KNOWLEDGE BASES DEVELOPMENT AT THE SMEs LEVEL IN THE NEW KNOWLEDGE SOCIETY

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Abstract: In the European countries more then 95% of the companies are small and medium-sized enterprises (SMEs) and majority of the European Union employees work in these companies. In order to develop intelligent business to become competitive, the enterprises must increase the quality and technologic level of products and services, to have permanent new product or to make old products bettering and to have a good prices policy. These activities request first a large amount of data, information and knowledge collected from all sources and then request transferring knowledge at each enterprise level. This paper analyses the state of art of the SMEs knowledge and presents how can be knowledge bases built and used at the SMEs level to support an enterprise department activity.

Key words: knowledge, knowledge bases, knowledge processes, knowledge society, SME.

1. INTRODUCTION

The market situation of the European countries is the following: 99% of companies in the EU are small and medium sized enterprises (SMEs) – companies with a maximum of 250 employees and a maximal turnover of € 50 million. In the European Union (Europe have 23 million SMEs and 41 000 large companies) SMEs employ more than 65% of all employees. During past years, SMEs have created 80 % of the new jobs in the EU (IP/08/1003, Brussels, 25th June 2008).

In the last time, a lot of research in the field of knowledge management is dedicated to large companies or international concerns and the small and medium-sized enterprises were forgotten.

Nowadays, enterprises tend to differentiate themselves from what they know (intellectual capital) and from how they use knowledge. The interest for knowledge within enterprises begins with identification that the value of market of several enterprises is much larger than the value of their own physical patrimony (equipments, facilities etc.). Anyway, before start to collect and use knowledge, the companies need to have a good defined answer at the essential SMEs questions shows in Fig. 1.

Fig. 1. The *essential questions* at the SMEs level.

2. THE SMEs KNOWLEDGE

Whether we consider one enterprise or a holding, for survival, it is necessary to learn from the past, supervise the present and plan the future. An important factor for the enterprise in the products and services development is to know, to establish, to translate and to define the customer requirements using quality methods, tools and techniques.

The enterprise use IT & C support to attract, retain and cultivate relationship with customers, streamline supply-chain, manufacturing, procurement systems and automate corporate processes to deliver the right products and services to customer quickly and cost-effectively. In this new era of information, the fundamental sources of wealth are knowledge and communication, and not natural resources or labour work [1, 6]. Today, one can differentiate three classes of elements as [2]:

1. *Data* – a discreet and objective group of facts of a certain event.

2. *Information* – a message containing an originator and a receiver and whose meaning involves a new interpretation based on a group data.

3. *Knowledge* – a mixture of experiences, values, contextual information and intuition, forming a framework in a person's mind that enables him/her to evaluate and to obtain new experiences and information's.

Kknowledge exists in the mind of people and circulates within organizations [1]. For all companies KM and innovation plays an important role [2]. Many of KM initiatives are implemented in large companies but in the last years there is a shift towards small and medium-sized enterprises [3]. According to some studies SMEs need a simple framework to organize their key knowledge processes: knowledge identification, knowledge acquisition, knowledge distribution and knowledge preservation [4, 5].

The *key knowledge processes* (KKPs) for SMEs identified by us are presented in Fig. 2 [6].

For SMEs it's necessary that the advantages of KM are clear and the implementation is easy otherwise they will continue to focus on their traditional way of working [7]. There are four different roles of knowledge in SMEs business (see Fig. 3), [8, 9]:

1) *Knowledge as support*: there is a low current strategic position of knowledge and in future too.

2) *Knowledge as manufactory*: knowledge plays now an important role but the importance will decrease in future.

3) *Knowledge as breakthrough*: in future knowledge will play a very important role for the business still it does not.

4) *Knowledge as weapon*: knowledge is important and the importance will increase in future.

Generally, in some SMEs activity sectors, the knowledge generate capacity exceeds the human records and process capacity, which lead to a super sized knowledge offer.

