

ANALYSIS OF THE KNOWLEDGE TRANSMISSION PROCESS IN THE PRODUCTION PROCESS DESIGN DEPARTMENT OF A COMPANY

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ABSTRACT

This study involves an analysis of the current situation in a major company, in terms of transfer of knowledge and the problems associated with it. The analysis has been based on observation, during one year, of the daily tasks of a group of people, carrying out similar design activities, of the production process design department. Additionally, the everyday observation of professionals at work has helped to understand particular aspects about the process of knowledge acquisition in industry. As a result of the above analysis, it has been observed that the process, which allows obtaining necessary knowledge to carry out the day to day work, consists of a long, individual process, based on acquired experience and an individual's particular way of thinking and acting. The conclusions drawn by these people are seldom shared. This fact implies that previous experiences and ways of thinking, when faced with similar situations to those faced by work colleagues carrying out similar tasks, cannot be taken advantage of. Therefore there is clearly room for an overall improvement in the efficiency of the system.

In order to facilitate the transfer of knowledge, especially tacit knowledge, in the analysed environment, the authors propose the need for using a methodology that is easy to apply, is not high time- or effort-consuming, and does not require computer skills, but a direct relationship between the people of the area. After considering the existing applications to support tacit knowledge transfer in organisations, especially in industrial environments, an adaptation to the business world of the Exchange of Mental Schemes (EMS) method is proposed.

Keywords: knowledge transfer, industrial environment, EMS methodology

1 INTRODUCTION

The present-day situation of globalisation forces companies to seek means that will allow them to be as effective as possible. Not only is it necessary to make use of the required resources for their activities, but it is also essential to be able to take the maximum possible benefit from them. One of them is knowledge. It is characterised by having (or the ability to have) a value that is in constant growth and which, unlike other resources, 'does not diminish but actually increases when being shared' [1].

Sharing knowledge, the first step to achieving knowledge transmission, is however not an easy task in organisations. Many factors, such as lack of time, lack of motivation or even an organisation's culture, have a negative influence on its transfer. Analysing the existing situation in a real organisation helps to understand it better in order to propose possible solutions to encourage this transfer of knowledge.

2 OBJECTIVES

The aim of the present article is:

- to analyse the existing situation in the production process design area of a major company in terms of transfer of knowledge and the problems associated with it;
- based on this analysis, determination of potentials and opportunities to improve the transmission of knowledge between people in the analysed department;
- analysis of the possible application of existing Knowledge Management (KM) methodologies in the studied environment, and finally,

- the proposal of a methodology to improve this transmission process.

3 STATE OF ART

Problems associated to knowledge transfer, specifically in industry, have been long studied, in addition to methodologies developed to improve it, most of which are included under the term Knowledge Management. According to von Krogh [2], KM refers to identifying and leveraging the collective knowledge in an organisation to help the organisation compete.

Analysing the literature, most KM applications can be divided, according to its aim, into the following three groups [3]:

- to make knowledge visible and show the role of knowledge in an organisation (eg. maps, yellow pages or hypertext tools);
- to develop a knowledge-intensive culture, encouraging behaviour such as knowledge sharing, seeking and offering knowledge;
- to build a knowledge infrastructure (a network of connections between people).

There are many KM applications to facilitate transfer of explicit knowledge, most of which are based on Information Technologies (IT) solutions. The basis for these applications consists in centralising the information, usually through the development of a computer programme, more or less customised, in such a way that all the people that are involved in a particular project can access it quickly, and in an orderly and transparent way. This large database will also be of assistance in making decisions and resolving problems, even those associated with other projects in the future or those carried out by other people.

Three common applications can be found [4]:

- the coding and sharing of best practices;
- the creation of corporate knowledge directories (mapping the internal expertise); and,
- the creation of knowledge networks (eg. online forums).

Methodologies to facilitate transfer of tacit knowledge, understanding as tacit knowledge that which “cannot be wholly formalised, nor transmitted solely through written documents” [5], “knowledge of techniques, methods and designs that work in certain ways and with certain consequences, even when one cannot explain exactly why” [6], “usually part of a long-term, accumulated learning process that often starts a more systematic scientific understanding of a technology process” [Senker XX], require a face-to-face application and not an IT-based one.

