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Business Process Management for Model Based Design Automotive Projects

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Abstract

This paper presents the utility validation of a model for knowledge management. The utility of the model will be validated through business process management (BPM). The model for knowledge management was already proposed in another article. The model was developed based on the real environment of knowledge management of two automotive companies. Specifically, the environment of the companies was in the field of Model Based Design software products. Business process management (BPM) was chosen because it allows the simulation and analysis in detail of the model. In the end this will give a brief overview about the success of using this knowledge management model in real life environments.

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Keywords: Model Based Design (MBD); automotive; Business Process Management (BPM); event-driven process chain (EPC); knowledge management; tacit knowledge; explicit knowledge;

1. Introduction

Business process management (BPM) comes with different definitions which summarize the benefits of using this approach by organizations. Next, some of the benefits of the business process management (BPM) were selected from the concept definitions: improves quality, efficiency, effectiveness (Meidan, Garcia-Garcia, Escalona & Ramos, 2017), it is adaptable to change (Gazova, Papulova & Papula, 2015), and its main role is that it aligns the process to the customer's needs (Kluza & Nalepa, 2017). Business process management (BPM) became easier to be used due to the support of tools which allows the users to have access to different actions. Nowadays the development of BPM for projects is used through dedicated tools.

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The selected benefits from the BPM concept give us an overview of the objectives of this concept in the organizations where it is used. Some of these objectives which are in the end the benefits of using BPM concept represent the results of the knowledge management concept when it is applied in an organization. The similarities between these two concepts are important to be mentioned, because one concept does not exclude the other concept.

Young et al (2014) quoted by Uden & He et al (2017) mentioned that when good knowledge management is done in an organization the results are positively influenced: the costs are reduced and the speed of response is increased. In conclusion of what he mentioned, the quality of the products increases and the teams of an organization can be more adaptable to change and efficient.

Hamza et al (2008) claims that the knowledge management concept should be encouraged to be disseminated at all the levels of an organization. This approach of dissemination at all levels is encountered also for the BPM concept in the BPM cycle mentioned by Mendling et al (2017). Considering the above approaches, this can be easily reworded as the culture of knowledge management and as a culture of BPM. The culture of knowledge management for an organization represents a big necessity and although it is not called as such, without a minimum of knowledge transfer the organization will probably fail (Nazim & Pauleen, 2017). However, the BPM concept should not represent a blocking point for an organization as it has a lot of benefits. The above mentioned idea is that establishing a culture of knowledge management and a culture of BPM helps the organizations to increase productivity.

In the present paper the BPM approach is used to validate the utility of a model proposed in the context of knowledge management. The model of knowledge management is described in detail in another article (Plesa & Prostean, 2017). This model was developed based on observing the context of two automotive companies which use Model Based Design. The obtained model of knowledge management could have an increasing usage by any organization, although it resulted from only two automotive companies which use Model Based Design. The model was proposed in the context of the companies which use Model Based Design because this technology is at the beginning and it extends more and more, year by year as reported on MathWorks® et al, (2017). Model Based Design technology, being at the beginning, is facing different problems including knowledge management.

Nevertheless, the object of this study, the model proposed for knowledge management, had as the main goal the encoding of tacit knowledge of employees into explicit knowledge (Plesa & Prostean, 2017). This model helps to develop a relation between the new employees and the experienced ones of the organization. The tacit knowledge is represented by the knowledge of the employees. In particular the valuable knowledge is kept by experienced employees. For that reason the model was developed between the new employees of the organizations and the experienced ones (Plesa & Prostean, 2017). The model of knowledge transfer presents the cycle between the new employee and the experienced one in the mentoring phase and how the tacit knowledge of the experienced employee can be encoded by the new employee into explicit knowledge (Plesa & Prostean, 2017).

The described model of knowledge management which has as goal the encoding of tacit knowledge into explicit knowledge can be access by anyone from the organization. This will be simulated and validated through the business process management (BPM) approach. The aim of this study is to prove the utility of the model in real life environments and this will be achieved using BPM tools. An event-driven process chain (EPC) diagram will be developed starting from the model proposed for knowledge management. Using EPC diagrams the model will be split in detail. Based on this new overview offered by the EPC diagram developed with a BPM tool, simulations will be done to test the model.

