; the barriers experienced; and finally whether specific structures, systems are in place to enable effective knowledge sharing. We found that while information and knowledge is shared it is done in an ad-hoc way and formal systems are not used. The study revealed that the barriers that prevent people from knowledge sharing include; lack of time; inability to make tacit knowledge explicit; communication difficulties and lack of trust. Respondents also identified critical areas that needed attention. These include the need for structuring and organising knowledge sharing, effective communication, team building as well as the ability to use computer systems. This analysis provides the critical information needed to guide the development of tailored support structures in order to equip employees with the skills and competences needed to become more effective in a knowledge economy.

1. Introduction

Manufacturing is essential to the European economy [1]. It has a very high multiplier effect and it stimulates much economic activity in its upstream and downstream functions [2, 3]. This leads to wealth generation and living standards unmatched by any other sector. However, the industry is facing many challenges at this time, including the continuing migration of traditional manufacturing to low wage economies and increased competition in the high technology sector from other developed economies. Future manufacturing strategies therefore must be based on knowledge intensive processes such as research and innovation [2, 3, 4, 5]. This will promote, create and secure high added value employment and growth. Manufacturing in Europe must shift from a resource-intensive to a knowledge-intensive, innovative sector that is capable of achieving and maintaining technological and production leadership in the global marketplace [3, 4, 5, 6]. Industrial transformation is a must therefore and a new approach to manufacturing is required. This can only be achieved through a new structure based on:

- Increased creativity, agility and flexibility in identifying and meeting customer requirements
- Continuous innovation in products, processes and business systems/models,
- A new approach to knowledge generation, transfer and use.

Successful transformation will depend on adopting new attitudes towards the continued generation and deployment of knowledge [3]. However, the knowledge process is complex and very difficult to manage. Despite many efforts, research indicates that organisations are still failing to manage knowledge effectively in organisations [7, 8]. Individual skills and competencies are not easily converted into tangible products and services. It seems that the

concept of knowledge management is still not very well understood or managed in practice. Consequently, new knowledge initiatives are not exploited to their full potential. In other words, companies are not reaping the full benefits of knowledge management project investments.

2. Objectives

The MITHRAS project was established in an attempt to develop a better understanding of the actual dynamics of knowledge sharing within European manufacturing small and medium sized enterprises (SMEs) and to develop specific support structures (e.g. training programmes, methodologies, systems and tools) to facilitate effective knowledge exchange and exploitation. The project is funded by the European Commission under the Leonardo Da Vinci initiative. It focuses specifically, on the metallurgical sector. The project team has a strong industrial focus and comprises representatives from technology transfer organisations, business incubation centres, federations of chambers of commerce, as well as owner managers of European SMEs representing seven European regions in Spain, Italy, the Netherlands, Denmark, Czech Republic, Ireland and the United Kingdom. The research focuses on identifying and prioritising the critical barriers or impediments to knowledge sharing both within and across organisational boundaries. By understanding where the impediments to effective knowledge sharing exist in a real life setting, practitioners can focus their efforts on avoiding the pitfalls. They are also in a better position to design and develop specific structures and systems to overcome these problems.

3. Methodology

In order to identify the barriers to knowledge sharing in European manufacturing SMEs a preliminary workshop was undertaken using focused workshop techniques. The workshop was targeted at managers of Manufacturing SMEs in the west of Ireland. The aim of the workshop was to identify and prioritise the key problems to knowledge sharing that these organisations face on a daily basis. Based on the findings from this pilot study a knowledge sharing audit was developed. This audit was used as a guide for structured interviews in order to ascertain (a) the extent and nature of knowledge sharing that takes place within the organisation; (b) the barriers experienced; and finally (c) whether specific structures, systems and culture are in place to enable effective knowledge sharing. The audit was divided into six sections (for more explicit details about the survey see [9]). Within each of these sections, research questions were formulated. These include:

- General information: *'In which country is your company settled?'*
- Knowledge sharing: *'To what extent and how do SMEs in the metallurgical sector share knowledge and what are the key barriers in this area?'*
- Collaboration and communication: *'To what extent do SMEs in the metallurgical sector cooperate and communicate?'*
- Awareness: *'Do employees realize what the importance of knowledge sharing is?'*
- Trust: *'Do employees of SMEs in the metallurgical sector trust each other with their knowledge?'*
- Organisational Structure: *'To what extent does the organisations structure promotes knowledge sharing within SMEs in the metallurgical sector?'*
- Training: *'Which subjects should be included in a training program for collaboration?'*

The knowledge sharing audit was piloted, tested and validated prior to its use. It was then sent to at least 20 SMEs with less than 100 employees in the seven participating regions of the MITHRAS project between February and May 2006 (see table 1). The total number of valid questionnaires is 158. This number is sufficient to derive valid information for interpretation means.

Country	Number of valid responses
The Czech Republic	23
Denmark	20
Ireland	21
Italy	30
The Netherlands	22
Spain	20
The United Kingdom	25

Table 1: Survey Respondents

4. Key Findings

This section presents the key findings of our survey. More specifically, it discusses the extent and nature of knowledge sharing that takes place within the organisation; the barriers experienced; whether specific structures, systems and culture are in place to enable effective knowledge sharing and finally whether training is required and if so what subjects should be considered and how should these be delivered. Each of these areas is discussed in more detail below.

4.1 Knowledge Sharing

‘To what extent and how do SMEs in the metallurgical sector share knowledge and what are the key barriers in this area?’

The research questions in the first section of the inquiry are related to knowledge sharing. We examined if knowledge is shared, and if so, in what way does this occur. We also attempted to identify the key barriers to knowledge sharing. According to our findings most companies share knowledge. 26% of the respondents say they don’t share knowledge at all. Many of these responses come from the Czech Republic where, according to our survey, knowledge sharing is rare. We found that knowledge and information are usually shared by word of mouth or by telephone. In general, there are no formal systems in place. Only 14 % use computer systems like the company network or the internet. 22% of the companies organise meetings to share their knowledge and information.

We found that the main barrier to sharing knowledge is the lack of time (21%). This is especially significant in Denmark, Spain and the Netherlands, where the lack of time is the most important barrier. The fact that knowledge is not organised appears to be an important barrier to knowledge sharing for the employees in every country as well. There seems to be a lack of supporting systems and it also seems that existing systems are too complex and not easily used. Also communication difficulties are mentioned as an important factor preventing people from sharing knowledge. Differences in level of education and personal conflicts are stated to be important problems in this area. The lack of trust is mentioned

because sharing knowledge can cause a conflict of interest. This is particularly relevant in Ireland. We also found that an organisation's hierarchical culture prevents people from sharing knowledge. This can mean that the employees receive insufficient information from higher management or that the organisational culture prevents people from sharing.

When the respondents were asked to describe a problem or case, communication difficulties and the fact that knowledge was not organized was mentioned in Spain, the Netherlands and Ireland. In Spain, Italy and the Czech Republic the importance of knowledge sharing seems to be underestimated. The Czech, the Italian and the Irish mentioned the fact that knowledge sharing can cause a conflict of interest. Our findings revealed that there is a large diversity of responses from different countries. For example, we learned that almost all the Italian respondents share knowledge while practically none of the Czech respondents do.

4.2 Collaboration and Communication

'To what extent do SMEs in the metallurgical sector cooperate and communicate?'

The questions in this section of the inquiry are related to collaboration and communication. We found that most of the employees (52%) collaborate with others in order to solve problems. 32% of the respondents form alliances with other companies in order to cooperate. Slightly more (34%) of them do not. In the Czech Republic no alliances are formed with other organisations at all. Almost half of the employees feel that communication among team members is efficient and effective. 24 % think it is not, including all of the interviewed Czechs. All of the Danish say that communication among team members is efficient and effective. The percentage of employees who say that communication between project teams is efficient and effective is 39% while 24% say it is not.