Analysing the literature, it is not easy to find KM applications or methodologies to facilitate this type of knowledge. One of a few examples is brainstorming, a worldwide-used technique to externalise explicit but overall tacit knowledge, such as personnel insights and intuitions. Other outstanding methodologies usually used in organisations to help to leverage an organisation’s knowledge, particularly its tacit knowledge, are storytelling (used of particular stories to illustrate a particular situation) and mentoring [8].

Despite the fact that all these techniques have the same objective (transfer of knowledge with rich tacit dimension through informal processes of socialisation and internalisation [9]), strategies applied to carry it out differ in an important way. An organisation’s social and cultural factors are also essential to succeed in applying each of these methodologies.

4 METHODS

The analysis has been based on observation, for one year, of the daily tasks of a group of people of the production process design department, carrying out similar design activities.

A coordinator task of a group of designers of the mentioned department has permitted observation of the way daily design problems are solved (seen as knowledge transmission tasks) without influencing its resolution. This observation has allowed the carrying out of a qualitative analysis of the general behaviour of each process designer (each person is responsible of the design of one specific production process) in every problem / task.

However, subjective appreciation by the observer is a factor difficult to isolate. In order to decrease the personal influence effect, a standardised form to fill out for every observed task has been developed (Table 1).

In this form, three different areas have been determined:

- Communication within the area.
- Communication with other related departments.
 - Departments which are a source of product information
 - Departments which are receivers of the designed production process
- Documentation.

The analysed parameters are the following:

- (1) Contact / feedback between people doing similar tasks.
- (2) Existence of group problem analysis.
- (3) Communication with the product developers to establish the premises that would make the process design easier.
- (4) Communication to obtain a clear and comprehensive list of other areas' premises and requirements to be considered in the process to be designed.
- (5) Use of previous project information.
- (6) Correctly document the designed process (use of Knowledge Management applications in an effective way).

Table 1. Form to fill out after the observation of every design task/problem solving.

Questionnaire Number	Date		
Process Designer Number	Task Number		
Communication within the area			
Have other people of the department doing similar tasks been consulted?	Yes	No	
Have particular problems in group within the area been analysed?	Yes	No	
Have other designers been asked about previous projects?	Yes	No	
When affirmative:			
Was information about problems and proven solutions received?	Yes	No	
Was the obtained information updated?	Yes	No	
Was the obtained information useful?	Yes	No	
Communication with other related departments			
<u>Departments which are a source of product information</u>			
Is the contact with the related areas periodical?	Yes	No	
With which areas?			
Has this communication been always with the same person of every area?	Yes	No	
Has any regular information transmission system been used?	Yes	No	
Has the production process designer generated feedback to make the process design easier?	Yes	No	
When affirmative:			
Has this feedback been considered?	Yes	No	
<u>Departments which are receivers of the designed production process</u>			
Is the contact with the related areas periodical?	Yes	No	
With which areas?			
Has this communication been always with the same person of every area?	Yes	No	
Has any regular information transmission system been used?	Yes	No	
Has the feedback of the consulted people been taken into account?	Yes	No	

Documentation		
Have previous projects been referred to in order to analyse its resolution?	Periodic	Specific moment
When affirmative:		
Has the same person participated in the previous analysed projects?	Yes	No
Have other people of the area participated in the previous analysed projects?	Yes	No
Are the consulted projects the last ones that have been performed?	Yes	No
Is the examined information updated?	Yes	No
Does the examined information only reflect the obtained results or does it also evidence the resolution process that was carried out?	Result	Process
Does the discussed information show encountered problems and how they were resolved?	Yes	No
Was this information available in any centralised information system accessible to every person of the area?	Yes	No
Has the present problem been documented in any centralised system of knowledge management?	Yes	No
When affirmative:		
Have the results been documented?	Yes	No
Has the resolution process also been documented?	Yes	No
Have all the problems and solutions been documented?	Yes	No
Other / Comments		

In addition, the daily observation of professionals at work helps to understand particular aspects about the process of knowledge acquisition in industry and its associated problems, the understanding, as knowledge acquisition, of the result of employees' action to acquire knowledge related to their daily work.

4 RESULTS

The first part of this section accounts for the explanation of the results about the knowledge transfer analysis in the daily design process activities obtained by the analysis of the forms presented in the section above (4.1). In order to help to understand the obtained results, the outcomes about the process of acquiring knowledge in industry and the problems associated with it follow this first explanation (4.2).

Finally, how to encourage transfer of knowledge in the analysed environment is proposed in the third part of this section (4.3).