In this way can be generated an inefficacy at the organizational and personal level. Figure 4 shows the relationship among knowledge production, knowledge assimilated and the knowledge uses effect. This figure reflects the three essential trends that characterize the new knowledge society and can influence some SMEs activities [6]:

1) *Knowledge offer increase*;

2) *Knowledge assimilated increase, but in a much slow rhythm*;

3) *Maintaining an almost constant level for knowledge used*.

Short, medium and long term knowledge in handling industrial purposes research will focus on three main directions [10]:

1) *Knowledge capitalization*;

2) *Knowledge formalization*;

3) *Knowledge use*.

The main studies are identified three important distinctions of knowledge types that has been used [11]:

1) *The explicit knowledge* – which can be expressed in words and numbers; they can easily be communicated and distributed in the form of data, scientific formulas, codified procedures or universal principles.

2) *The tacit knowledge* – that are very personal and difficult to formalized, dependent on experience and individual characteristics.

3) *The implicit knowledge* – stored in the entities that depend on the practical context – products, technologies, processes, etc.; the value of knowledge is manifested in physical goods and services, the intellectual products (patents and licenses), processes (structural capital) and people (intellectual capital).

At the enterprise level the knowledge could be found to individual, group or external resources. Professional qualifications, personal experiences, capacity to transform information's in knowledge constitute the individual resources.

Patent acts, models, concepts, enterprise culture and management form the group resources. Individual and group resources totality represents the enterprise internal resources.

Relations set of external resources with client, suppliers and partners, product and services credibility,
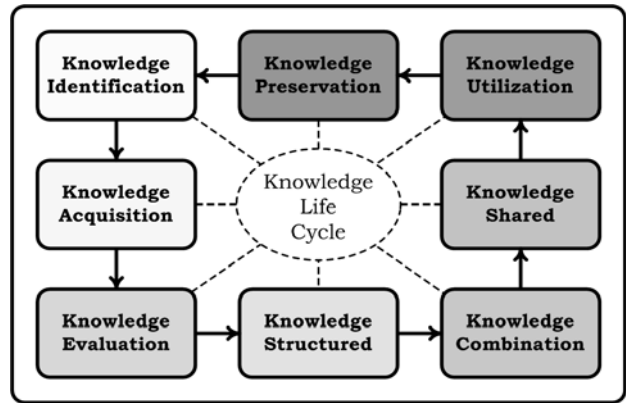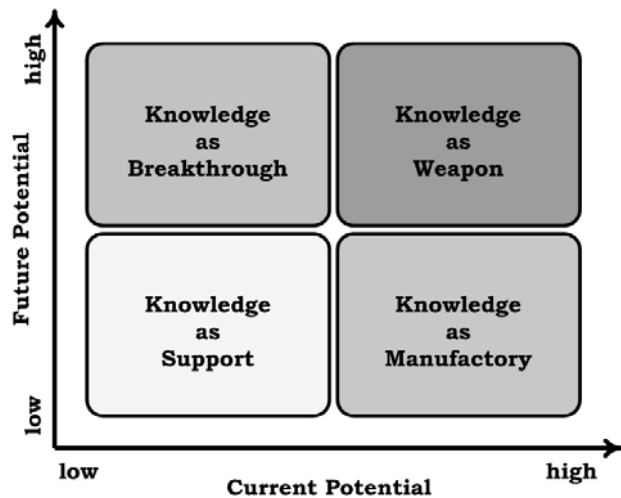

Fig. 2. The *key knowledge processes* in SMEs.

Fig. 3. The *knowledge roles* in SMEs business.
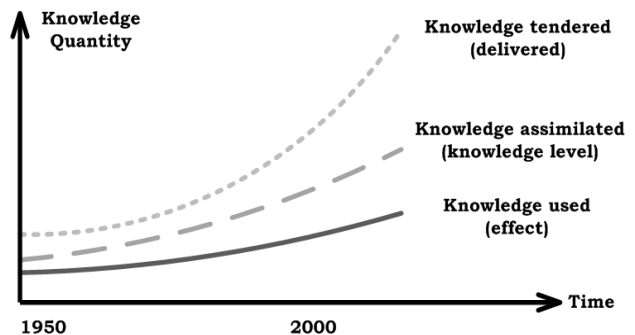