2. Theoretical background

Business process management (BPM) approach is used by organizations because it allows the workflow of projects to be more efficient, to be more adaptable to change (Gazova, Papulova & Papula, 2015), to align the processes to customer needs (Kluza & Nalepa, 2017) and in the end, the quality of organizations is increased (Meidan, Garcia-Garcia, Escalona & Ramos, 2017). Using The BPM helps the organization improvement (Kluza & Nalepa, 2017). Additionally, in this way the organizations could be able to innovate (Harmon & Wolf, 2017 quoted by vom Brocke, Zelt & Schmiedel, 2016). The BPM approach implementation is also supported through dedicated BPM tools. The BPM approach is used in various business contexts (vom Brocke, Zelt & Schmiedel, 2016). The

present study uses a BPM tool to simulate the workflow of a model in the context of knowledge management. The tool used by the present study is ARIS (ARIS, 2017).

In the literature of the last years two types of goals were identified when a BPM is used in an organization. In an organization, the goals influence the implementation of BPM, for that reason it is important to know the context for which a BPM is applied (vom Brocke, Zelt & Schmiedel, 2016). Two types of goals were identified: exploitation and exploration. Exploitation seeks to obtain process improvement using the known tools and techniques of BPM. On the other hand, exploration seeks to innovate using new tools and techniques (vom Brocke, Zelt & Schmiedel, 2016). For the current study the exploitation goal applies, because the BPM tools and techniques are used to improve a process. However the innovation focus for organizations will remain as long as there will be competition. At the level of BPM approach different tools are optimized in this direction, to improve the exploration goal of BPM to help innovation (Geissdoerfer, Savaget & Evans, 2016).

The event-driven process chain (EPC) diagram is a method provided by the BPM tool, ARIS. The current paper used the EPC to manage a single process management. At the level of an organization Mendling et al (2017) identifies three levels of BPM. The top level includes all the processes of an organization and the assigned priorities between them. The middle level includes the management of a single process management. This level has a cycle of development which consists of: discovery, analysis, redesign, implementation and controlling. The bottom level manages a singular process instance and this also applies to the current paper optimized with EPC diagram. This level has also a cycle of implementation which includes the following: planning, execution, monitoring and adaptation.

For the holistic understanding of BPM in the last years six core elements of the BPM were identified. The elements are: strategic alignment, governance, methods, information technology, people and culture. These elements are interconnected. The interconnection between these elements was clearly presented by Gazova, Papulova & Papula et al (2015). From the above mentioned elements, people and culture are related directly with this study. People are included because in the proposed model they have the main role. The culture relates perfectly with the culture of knowledge management concept (Nazim & Pauleen, 2017).

3. Our approach

The aim of the present paper is to validate the model of knowledge management discussed in another paper (Plesa & Prostean, 2017). The validation consists in developing the model with a business process management (BPM) tool, the tool used for this study is ARIS.10.0_Client (AEP single for students). This will lead us to simulate different cases. Designing the model with this tool will enable us to define different objects with attributes of timing. Based on these attributes and on the relation between the objects, the model will be simulated and the obtained results will be analyzed.

The present study which analyzes a model proposed in the context of knowledge transfer process, aims to analyze the following research issues:

- The allocated time and costs by the organization to integrate a new employee applying the model proposed in another paper (Plesa & Prostean, 2017) in comparison with not using the model.
- The efficiency of the new employee and the experienced one which affects the costs of the organization.
- The costs and efficiency improvement in the context of the proposed model for knowledge management.
- The benefits of using the proposed model in real life environment.

First of all, an overview about the model of knowledge management analyzed by this paper will be summarized. The model presented in the context of knowledge management introduces the encoding of tacit knowledge into explicit knowledge in the integration process (Plesa & Prostean, 2017). The model presents the new employee of an organization in the context of Model Based Design organizations. In the integration process a task for mentorship is assigned and it is assigned to the experienced employee, who will lead the new employee to theoretical and practical learning. The tacit knowledge involved in this process of knowledge transfer should be encoded in explicit knowledge. This process is defined in the knowledge management model mentioned in another paper (Plesa & Prostean, 2017). In conclusion, the model analyzed in this paper presents the encoding of the tacit knowledge in explicit knowledge through the integration process of the new employees.