4.1 Knowledge transmission process

As explained in section 3, an observer has filled out a standardised form to analyse every process design activity from the point of view of knowledge transmission. Overall, five different production process designers performing an average of 20 production process design activities each have been analysed. On the basis of the obtained information, conclusions related to the previously defined parameters are the following:

(1) Contact/feedback between people doing similar tasks:

There is no regular contact between people of the same area doing analogous activities, due to the fact that they do not necessarily have to interact in order to carry out their daily work. There are two exceptions to this assertion: young people with little experience do ask people with more experience

how to solve particular problems; when friendship exists between two members, two positive effects occur: significant information transfer and feedback generation.

(2) Existence of group problem analysis:

It is not common to encounter a spontaneous group analysis of a particular problem (each process designer is responsible of one design activity). Group analysis is always induced by the person responsible for a group of process designers.

(3) Communication to influence product in order to optimise process design:

There is communication and exchange of information between product designers and process designers. There is also a KM application that effectively works to document all the product information (i.e. information from product designers to process designers). Communication in the opposite direction (to influence product in order to optimise the process) is carried out without a centralised documentation, being more difficult to be controlled and it is rarely shared between process designers.

(4) Communication to have a clear and comprehensive list of other areas' premises and requirements to be considered in the process to be designed:

There is communication and an exchange of information between people of different areas related in the same production process (production personnel, maintenance personnel, logistics personnel, etc.). In spite of it, there are specific points of this communication that could potentially be improved:

- There is no centralised system where the information is stored.
- There are poorly defined and changeable premises:
Efficiency of a determined area in industry is not only quantified in terms of an advantage over its competitors, but it is also the result of client satisfaction, in cases such as the present, with minimum source of means and in timely fashion. Therefore, a fundamental first step is to understand perfectly, and in depth, what the wishes of direct clients that must be satisfied are (and what areas are going to receive the consequences of the work done).
Understanding these subjects is not an easy task, given the fact that, as shown in the analysed area, related or client areas have a similar structure, i.e. experienced people, with their own individual ideas, and without the communication or transfer of knowledge between them that would make a basic unitary concept possible (see 4.2). As direct consequences, the basic premises will be neither clear nor unitary, but they will differ, depending on the person from the client area that has to be dealt with, according to their own ideas and wishes. This lack of definition often implies that the list of points to be complied with is not constant throughout, but that additional wishes are added as needs arise. Thus it will be a changing list, normally incomplete and solely transmitted to a small part of the executing entity (i.e. to the person with whom they relate).
In addition, in most situations there is not only one receptor or client department, but a number of areas involved with interests, often contrasting with each other.
- There is no communication between people of the process design area belonging to different inter-departmental groups (one group per process to be designed, formed by the process designer, a production person, a maintenance person, a person from logistics, etc.) and because of this lack of communication, a comparison between premises and establishment of priorities of fulfilment can not be discussed (Figure 1).

(5) Use of previous project information:

Information from previous projects, in which the same process designer has also taken part, is consulted. Otherwise, not to take advantage of information from recent projects developed by colleagues is quite usual.

(6) Correctly document the designed process (use of KM applications in an effective way):

There is a new KBE (Knowledge-Based Engineering [10]) tool for supporting production processes that is not entirely in operation. It is a very complete and powerful application but quite complicated and time-consuming to use. The success of this new tool will be possible when it is established as the only way to document processes from their start-up.

Until now, previous project information has not always been centralised or updated, which makes people in the area lose confidence in the information stored. Moreover, neither the process used to develop it nor the encountered problems and their solution have been supported, and only the results can be evidenced.