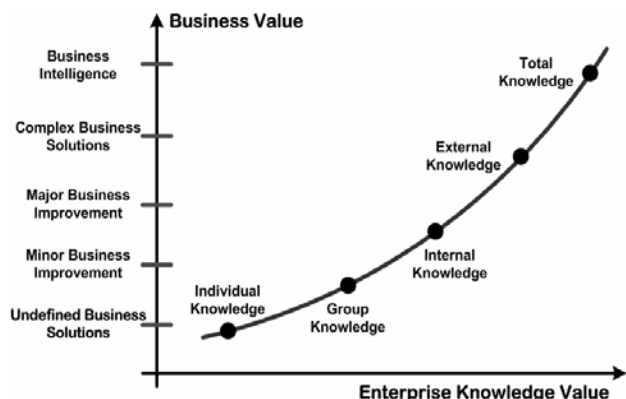**Fig. 4.** *Knowledge flow* vs. *knowledge used* in SMEs.

Fig. 5. *Business value* vs. *knowledge value* in SMEs.

offering quality. Tacit or explicit knowledge transfer between these resources and knowledge conversion from a resource to other determines value creation [12]. Figure 5 shows how business value is added when the volume and quality of knowledge from the company grows.

3. THE SMEs KNOWLEDGE BASES MODEL

According with standards and technical norms enterprises have a technical or engineering department for manufacturing, montage, design, research, service, products quality assurance, activities support. One of these department main activities is to choose a product based on project, montage, and data sheets requested characteristics.

A library, database or knowledge base at the enterprise level to sustain this activity is necessary. We analyzed this activity and elaborated an expert system implemented in VP-Expert (we used expert system generator - VP-Expert version 2.1, by Brian Sawyer, Educational Version, distributed by Paperback Software International) to choose a product when the technical characteristics are known.

To build the knowledge base (see in figure 6 the knowledge base *ALEGCONT.KBS*), we used an enterprise model active in design, montage and service for water, gas and heating systems. We established a number of water, gas and heating class elements available in the enterprise warehouse and, after that, we defined the elements main technical characteristics, destination, constructive characteristics, etc.

For example, we considered a meter element and we established a complete meter name like below (we mark with 'C' each defined technical characteristic):

Domestic (C_3) **Cold** (C_2) **Water Meter** (C_1), **Mono-jet with Dry Mechanism** (C_4) → *knowledge base consults* → **ETX** Model with Nominal Diameters **DN 15 - 20 mm**
Or:

Domestic (C_3) **Cold** (C_2) **Water Meter** (C_1), **Multi-jet with Dry Mechanism** (C_4) → *knowledge base consults* → **MTX** Model with Nominal Diameters **DN 15 - 50 mm**

We eliminate the producer name from the complete element name to each product for advertising reason. After meters technical characteristic defined we built the knowledge base *ALEGCONT.KBS* (Figs. 6 and 7).

Production rules form the knowledge representation model used in this work.

In *ALEGCONT.KBS* knowledge base there are *if-then* structure rules excluding the rules for inference engine operations.
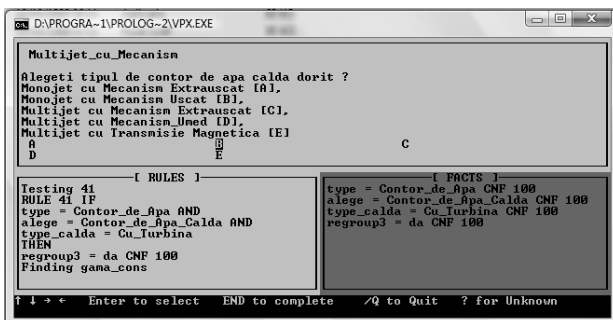

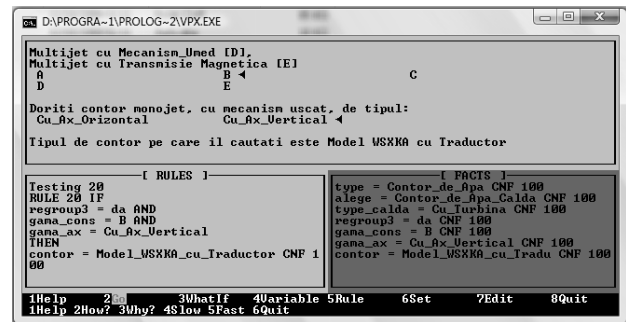**Fig. 6.** The knowledge base *ALEGCONT.KBS* interrogation.