In the following the object of this paper, the model of knowledge management described above, which presents the transition of tacit knowledge to explicit knowledge is presented (Plesa & Prostean, 2017), in order to complete the overview described:

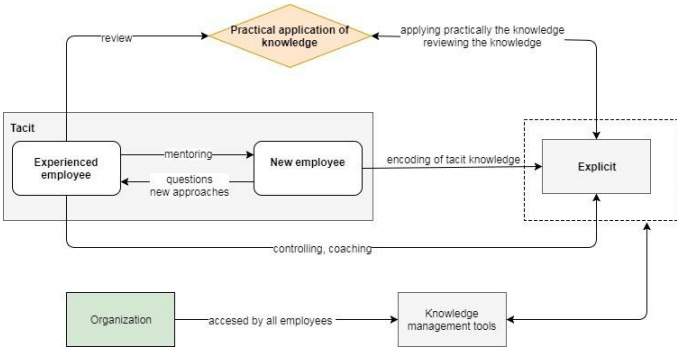

Fig. 1. Model of knowledge management, the encoding of tacit knowledge into explicit knowledge (Plesa & Prostean, 2017)

Starting from the model of knowledge management, Fig. 1, which encodes the tacit knowledge to explicit knowledge an event-driven process chain (EPC) diagram of BPM ARIS tool was used for the next design:

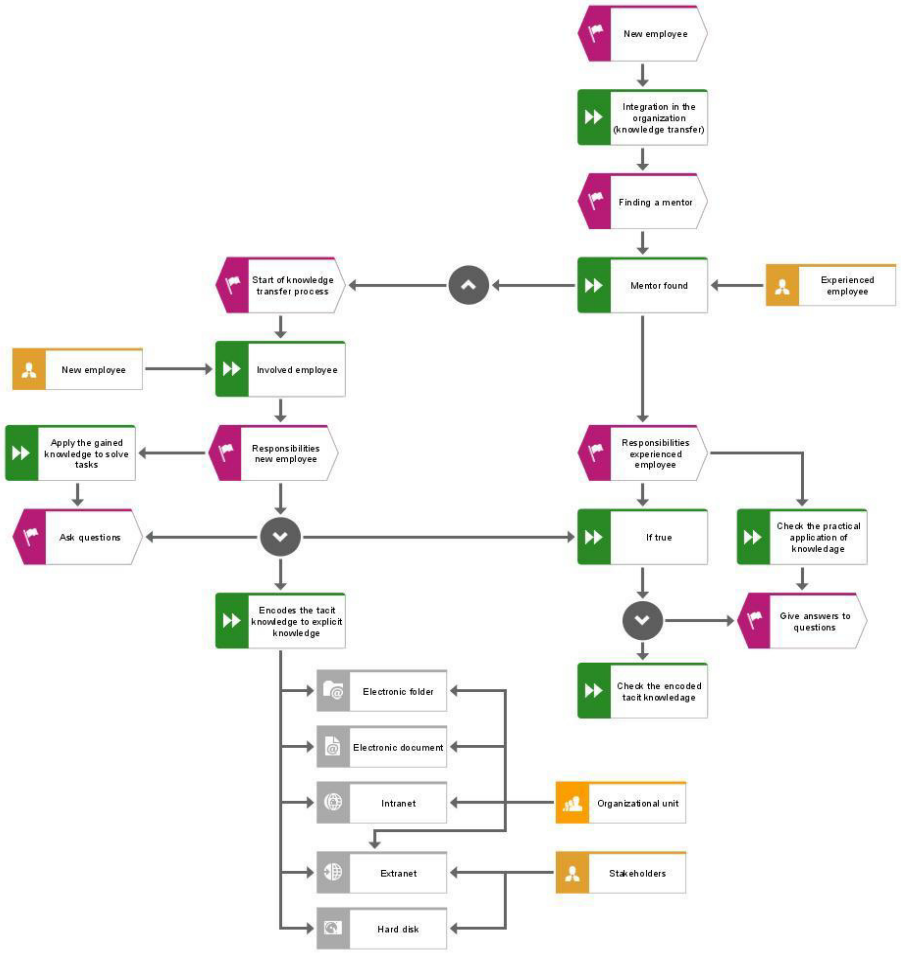

Fig. 2. BPM - EPC diagram developed with ARIS, based on Fig. 1

Fig. 1 was designed using the EPC method, this method, according with Scheer et al, (2002) is a diagram which allows the workflow modelling of a business process. The method includes different objects such as: events, functions, roles and IT logistic. All these objects are interconnected based on dependencies and established rules. For each object different attributes can be applied and in the current paper attributes of timing were considered. The EPC diagram makes the model from Fig. 1 functional. It can be simulated to obtain results as from a real environment. The BPM benefits allow the simulation of processes before to be exposed in real environments.