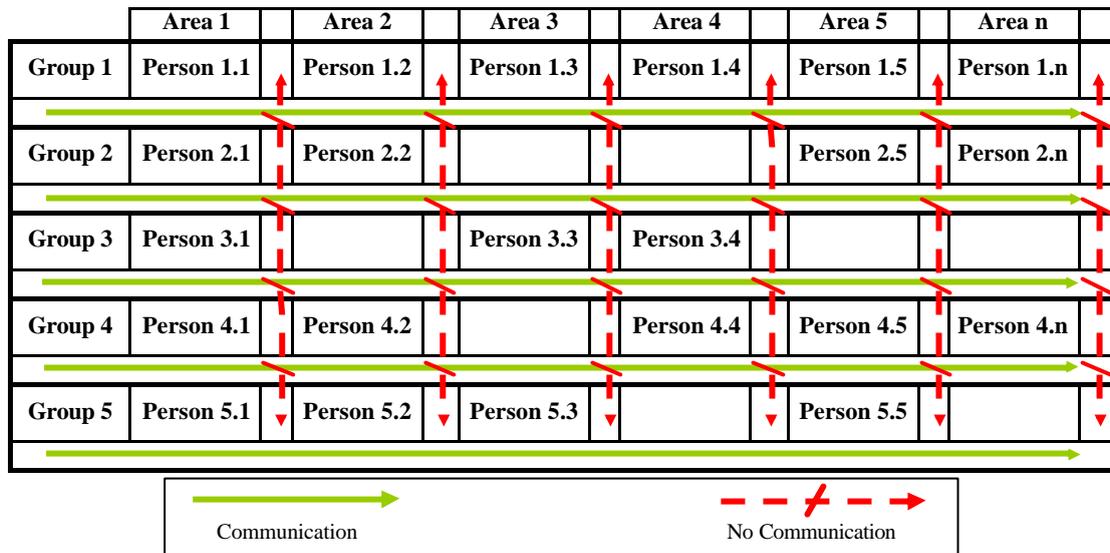


Figure 1. Communication schema between different design groups and areas in the analyzed company.

Lack of communication and knowledge transfer, and a mistaken use of the available KM applications are the most common problems detected after this analysis.

4.2 The process of acquiring knowledge in the analysed company

The process of acquiring knowledge is usually a slow process, based on theoretical or practical learning and accompanied by the subsequent reflection that allows an understanding of the learnt phenomenon.

In the analysed business environment, acquisition of knowledge mostly occurs on the basis of experiences, either successful or failed ones, in the day-by-day of daily work. It is not usually an orderly learning process, but rather one that occurs in a forced way, insofar as each individual has to confront a series of problems or situations, never accounted before, which the subject has to overcome. Thence, the learning process which each individual must undergo, will depend not only on the situations and experiences that s/he has, but also, and in a determining way, on their own way of being and other personnel characteristics, such as their attitude when dealing with problems, level of curiosity, mental structure, etc. [11].

It could be said that, the learning acquired by a person through daily tasks will depend on, in the least, the following factors:

- the experiences or problems which they must deal with.
- the way in which they resolve those problems.
- the individual characteristics of each person.

Within the structure of this major company analysed, two types of people can be differentiated: experienced people and recently incorporated people.

4.2.1 Knowledge of experienced employees

Each of the most experienced employees has a different way of behaving in the same situation: their knowledge is determined and differs significantly from each other. Further, it is suggested by the authors that their mental structures on a given concept differ from each other in an important way [12]. This fact can be observed in the daily work experience. When faced with the same situation, different employees approach a problem in very different ways, using different resources and reaching different conclusions.

Thus, it could be said that the knowledge owned by experienced employees is knowledge that is not shared within the area itself.

4.2.2 Knowledge of the recently incorporated workers

Younger employees with university studies have the capacity to learn quickly and easily. In addition they have a different way of confronting problems because of the structures and way of thinking that they have learnt during their engineering studies. On the other hand, their lack of experience increases the degree of difficulty in their day-to-day work. The way they behave will depend on the ideas or concepts that they learn through asking or observing their colleagues. The fact of observing a variety of different ways of behaving and of hearing a wide range of opinions inevitably create a sensation of insecurity. They do not know exactly who to turn to, depending on the problems and situations as they arise and, again, they are guided by the advice, often contradictory, of their colleagues working in the same area. Their capacity for logical discrimination, acquired at university, and the different experiences that they have had will help them to make their own decisions.

In short, the individual knowledge of recently incorporated workers in the day-to-day work area is acquired, despite the complete technical base that they dispose of, on the basis of the day-to-day situations that they encounter and without any clear guidance as a basis. Neither is it, in this case, knowledge that is shared with the other people within the area.

4.2.3 Problems associated to the knowledge acquisition process

The individual knowledge that these people have acquired (based on their own personal experiences) makes them uniquely knowledgeable about a segmented part of the knowledge of the area as a whole. We could say that they form a network, not interconnected, of knowledge of the area (not developed to its maximum potentiality).

