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## IMPROVING THE QUALITY OF KNOWLEDGE LEVELS THROUGH MATURITY MODEL IN SME OF SERVICES

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### *Abstract*

*The aim of the paper is to show possibility of using knowledge management maturity model (KMMM) for knowledge processes assessment. As a support tool for increasing quality of the knowledge processes can be used mainly PDCA cycle and Kolb's learning cycle. PDCA cycle ensures creation of new knowledge and Kolb's cycle ensures improving the quality of existing knowledge. ISO 9001 standard can provide documentation of knowledge. Important is perception management knowledge like never-ending and continuously improving process.*

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**Keywords:** management maturity model, quality of the knowledge processes.

### **Introduction**

Most of the business failures lie in the lack of knowledge. On the other hand the rapid development of knowledge and informatization may represent source barriers to business development. Comparing enterprises in terms of size, the situation is worse in SMEs. In the business environment of SMEs are different barriers such as: lack of financial resources, own professional background as well as sufficient human resources. In SMEs also far more frequently, than in large enterprises, occurs unsystematic process of handling with knowledge. There is a lack systems for storing knowledge, it is not supported knowledge sharing and there are not produced sufficient conditions for learning [Pee-Kankanhalli, 2009].

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If the enterprise is focused on the provision of services, the importance of knowledge management for him is even greater, because the provision of services depends mainly on who and how the services are provided – on human resources and their knowledge level.

### **Increasing and decreasing the level of knowledge in the enterprise**

In enterprises it is important to support knowledge processes in which either increases the amount of knowledge or improve existing knowledge quality [Choi-Lee, 2002].

However, in the case of the human factor occurs in addition to processes of learning also of forgetting the learned. In this paper, we focus on knowledge-intensive processes, which:

1. improves the quality of knowledge in the enterprise:
  - a) generate new knowledge – learning
  - b) enhances the level of existing knowledge – knowledge retention and repetition
2. reduces the quality of knowledge in the enterprise:
  - a) occurs knowledge losses – forgetting,
  - b) and this may influence in maturity models transition from level to level.

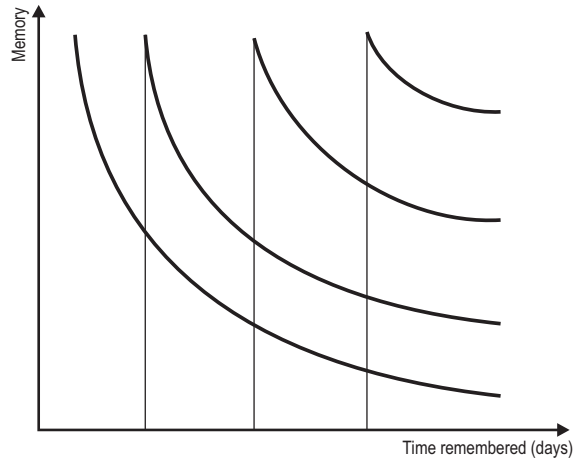
For each enterprise, it is important to focus on improving the quality of knowledge (learning and retention) and eliminate knowledge losses (forgetting) [Chen-Fong, 2012].

The German psychologist and scientist Hermann Ebbinghaus was the first to perform elaborate and scientific experiments on how we learn and forget. His fundamental finding, one that was confirmed in hundreds of scientific studies over time, is the forgetting curve. – On – Fig. 1 is simplified forgetting curve, which shows exactly how humans, and as it turns out other living organisms, forget an initially learned fact. Ebbinghaus found that the forgetting curve is exponential.

That means that the retention rate (the percentage of what we still remember) decays in the first days and weeks extremely rapidly. In fact the decay is so strong, that we forget almost 80% of all new learned items within one to two weeks.

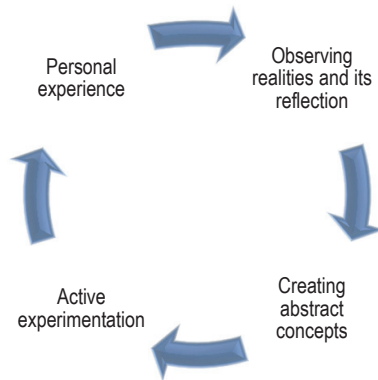
To reduce losses knowledge, it is necessary to ensure continuity of learning processes, as well as the retention of existing knowledge. This leads to continual repetition of already learned knowledge and also to the formation of new knowledge. As a continuous process, understood the learning process Denis Kolb (1984), when create the Kolb learning cycle. (Fig. 2). This is composed of four phases:

1. Personal experience – situation which gives rise to new experiences. This situation can be planned or accidental.
2. Observing realities and its reflection – involves active thinking about the experience acquired and its significance.