4.3 Awareness

'Do employees realise what the importance of knowledge sharing?'

This part of the survey explains to what extent SME staff members in the metallurgical sector realise what the importance of knowledge sharing. Most of the employees (54%) feel that knowledge sharing is worthwhile for them. 22% disagrees on this matter (most of them originate from the Czech Republic). When all participating countries are compared, it is interesting to see that nobody in the Czech Republic feels that knowledge sharing is worthwhile for them while in Denmark only one, and in the Netherlands only two respondents disagreed. Half of the questioned people (51%) feel that they personally gain from information and knowledge sharing. The findings of our survey also revealed that many respondents believe that individuals do not understand the benefits of sharing knowledge.

4.4 Trust

'Do employees of SMEs in the metallurgical sector trust each other with their knowledge?'

This part of the inquiry affects trust. Trust can be of great importance when sharing knowledge. In general we found that there is a high level of trust within the organisations. 49% of the employees trust others to share information. 19% do not. Over half of the employees (56%) are comfortable asking colleagues for information. Of those who are not comfortable asking, 68% is Czech.

4.5 Organisational structure

'To what extent does the organisations structure promotes knowledge sharing within SMEs in the metallurgical sector?'

The research questions in this part of the inquiry are related to the companies' organisational structure. The key findings are presented in table 2.

Question	Comment
Does your organisation value knowledge sharing?	The opinion about the extent to which organisations value knowledge sharing is scattered. While some respondents feel that knowledge sharing is valued (43%) some (33%) feel that it is not valued at all. The attitude towards this matter is about the same in every country, except from the Czech Republic. Here it seems that knowledge sharing is not valued at all.
Is it easy to share knowledge throughout the company?	The overall opinion about how easy it is to share knowledge is also scattered. 37% feel it is easy to share knowledge and 28% feel it isn't. When comparing the responses by country, a strong difference in opinion can be noticed. Spain and the Czech Republic generally disagree on this matter while Italy and the Netherlands mostly agree. In Ireland and Denmark the overall opinion is divided between agree and disagree.
Are performance measures used to promote knowledge sharing?	Only 16% of the respondents say performance measures are used to promote knowledge sharing in their organisation.
Is knowledge sharing and reuse rewarded?	Generally, knowledge sharing and reuse is not rewarded. Roughly all of the countries participating in this study have the same opinion about this.
Does the organisation's structure promote knowledge generation and learning?	We found that the structure of most organisation's does not promote knowledge generation and learning. This opinion is strongly represented in the Czech Republic and in Ireland.
Is there a high level of co-operation across the organisation's units?	According to our findings there a high level of co-operation across the organisations' units.
Are communities of practice used to optimise core competencies?	In 28% of cases, communities of practice are used to optimise core competences. 30% of the respondents say these are not being used. When the differences between the participating countries are closer observed, it appears that in Spain and Denmark communities of practice are used while in the Netherlands and Ireland, they are not.
Are there are formal systems in place to share knowledge in your	The majority of respondents say that there are no formal systems in place to share knowledge in their organisations.

organisation?	
Are there specific people in your organisation who act as knowledge sharing brokers?	Our study revealed that in the majority of cases there are no specific people in their organisation who act as knowledge sharing brokers.

Table 2: Organisational Structure and Knowledge sharing

Upon analysis of our survey it seems that organisations do not value knowledge sharing as much as they should do. Organisations' structures do not promote knowledge generation and learning. Perhaps this is why people find it difficult to share knowledge. Knowledge sharing is not promoted or rewarded in most organisations. In general, there are no formal systems in place to share knowledge within the organisations.

4.6 Training

'Which subjects should be included in a training program for collaboration?'