Moreover, it is also necessary to discuss a belief that is widespread among different workers: “sharing one’s knowledge implies a loss of power in their relationship with their colleagues”. Generally speaking, there is a certain natural reticence, an avoidance, of sharing individual knowledge, or even about asking colleagues for advice when faced with problematic situations [13]. This hypothetical loss of power, allied to the loss of interest in the work of their colleagues as a result of the individualism that has developed over the years, makes it significantly more difficult for knowledge to be transferred between different people and different generations.

Thus, it makes sense that there should be a need to improve communication and the transfer of knowledge between different people in the same area, in order to increase overall performance ([13]-[15]) and avoid loss of necessary knowledge (especially tacit knowledge - both cognitive and technical [16]).

As a summary, conclusions drawn from the above analysis are the following:

- There is no optimum overall knowledge, but just individual knowledge unshared between the different people in the area.
- Consequently, advantage is not taken of the potential resulting from combining or pooling all of the individual knowledge and distinct points of view possessed by the different individuals.
- Personnel with a great capacity (young personnel with university studies) learn the knowledge necessary for their daily work by means of a process that is both individual and slow. Advantage is not taken of the potential that these people have.
- The mental structures and new points of view of the young, recently incorporated people are not used to improve or complement the points of view and knowledge of the more experienced people.
- As there is no transfer of knowledge between the different people in the area, the individual knowledge gained over the years by each person will be lost when that person retires or changes jobs.

Once again, the lack of communication and of a transfer of knowledge is the point in common for all of the functioning problems encountered in the day-to-day of the area analysed.

4.3 How to encourage the transfer of knowledge in the analysed environment

In view of the above, it can be concluded that there is a need to improve communication, transfer and exchange of knowledge, above all between people working in the same area, despite the fact that they do not necessarily need to interact in order to carry out their daily work. According to the analysis,

such interaction will significantly benefit the overall functioning of the different tasks associated with the department and its relationship with other areas. Thus, the aim is to ensure that these people engage in this process in a natural way, of their own free will, and on the basis of a pre-established methodology.

4.3.1 The existence of methodologies in everyday work

As it has been observed, when analysing the features of the personnel, the act of sharing own knowledge is seen, in most cases, as a loss of power [13]. Specific knowledge with regard to a given subject grants the person that possesses it the possibility of standing out from the rest and of being able to resolve a problematic situation with greater ease than the others.

In addition, the more experienced people, in particular, are used to distinguishing which activities might bring them benefits at work and which might not and because of that, they tend whenever possible, to concentrate on the first.

Despite this fact, there are tasks that must be carried out in order to comply with the process in spite of not belonging to this group. In these cases, and in order to ensure that all the people involved in the process carry out their activities properly, some highly specific and very clear methodologies have been defined to point out what, when, with whom and how a task must be done, which also implies a subsequent control to check that this has been the case.

In the particular case that is being analysed in this article, our aim is to be able to ensure that the different people in the area understand and consider the exchange and transfer of knowledge as a useful tool that will bring them personal benefits in terms of their daily work, especially tacit knowledge.

However, it is expected by the authors that the consideration of the exchange and transfer of knowledge as being a useful tool will not certainly be an idea that they will easily accept, insofar as this tool will not be seen as useful from the start. It is bound to involve a long, slow process of self convincing. What will make them change their minds will be the achievement of satisfactory results.

In order to start this process of experimentation and self-analysis of results, it will be necessary to establish a clear methodology that explains to the different people in the area exactly what this exchange and transfer of knowledge consists of, and how it should be carried out, even considering the frequency with which the methodology could be applied and any initial external control.

In order to facilitate the transfer of knowledge, especially tacit knowledge, in the analysed environment, the authors propose the need of using a methodology easy to apply, not high time- or effort-consuming, does not require computer skills, but a direct relationship between the people of the area.

4.3.2 Review of existing KM methodologies and analysis of its application in the studied area

As presented in section 3, there are many KM methodologies that are being applied successfully in industrial environment to improve management of knowledge within organisations. When analysing those KM applications used to improve specifically knowledge transfer, most of them are based on IT solutions making transfer of explicit knowledge possible. There are, however, other face-to-face based methodologies that look for a transmission of more than just knowledge that could be written down.

One possible application is storytelling: there are situations in which telling a story to illustrate a specific situation helps all the people involved to understand more than just directly explaining the problem/situation. A pro-active attitude is necessary to think about what is to be transmitted, to find the story that could adapt to the situation, and to transmit it.