Additionally, EPC design will be described shortly. The EPC diagram describes the process of encoding the tacit knowledge in explicit knowledge in the context of new employee integration (Plesa & Prostean, 2017). The EPC diagram starts when a person receives the status of a new employee (in the diagram this is marked through an event "New employee"). After this event is triggered, the integration process function is started. Next in this process is the finding of a mentor marked through the event "Finding a mentor". The business process continues with the function "Mentor found", which denotes that the mentor was selected in the organization. At this same level, the "Experienced employee" role is created and also, here, is the trigger for an event which starts the integration process for the new employee. This event is triggered through a rule by typing "AND". Starting now the diagram has two directions. One is represented by the new employee's tasks and the other one by the experienced employee's tasks. These two directions happen at the same time.

On the left side of the EPC diagram the function "Involved employee" is shown, which has the scope to assign a role, in this case the role of the "New employee". Next, after the role was set the responsibilities for the new employee are assigned. The responsibilities of the new employee are shown through two functions: "Apply the gained knowledge to solve tasks", "Encoding the tacit knowledge in explicit knowledge" and an event "Ask questions". At the level of the event "Responsibilities new employee" some rules are set. First we have the function "Apply the gained knowledge to solve tasks" (which will always happen) and then by typing "OR" the other function "Encoding the tacit knowledge in explicit knowledge" become true. The event "Ask questions" could happen for both functions. If the function "Encoding the tacit knowledge in explicit knowledge" become true in the diagram, then methods of saving the knowledge are applied, shown in the diagram as: "Electronic folder", "Electronic document", "Intranet", "Extranet", "Hard disk". All of these have the property that could be accessed by different third parties, such as other employees from the organizational unit and stakeholders.

The right side is dedicated to the experienced employee's duties, and is marked through the event "Responsibilities experienced employee". The experienced employee always has the duty to check the work done by the new employee. Particularly, it is showed through the function "Check the practical application of knowledge". Then a function "If true" is integrated, because the next responsibilities of the experienced employee are preceded by the new employee's responsibilities. If the new employee's function "Encoding the tacit knowledge in explicit knowledge" is true then the experienced employee's responsibilities are presented through the function "Check the encoded tacit knowledge". If the event "Ask questions" becomes true then the event "Give answers to questions" will be triggered.

As already mentioned, the EPC diagram can be simulated. The goal of this paper is to simulate the model and to analyse the results to give answers to the research issues. For every object from the EPC diagram attributes of timing were assigned. Based on this, experimental cases will be generated and will be analysed. The simulation and the results will be discussed in the next chapter of this paper.

4. Experimental results

The experimental results are obtained from the simulation of the event-driven process chain (EPC) diagram and will be discussed in this study, the EPC diagram was designed using ARIS.10.0_Client (AEP single for students).

The present paper uses the following variables for the experimental results: time, efficiency, costs. The time was set to be a minimum of one month to a maximum of eighteen months. The working days per month were established to twenty one. The working hours per day were established to eight per day, forty hours per week. The efficiency of the employee is rated between zero percent to one hundred percent. The efficiency is calculated taking into account the time spent working on projects. Costs are set taking into account the rate per hour for every employee. For the experienced employee the rate is set to thirty Euros per hour and for the new employee to twenty Euros per hour.

Time:

- Min 1 month to 18 months
- Working days per month are 21 days
- Working hours per day are 8 days, 40 hours per week

Efficiency:

- Rated between 0% to 100%

Costs:

- Experienced employee 30 EUR per hour
- New employee 20 EUR per hour

The EPC diagram was simulated and the next two cases have emerged from the simulation:

Case 1: The simulation has evaluated only one responsibility of the new employee. This is, the responsibility of applying the knowledge to solve the received tasks on the projects. From the EPC diagram illustrated in Fig. 2, only the function "Apply the gained knowledge to solve tasks" was reached. This case of simulation shows also that only the function of "Check the practical application of knowledge" of experienced employee's responsibility was reached.

Case 2: Regarding this case, the simulation reached the other responsibilities of the new employee. This is the function of "Encoding the tacit knowledge in explicit knowledge" from the EPC diagram Fig. 2.

Analyzing the cases returned by the EPC diagram, the important one for this study is the second case, Case 2. The Case 2 is important for this study because it represents the entire process described in Fig. 1, the one which this study aims to validate.

The most important results obtained from Case 1 are the ones related to timing. From the simulated EPC diagram two major results were extracted in terms of timing. Case 1 needs fifteen months to be finalized, which represents the end of the mentoring phase for the new employee. In return, Case 2 was extended with three months, which means that eighteen months are needed to finish the mentoring phase. The increase of time was expected because to encode the tacit knowledge to explicit knowledge requires additional time for writing and checking. As a conclusion extending the time period will conduct to additional costs which in the end are paid by the organization.