Fig. 7. The knowledge base *ALEGCONT.KBS* consults.

RULE 29

IF   type = Contor_de_Caldura AND
             type_ccaldura = Contor_Ultrasonic
THEN   contor = Contor_TermoSon
BECAUSE "Contorul ales este conform cerintelor.";

RULE 30

IF   type = Contor_de_Caldura AND
             type_ccaldura = Contor_Compact
THEN   contor = Contor_TermoCom
BECAUSE "Contorul ales este conform cerintelor.";

RULE 31

IF   regroup5 = da AND
             cmultijet = Cu_Totalizator
THEN   contor = Model_M_TX
BECAUSE "Contorul ales este conform cerintelor.";

RULE 32

IF   regroup5 = da AND
             cmultijet = Cu_Trans_Date_la_Distanta AND
             date_type = Cu_Traductor
THEN   contor = Model_M_TXKA
BECAUSE "Contorul ales este conform cerintelor.";

RULE 33

IF   regroup5 = da AND
             cmultijet = Cu_Trans_Date_la_Distanta AND
             date_type = Cu_Lagare_Imbunatatite
THEN   contor = Model_M_THXKA
BECAUSE "Contorul ales este conform cerintelor.";

The user choose first the needed class meter (water, gas or heating meter) and then follows few steeps requisite to establish the product technical characteristics and, finally, the user see the available meter name which correspond from technical point of view. If the users wish he could see, for verification, the covered way of expert system inference engine during to knowledge base consults. For Fig. 6 interrogations, the covered way is the following:

! contor
! ! Testing 1
! ! ! type
! ! ! ! (= Contor_de_Apa CNF 100)
! ! Testing 2
! ! Testing 3
! ! Testing 4
! ! ! regroup0
! ! ! ! Testing 38
! ! Testing 5

```
!  !  Testing 6
!  !  Testing 7
!  !  !  regroup1
!  !  !  !  Testing 39
!  !  !  !  !  alege
!  !  !  !  !  !  (= Contor_de_Apa_Calda CNF 100 )
!  !  Testing 8
!  !  Testing 9
!  !  Testing 10
!  !  Testing 11
!  !  !  regroup2
!  !  !  !  Testing 40
!  !  Testing 12
!  !  Testing 13
!  !  Testing 14
!  !  Testing 15
!  !  Testing 16
!  !  !  type_calda
!  !  !  !  (= Cu_Turbina CNF 100 )
!  !  Testing 17
!  !  !  regroup3
!  !  !  !  Testing 41
!  !  !  !  (= da CNF 100 )
!  !  !  gama_cons
!  !  !  !  (= B CNF 100 )
!  !  Testing 18
!  !  !  gama_ax
!  !  !  !  (= Cu_Ax_Vertical CNF 100 )
!  !  Testing 19
!  !  Testing 20
   !  !  (= Model_WSXKA_cu_Traductor CNF 100 )
```

4. CONCLUSIONS

In the last time, a lot of research in the field of knowledge management is dedicated to large companies or international concerns and the small and medium-sized enterprises were forgotten. This is the main reason why in this paper was analyzed the SMEs knowledge, the key knowledge processes at the SMEs level and the knowledge roles in SMEs business based on the main internal and external SMEs knowledge resources used during the product development process and business strategies elaboration. Finally yet importantly, the paper presented how a knowledge base can be built at the SMEs level to support an enterprise department activity.

This work is focusing on a university - SMEs partnership. The validation of this methodology by a case study in the CESICED project is to determine the new organization type for integrating the virtual enterprise medium and to outsource shared resources from UPB-PREMINV research centre to industrial and university partners. We intend that our future work in this area includes building other knowledge bases to support eventually all SMEs departments' activities.

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