**Figure 1.** Forgetting curve

Source: Ebbinghaus (1964).

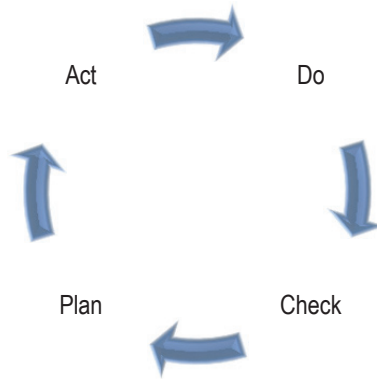


**Figure 2.** Kolb learning cycle

Source: Kolb (1984).

3. Creating abstract concepts and generalization – at this stage there is a generalization of the experience and its potential use in similar situations.
4. Active experimentation – the testing of new knowledge in new situations, which provides the foundation for the emergence of a new experience. Then the cycle begins anew, but with a higher amount of knowledge [Kolb, 1984].

From the perspective of knowledge management and knowledge processes in the enterprise is essential to ensure the creation of new, documentation and qualitative improvement of existing knowledge. For ensuring these processes it can be connected Kolb's learning cycle with Deming's PDCA cycle (Fig. 3).



**Figure 3.** PDCA cycle

Source: Deming (1993).

PDCA cycle has four phases:

1. Plan – plan what you want to do.
2. Do – implement the plan, do, what you have planned.
3. Check – check if everything is done according to plan.
4. Act – act according to what you found, or execute a correction if there a plan has not been fulfilled [Deming, 1993].

By comparison of the two basic models specific to Knowledge Management (Kolb's learning cycle) and Quality Management (PDCA cycle), it is possible to express the relationship between knowledge management techniques and quality management (Fig. 4). If we want to be more specific about the existing relationship between research sites, we could give him the adjective „support”, because studied discipline can support each other through mutual use of tools.

In terms of knowledge, it is relevant that the PDCA cycle for the checking of making, occurs new knowledge, which is used to improve planned, made against a controlled activity. Cycle retains its continuous nature of continuous improvement, because after the improve phase, occurs a new plan and the cycle continues. PDCA cycle also allows storing of existing knowledge.

In Kolb's learning cycle occurs learning through experience. Entity obtains experience (knowledge), it is observed, compared with the general theory, verify it in practice and then on the basis that creates new knowledge. Resulting knowledge pass again all phases learning cycle, so their quality is constantly increasing (Fig. 5).

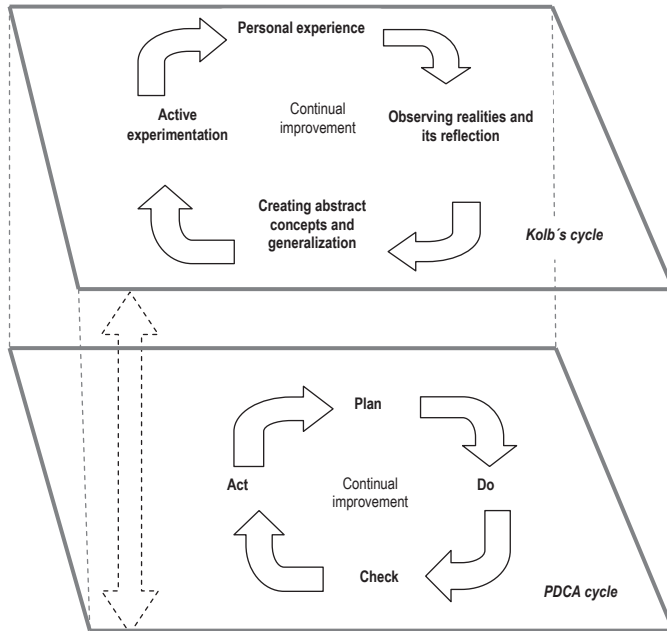


Figure 4. Comparison of Kolb 's learning cycle and PDCA cycle

Source: own processing.