The MITHRAS project, aims to develop support structures that will provide employees and lower level managers of European SMEs with the skills and abilities needed for collaborative knowledge. Therefore, in this part of the survey, an inventory is made of the organizations requirements regarding training. Approximately 65% of the respondents believe that they do not receive adequate training on knowledge sharing. When asked what training should be provided we learned that the four main topics that should be included in a training programme are:

- How to organise knowledge and how to make knowledge sharing measurable. This means that there is a demand for formalisation of knowledge.
- How to communicate efficiently. Communication with people of different levels of education or of different generations often causes problems.
- How to build effective teams. As lack of trust can cause problems, respondents feel it is very important to learn to trust each other and to create an atmosphere of not being afraid to ask.
- How to use computer systems, the central server and the internet.

Besides these topics, respondents want to learn about the importance of knowledge sharing, they want examples of how collaboration can be used to engage and to motivate people, and they would like to manage their time more efficiently in order to create time for knowledge sharing. We also learned that the most important characteristics of a training programme are:

- Engaging with fellow participants and best practise tools and checklists
- Problem based learning and exercises
- Access and exposure to industrial cases

Therefore, the training should be pragmatic cases and should pay attention to engaging with fellow participants.

5. Summary and Discussion

In general, SMEs in the metallurgical sector share information. However, it can be concluded that most of the respondents share knowledge in an ad-hoc way and do not use formalized systems. Consequently, a training programme for knowledge sharing should raise awareness for knowledge sharing and for the importance of formal systems. As far as barriers are concerned, the lack of time is considered the main barrier. It seems that management should reserve time in the schedules of their staff for knowledge sharing. The fact that knowledge is not organised and the existence of communication difficulties cause problems in the area of knowledge sharing as well. The lack of trust is mentioned because sharing knowledge can cause conflicts of interest. That is why a training programme should include a part about team building and communication. Most of the respondents say they cooperate and communicate effectively and understand the importance of knowledge sharing. Organisations do not value knowledge sharing as much as they should do and organisations' structures do not promote knowledge generation and learning. That appears to be the reason why people find knowledge sharing hard. Performance measures are not used to promote knowledge sharing and because knowledge sharing is not rewarded in most of the cases, people do not tend to share.

The majority of respondents feel that they do not receive adequate training on knowledge sharing. When asked what should be included in a training programme for collaboration respondents highlighted the need for structuring and organising knowledge sharing, communication and team building as well as the ability to use computer systems, the central server and the internet. We also learned that any training programme should adopt problem based learning techniques, be pragmatic and should allow participants to access best practise tools and checklists. From this analysis, the project team developed a training plan that aims to provide employees of manufacturing SMEs with the competences necessary for collaborative knowledge building. Modules and materials, both for tutors and participants were also developed and finally, a pilot training course being executed with a limited number of SMEs managers and employees in order to test the material and technology with a view on improvement and correction of deviations.

6. Conclusions

Increasingly, it is recognised that knowledge produced, needs to be managed and developed. It is uniquely companies that transform new and existing knowledge into jobs, money and economic growth. Their ability to absorb, generate and exploit knowledge is therefore critical to the national social and economic well being. While invention is important it is an overrated source of innovation and wealth. Most of the knowledge that companies use in innovation comes from external sources. Therefore, the ability of organisations to recognise the value of new knowledge, assimilate it and apply it to commercial ends is key to performance. European SMEs have a pivotal role to play in this regard. However they must shift their emphasis from managing and optimising resources to managing and optimising knowledge. Consequently, radical changes are needed in industry to significantly improve communication and collaboration. The MITHRAS project aims to improve the capacity of manufacturing SMEs in general and metallurgical SMEs in particular to generate, share and use knowledge in order to become more competitive. To do this key barriers to knowledge sharing were identified and analysed. From this analysis an accurate representation of the training needs and enabling tools required in European manufacturing SMEs were identified and prioritised. Based on this information specific support structures including digital training programmes, methodologies, systems and other enabling tools are being developed and validated in industry. It is hoped that such initiatives

will equip SMEs with the skills, structures and systems necessary to share knowledge and thus increase competitiveness, sustained growth and profits.

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