Another possible strategy to transfer knowledge with a rich tacit dimension is mentoring. However, its application is individual (an experienced employee mentors a junior one) and knowledge flows normally only in one direction (as happens in Reflective Practice proposed by Schön).

A methodology which is intensively used in organisations, especially in the design phase, is brainstorming. It is a collective methodology focused on generating ideas from personal insights and the combination or evolution of other people's ideas.

An application adapted to the organisation's culture of the analysed area is, however, not easy to find: it should be an abridgement of group application, with participation of employees who are not always pro-active enough, that helps to transmit all the personal and individual knowledge acquired and learnt over years, but which needs little time or effort.

4.3.3 Proposed methodology – Exchange of Mental Schemes (EMS) methodology

The proposal of the EMS (Exchange of Mental Schemes) methodology is based on the results obtained in the study [12] consisting of the exchange of mental schemes in the learning of engineering concepts. As explained in that study, by means of an in-group application of the EMS method, a much more in-depth understanding of the analysed concepts is achieved, to the extent that there is a modification (change or extension) in the mental scheme of each of the participants, and the learning process is much longer lasting.

The application of this method to the case analysed from industry is proposed so that the different people from the area are able to modify their mental schemes with regard to the basic concepts of their daily work, obtaining schemes that are as complete and extensive as possible, and also with a greater number of points in common. In this way, common bases with regard to overall actions in the area will start to be placed in position and, as a result, performance is expected to improve.

The EMS method is based on the concept of self-explanation in learning ([17]-[18]). Recent studies have illustrated the benefits of self-explanation in achieving a thorough understanding of concepts: self-explanation has been proven to be an effective metacognitive strategy that can help students to develop a thorough understanding of the subjects they are studying. An evolution of this process is proposed: the idea consists of forcing reflection and a thorough understanding of concepts or ideas by explaining one's own mental scheme, not just to oneself, but in a group. The aim is to compel each member of the group not only to analyse his or her own mental scheme in greater depth, but also to listen, understand and analyse the concept as explained by the others.

In terms of D.A. Schön [19], it could be said that a group reflection-on-action is carried out, considering that the action to be analysed will not be a common experience, but the own mental scheme about a concept, problem or design activity that the people applying the methodology are used to dealing with in their daily tasks.

Stages of the EMS method

There are two stages or different parts to applying the method proposed:

- The first step consists of an individual explanation by each person in the group of his or her mental scheme with regard to a specific concept (problem, task, etc.). This first stage of individual explanation must be accompanied by listening that is active, open and reflective on the part of the rest of the group members. In order to explain the mental scheme of the concept chosen, the people in the group are urged to use any means at their disposal in order to be able to exteriorise (verbally, with drawings, diagrams, etc.) their own mental scheme, conveying all the ideas or nuances contained by the concept and, to this end, using all the resources they believe to be appropriate, such as comparisons, sensations, memories, etc., in spite of the fact that these might seem absurd. It is important that the rest of the people listen respectfully to the explanations, attempting to understand perfectly what the speaker is trying to convey to them. This initial individual explanation must be given by all members of the group before going on to the second stage of the method.
- The second stage of this method comprises an active discussion of the concept in question, based on the individual explanations made by each member of the group, and analysing the different perspectives that have been presented, formulating questions that help to express and understand the different points of view, etc. This interconnection is important, given that it is through feedback from the other people that the person in question is forced to reflect on their own ideas. This process will be brought to an end in a natural way, when the people in the group believe that they are unable to contribute any additional reflection to the concepts and ideas already explained. In this case, the method guide or facilitator will confirm the questions and comments made by the other members of the group, who will also be involved in the same process of self-explanation. The advantage of this methodology lies in the fact that the different points of view expressed by the various participants oblige the rest to reflect on perspectives that they would not have otherwise considered, thereby enriching this line of action and generating feedback. Unlike other IT-based KM applications, the EMS methodology does not consist of an orderly centralisation of information to be consulted in a near future by people of the area that could be interested in this information, but a transmission, in oral form, of the mental schemes of daily work concepts and an enrichment of the own mental schemes due to the feedback and interaction generated in the methodology application sessions.

4.3.4 Possible methodology application problems due to organisational culture

In order to reduce the application problems of the EMS methodology, the reasons why other KM applications have not always work in an optimum way in the analysed department have been studied. The purpose is to avoid the same kind of problems when the EMS methodology is applied.