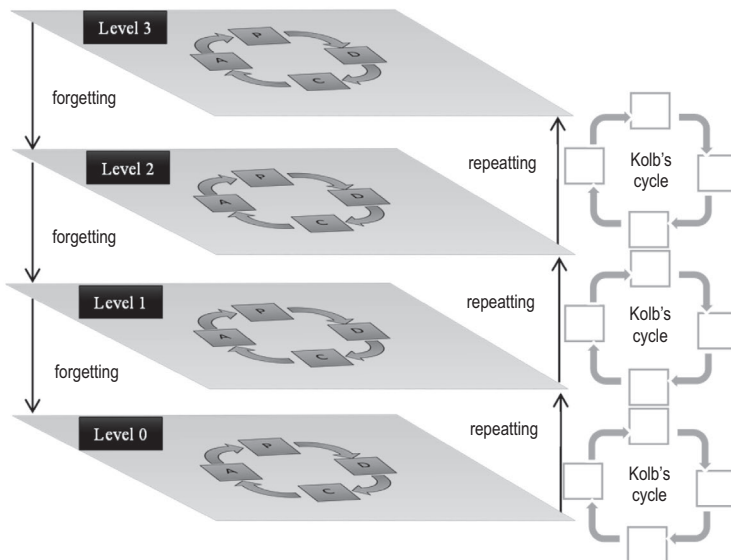
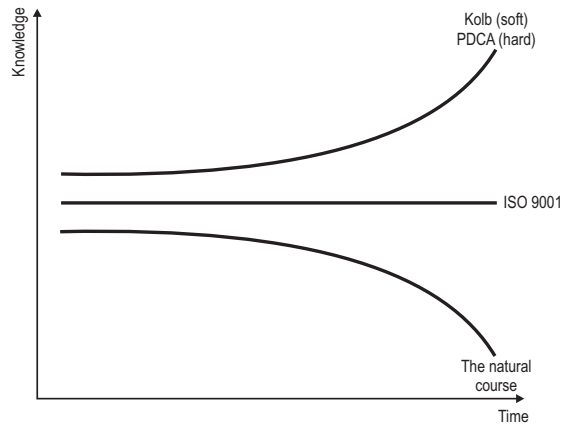


Figure 5. Possibilities of increasing and decreasing the quality of knowledge levels KMMM

Source: own processing.

PDCA cycle as well as Kolb learning cycle help improve the quality knowledge and knowledge processes, while in the PDCA cycle knowledge creation – are the result new knowledge and Kolb's learning cycle to improve knowledge – the result is improved quality level of knowledge in the enterprise. Opposite effect causes forgetting, this may reduce the quality of knowledge and also may reduce the level of knowledge management in the enterprise. To prevent loss of knowledge is very important retrieval of knowledge. Therefore, learning should take place as a continuous process. Repeated evaluation of the knowledge level in the enterprise using a model of maturity is possible to determine on which curve the enterprise is (Fig. 6).



**Figure 6.** Graphical representation of increasing and decreasing the quality of knowledge levels KMMM

Source: own processing.

Figure 6 shows three alternatives – 3 curves, which reflect the progress of knowledge processes in the company and may be:

1. Declining – if the amount resp. reduces the level of knowledge. In this case occurs loss of existing knowledge caused by forgetting or Failure to keep knowledge.
2. Linear – ISO 9001 supports the retention of knowledge and thus prevents the Knowledge losses in the enterprise.
3. Growing – continuity of PDCA cycles and Kolb's learning cycle allows increasing the knowledge levels in the enterprise.

### KMMM creation

In terms the level of implementation includes the proposed model six basic components:

1. The criteria for assessing knowledge management K1-K6:

- K1: People, education, competence
  - K2: Environment
  - K3: Processes
  - K4: Leadership
  - K5: Technology
  - K6: Continuous Improvement
2. Levels of knowledge management maturity
  3. Indicators of the evaluation criteria
  4. Scale of points for evaluating the maturity level of criteria
  5. Suggestions and recommendations for achieving a higher knowledge management maturity level
  6. Glossary

For improving the knowledge management is in the KMMM important recommendations and suggestions for improvement. The fulfillment of these recommendations in the different levels is an essential attribute for the transition to the next level. Characteristics of levels and suggestions and recommendations illustrate Table 1.

**Table 1.** Suggestions and recommendations for achieving higher maturity levels

Maturity level	State of the KM corresponding to the maturity level	Proposals for moving to a higher maturity level	PDCA cycle and Kolb learning cycle
<b>Level 0</b>	The company has a system of knowledge management, there are not defined knowledge processes, knowledge in the company are chaotic – after the enterprise fragmented or isolated – hidden in the minds of so employees do not know about them and not use them adequately. In enterprise is – lacks of the real vision of KM.	At this level it is important to create a vision and set goals KM. Furthermore, it is necessary to develop a positive attitude for KM of employees, establish programs for the introduction of KM and initiate the process of acquiring, sharing and documentation such as. training courses, coaching, capturing of experience and so on., which can be transferred and used for further development and support KM.	Knowledge is created  Existing knowledge is improve
<b>Level 1</b>	It Occurs first practical definition of KM and based on which are formed the first pilot projects KM. Staff are familiar with what is KM but not yet identified with this approach. Knowledge processes are described only partially based on literary sources of „KM pioneers”.	When reaching level of initiation is recommended to create a „developed” strategic plan focused on standardized approaches of knowledge MANAGEMENT SYSTEM, which are an expression existence of a knowledge management system in the enterprise. Managers should utilize knowledge and information from all sources within the enterprise and use them in creating competitive strategies.	Knowledge is created  Existing knowledge is improve

Table 1 continued.

Maturity level	State of the KM corresponding to the maturity level	Proposals for moving to a higher maturity level	PDCA cycle and Kolb learning cycle
<b>Level 2</b>	In enterprise is creating a strategic plan, whose main goal is to build a knowledge management system. Employees are identified with enterprise vision of KM, trying to reach their full potential of knowledge. Change in thinking.	Enterprise should focus on an integrated approach to KM – encompass all parts of the enterprise, systemic approach to KM, the ability to develop flexibility, regularly evaluate on the results achieved in order to meet the new requirements in KM, to fulfil the vision of enterprise in terms of KM.	Knowledge is created  Existing knowledge is improve
<b>Level 3</b>	In enterprise is a system providing KM process knowledge in all directions from the acquisition to the documentation, so that the most effective use of all the possibilities. Enterprise also evaluate the results of KM and fills arrangements for continuous improvement.	Achieve the highest level KM should not mean a static condition, but a dynamic fighting in terms of continuous improvement. It is particularly important to respond flexibly to changes in the environment. This level is probably the most obvious evidence of the enormous importance of learning as a cyclical never ending process.	Knowledge is created  Existing knowledge is improve

Source: own processing.

Maturity model should have an essential as the PDCA cycle, and Kolb's learning cycle in the cyclicity of knowledge management. This will ensure the principle of continuous improvement.

## Research results

The above-referenced assessment model of knowledge management was the subject of verification in the micro-enterprise services (micro enterprise A). The following are partial results of the verification evaluation model of knowledge management in the micro-enterprise A.

The following tables show the results score of criteria K1-K6. Each table presents maximum possible score of the indicator, score and percentage of obtained scores for individual indicators reached a maturity level of the criteria, which stems from the specified point of scale for assigning maturity level as a criterion.

### K1: People, education, competence

In criterion K1 attention was focused on human resources. People can be considered as the most important source of productive resources in the enterprise. In the field of knowledge management is the importance of people more significant because people are just bearers of knowledge.



K1 contains indicators of education, knowledge and behaviour, which illustrates the Table 2.

**Table 2.** Evaluation criteria K1 in the micro enterprises A

Indicator	Maximum score	Obtained score		K1 Maturity level
		N	f (%)	
Education	9	6	67	
Knowledge	9	3	33	
Behaviour	9	4	44	
Total	27	13	48	<b>1</b>

Source: own processing.

In the indicator Education is evaluated level of training of educational achievement or training. Knowledge indicator evaluates the knowledge level of all human resources in micro-enterprise A. Behavioural indicators evaluates behaviour of all employees in micro-enterprise A. Table 2 illustrates evaluation the criteria and the maturity level K1.

Based on the results in Table 2 was the criterion K1 in the micro-enterprise A assigned by maturity level 1, which means that the company in terms of the criteria K1 – people, education, competence – is at the initiation of knowledge management. Based on the characteristics of the different maturity levels classified according to the criteria, we can conclude that people in micro-enterprise A have the basic knowledge necessary for the performance of work and these are reflected in the behaviour of employees.

In the same manner in the form of frequency tables are evaluated the other criteria of knowledge management maturity model for micro-enterprise services.

### **K2: Environment**

In this criterion the emphasis is to determine, whether in the micro-enterprise A occurs creating business climate supporting knowledge processes, whether employees actively cooperate with each other and how important are the views of employees. Table 3 expresses the evaluation of the criteria K2 in micro-enterprise A.