After observation of the area's behaviour, some probable reasons have been detected (most due to people having much experience, but due also to numerous habits acquired in the past):

- Lack of time.
- Lack of enough computer abilities of older, experienced people in the area.
- Sharing of knowledge is seen as a loss of individual power.
- Most people have not experienced the benefits of having available correct documentation from previous projects.
- There is no motivation for the people in the area to document the process/results of the project in a complete and correct way.
- There is not a clear directive from management to foment a correct use of KM applications (the first priority is seen as solving daily problems).

Thus, the proposed methodology must be much easier and require less effort to be carried out:

- Oral process.
- A fixed schedule must be followed [For example, once a week – a two-hour session Friday afternoon (one or two concepts/problems/activities per week)].
- As a group task, it is more difficult to be postponed than an individual activity.
- It could be seen as a different activity after the weekly routine.
- It is common that older people with experience like to discuss their experiences and knowledge.
- To ensure that overall functioning will be as expected, it must be accompanied by an important cultural change that encourages this type of activity [13].

In this section, a series of possible limitations, detected a priori, must also be considered. These have been classified on the basis of whether they are self-imposed limitations, for each individual, or external limitations (imposed by the organisation or management).

Self-imposed limitations:

- Fear of sharing own knowledge due to a loss of power [13].
- Fear of appearing foolish by explaining own mental schemes.
- The more experienced people may have concepts that are so firmly rooted that they cannot accept any other way of thinking or doing things.
- Lack of habit of listening to anyone else.
- Inability to open one's mind to new ideas.
- Possible prejudices between experienced people and young, recently employed people.
- Perceiving the activity as a waste of time, as an activity that is useless and contributes nothing.

Limitations imposed by the organisation and/or the management:

- Not to encourage human capital and knowledge among their collaborators as a fundamental and essential element without which daily work cannot be carried out.
- A general atmosphere where there is a lack of time or a reluctance to engage in this type of activity [13].
- Not respecting the sessions scheduled by collaborators with other people from the area in order to carry out this method.
- Not to listen to and/or accept ideas for improvement that could arise at these encounters.
- Wanting to know the results of these sessions (which could act as a restriction on the part of collaborators with regard to their freedom to act in the various sessions).

Thus, it is essential that there be a climate that is favourable for the transfer of knowledge and the exchange of ideas. To this end, clear bases to promote this climate must be established.

- It will be very important to convey the idea that unshared knowledge is not valid knowledge, and that the transfer of knowledge represents power for all people who participate in the transfer process.
- Promotion of the idea that the capital of the department is its people, the knowledge that they possess and continuously acquire through their daily work.
- A climate of cordiality, relaxation and goodwill.

In addition, the following norms must be taken into account and applied during the process of the exchange of mental schemes:

- A relaxed, stress-free atmosphere.
- Dealing with questions that are not directly associated with a specific person, so that opinions can be given freely without offending sensibilities.
- Respecting other people's ideas and not arguing or entering into conflicts.
- The opening of minds, as much as possible, to try to understand other people's mental schemes.
- Using, if considered opportune, exaggerations or ideas that might appear to lack any basis, should these help, in some way or other, to express one's way of thinking with regard to a given concept.
- Nobody must be permitted to laugh at anyone else in the group (as happens in brainstorming).
- Making as many comments as possible, as well as reflections, with regard to the concepts expressed by third parties (maximum interaction).

This technique is considered as just one possible way of learning and, as a result, as benefiting the participants. The results of these sessions must not elevate to management (with the exception of certain joint ideas that will need management support to be put into practice). What is sought here is that people will be able to apply the methodology in a relaxed way without feeling inhibited.

All the points stressed in this section will probably help in an effective application of the proposed methodology. Nevertheless, only years of practical application in the industrial environment will ensure its success.

5 CONCLUSIONS

As a consequence of not enough communication and lack of knowledge transfer, especially between people doing similar tasks, and not to use efficiently the KM applications available in the department, there is no optimum overall knowledge, but just individual knowledge unshared between the different people in the area. Therefore, advantage is not taken of the potential resulting from combining or pooling all of the individual knowledge and distinct points of view possessed by the different individuals.

In order to improve overall efficiency by encouraging the transfer of knowledge and exchange of mental schemes, a methodology is proposed: it consists of an adaptation to the business world of the Exchange of Mental Schemes (EMS) method [12].

Difficulties found in the analysed environment applying different available KM methods have also been studied in order to reduce the same kind of problems in the application of the proposed methodology.

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