**Table 3.** Evaluation the criteria K2 in the micro-enterprises A

Indicator	Maximum score	Obtained score		K2 Maturity level
		N	f (%)	
Business climate	9	3	33	
Interpersonal relationships in the enterprise	9	3	33	
People's views and delegation	9	6	67	
Total	27	12	44	<b>1</b>

Source: own processing.

In criterion K2 was achieved level 1 – levels initiation, which we can according to the characteristics maturity levels classified under the criteria defined as the levels the neutral atmosphere and the business relationships between human beings usually of a formal nature.

### K3: Knowledge Processes

In this criterion, we searched for evidence of the existence and promotion of knowledge process in the micro enterprises A, which are the acquisition, sharing and use of of knowledge. Results are summarized in Table 4.

**Table 4.** Evaluation the criteria K3 in the micro-enterprise A

Indicator	Maximum score	Present state	Obtained score		K3 maturity level
			N	f %	
The acquisition of knowledge	9	depending on the actual needs	4	44	
Knowledge sharing	9	as appropriate	3	33	
Knowledge using	9	depending on the actual needs	4	44	
Total	27		11	41	<b>1</b>

Source: own processing.

K3 criterion was rated as well the above criteria and it has been assigned levels of initiation. This maturity level can be characterized as a level where knowledge processes are partially supported depending mainly on the legislative requirements.

### K4: Leadership

Securing of knowledge management by top management is necessary for micro enterprise. The management should support the processes of acquisition, sharing and utilization of knowledge and continuously improve them. It should also define the objectives of knowledge management and ensure the company against losses of knowledge capital. In Table 5 shows the maturity level criterion for K4.

**Table 5.** Evaluation criteria K4 in the micro-enterprise A

Indicator	Maximum score	Present state	Obtained score		K4 maturity level
			N	f %	
Support of knowledge processes		Unsystematic supporting	6	67	
Objectives of knowledge management		Undefined	0	0	
Knowledge loss		Unsecured	0	0	
Total	27	-	6	22	<b>0</b>

Source: own processing.

Leadership is considered to be in the business for one of the criteria with the greatest shortcomings because insufficiently secure the area of knowledge management. This is the finding level maturity criterion for K4 shown in the table above. In micro enterprises and from the perspective of top management would be appropriate to focus on personal development in terms of management skills, identify of knowledge management goals and ensure enterprise before the Knowledge losses.

#### **K5: Technological Infrastructure**

In criterion K5 intention was to find out at what level the enterprise is in the ownership and use of technology, whether it has sufficient technological base, or whether using information technology in the knowledge management. Indicators in criterion K5 are: technological base, use of technology, interest in IT, which reflects Table 6.

**Table 6.** Evaluation criteria K5 in the micro-enterprise A

Indicator	Maximum score	Present state	Obtained score		K5 maturity level
			N	f %	
Technological – base	9	Basic	3	67	
Using of the IT	9	Partial	3	0	
Interest in IT	9	Does not expres	0	0	
Total	27	–	6	22	<b>0</b>

Source: own processing.

Maturity level of technological infrastructure is in the micro-enterprise critical since reaching level 0, which is a serious deficiency for the enterprise, especially because information technology represents an important support tool in the management knowledge.

#### **K6: Continuous improvement**

Criterion K6 – Continuous improvement is an important criterion with regard obtaining information on the existence of feedback in the enterprise. Table 7 shows the level maturity criteria K6 – Continuous improvement in the micro-enterprise the knowledge management A. Under this criteria, we focused on the detection monitoring requirements within the knowledge management in the enterprise, on the way evaluation results in the knowledge management and corrective actions taken.

The level of maturity for K6 is zero, which represents with regard the requirements for the cyclicity, the serious lack of management knowledge. Level 0 can be based on K6 Tables 1 characterized as a state in which the company does not pay performance monitoring management knowledge nor has developed procedures in terms of continuous improvement.

Table 7. Evaluation criteria K6 in the micro-enterprise A

Indicator	Maximum score	Obtained score		K6 Maturity level
		N	f (%)	
Analysis and monitoring of knowledge	9	0	0	0
People vigor and continuity processes	9	0	0	0
Elimination of the identified shortcomings	9	3	33	1
<b>Total</b>	<b>27</b>	<b>3</b>	<b>11</b>	<b>0</b>

Source: own processing.

Based on the score of indicators in the micro-enterprises A was evaluated levels maturity of all specified criteria K1 to K6. Then evaluated by based level of the individual criteria may be applied to the evaluation of the overall level maturity in micro-enterprise A. Table 8 shows the result of the overall evaluation of knowledge management in the micro-enterprises A, which we have obtained based on point scale.

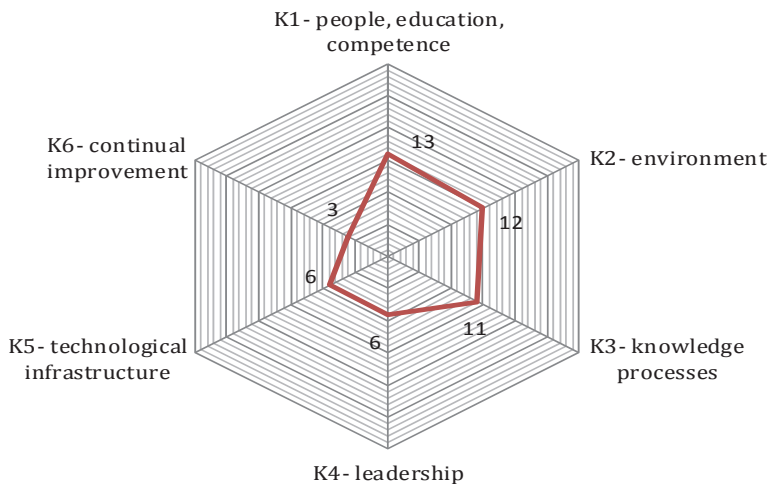
Table 8. Cumulative assessment of the overall KM maturity level in micro-enterprise A

Criteria	The obtained point evaluation	Assigned maturity level
K1 – People, education, competence	13	1
K2 – Environment	12	1
K3 – Knowledge processes	11	1
K4 – Leadership	6	0
K5 – Technological infrastructure	6	0
K6 – Continual improvement	3	0
<b>Total score</b>	<b>51</b>	<b>1</b>

Source: own processing.

The achieved maturity level of knowledge management in the micro-enterprise A is 1 – levels of initiation. Based on the characteristics maturity levels can be concluded that in the micro enterprises and appear first practical definition of MZ and based on them the first pilot projects are formed the KM. Staff are familiar with what is the KM but not yet identified with this approach. Knowledge processes are described only partially based on literary sources of „the KM pioneers”.

This result may be due to the clarity of the display using the spider graph. For illustration evaluation of knowledge management expresses Fig. 7th.



**Figure 7.** Spider view maturity levels of KM in the micro-enterprise

Source: own processing.

From fig. 7 is a noticeable lack elaboration of knowledge management especially in the criterion K6, although a low level of maturity achieved in the criteria K4 and K5. The results show a few facts, which may be selected for micro-enterprise as a benefit:

1. Micro-enterprise A has three fundamental under-developed areas (K4 – Leadership, K5 – K6 and Information Technology – Continuous improvement).
2. Maximum level achieved in all assessment criteria is 1.
3. Micro-enterprise A reach an overall maturity level 1 – levels initiation, but based on a set point scale it can be stated, that the obtained point evaluation is borderline with the maturity level 0.

Based on the above conclusions it is possible to choose and propose from the part of the proposals and recommendations for the micro-enterprise the following measures to improve the state of knowledge management and to increase the maturity level in the micro enterprise A:

- to develop a positive employees attitude of the knowledge management;
- to develop programs for the implementation of knowledge management;
- to initiate the process of obtaining, sharing and documentation such as: training courses, coaching, capturing of experience and so on., which can be transferred and used for the further development and promotion of knowledge management.

At the same time the enterprise can lay down a new vision and objectives of management knowledge depending on its own circumstances and needs arising from the business activities.

## Conclusion

The value of the knowledge and knowledge management in the current competitive environment of the enterprises has a justification. The reason of excessively and frequently using of this concept is the value of the knowledge capital that is often hidden in the minds of employees or explicitly located in the enterprise as an internal guidelines, a knowledge base, documented procedures, etc.

Large enterprises are more engaged in knowledge and knowledge processes such as micro-enterprises. They have developed many methods to measure and evaluate knowledge while micro enterprises considered those methods as complicated in relations of data acquisition and of their evaluation too.

The paper deals with the evaluation of knowledge management in micro enterprises and proposing of steps for the improvement of knowledge management. For this purpose is used knowledge management maturity model.

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