Having this primary result of the time increase from the EPC diagram, leads us to analyze if Case 2 has the potential to overcome the results from Case 1. The analysis use the variables mentioned above: efficiency, time and costs.

The aim of the experiment is to prove that Case 2 can overcome the additional costs generated by the increase of time. Simulations of efficiency and costs are done during the specified time for Case 2, eighteen months. The Case 1 needs fifteen months to be finished, for the second case three additional months are needed. In the simulations the time will be split in periods of three months which will provide a better overview.

First of all the efficiency of the employees was defined. The efficiency is defined as zero percent to one hundred percent for the already defined periods of time of three months. In the table below the assigned efficiency for employees can be seen.

Table 1. Employee efficiency rates

	Efficiency new employee (%)	Efficiency experinced employee (%)
Mo1, Mo2, Mo3	0	75
Mo4, Mo5, Mo6	10	78
Mo7, Mo8, Mo9	30	85
Mo10, Mo11, Mo12	45	90
Mo13, Mo14, Mo15	75	97
Mo16, Mo17, Mo18	90	100

Secondly, the wages per period were defined for every employee. After the costs were set, the organization's losses were calculated. The wages were set according to the next formula: the hour rate in Euros for every employee multiplied by the working days per month (21) multiplied by the working hours per day and multiplied by three months. The formula overview:

- new employee: 20EUR/hour * 21days/month * 8hours/day * 3 months
- experienced employee: 30EUR/hour * 21days/month * 8hours/day * 3 months

The organization's losses were calculated starting from the wages formula set for every employee minus efficiency rates set in Table 1 multiplied with wages. The formula overview:

- wages/3months – efficiency * wages/3months

In the table below all the calculations mentioned above are presented:

Table 2. Employee wages and organization's losses

	Salary new employee (EUR)	Organization losses new employee (efficiency * salary) (EUR)	Salary experienced employee (EUR)	Organization losses experienced employee (efficiency * salary) (EUR)
Mo1, Mo2, Mo3	10080	10080	15120	3780
Mo4, Mo5, Mo6	10080	9072	15120	3326.4
Mo7, Mo8, Mo9	10080	7056	15120	2268
Mo10, Mo11, Mo12	10080	5544	15120	1512
Mo13, Mo14, Mo15	10080	2520	15120	453.6
Mo16, Mo17, Mo18	10080	1008	15120	0

The costs for organizations are given by the salary of the employee, all details of wages and organization losses are listed in Table 2. Having this raw data we can analyze different situations. First, we will calculate the losses of an organization for the entire period, eighteen months for each employee. These will be calculated from the Table 2. Summing all the values from the column "Organization losses new employee (efficiency * salary) (EUR)" we obtain a total of 35,280 EUR losses per eighteen months. For the experienced employee the same calculation is made, taking in consideration column "Organization losses experienced employee (efficiency * salary) (EUR)" 11,340 EUR losses per eighteen months is obtained.

The next important step is to calculate the organization's losses for a period of fifteen months. It is important to know how much the organization spends to integrate a new employee. This was calculated by doing an average between the organization's losses from Table 2 for each employee to obtain the additional costs needed for three more months of integration. The accurate calculation will be to make the same calculation as was described in Table 1 and Table 2 for a period of fifteen months, but it is not wrong to consider only the average, for the purpose of this study. Then the next results were obtained for the additional three months, for the new employee the organization's losses are 5,880 EUR and for the experienced one the losses are 1,890 EUR.

Overview of the calculations explained:

Period eighteen months:

- new employee: 35,280 EUR losses for the organization
- experienced employee: 11,340 EUR losses for the organization

Period fifteen months, the losses for the three additional months:

- new employee: 35,280 EUR/6 periods of three months = 5,880 EUR losses
- experienced employee: 11,340 EUR/6 periods of three months = 1,890 EUR

Having the data above, it results that the total organization losses for three additional months is 5,880 EUR plus 1,890 EUR, this means a total loss of 7,770 EUR.

The calculations above are valid when any organization decides to implement the model of encoding the tacit knowledge into explicit knowledge presented in Case 2 of the EPC diagram. As a conclusion the organization's losses for a period of fifteen months are 38,850 EUR. For this calculation the following formula is used: the sum of the organization losses obtained for eighteen months for each employee minus the total losses obtained for the three additional months (35,280 + 11,340 – 7,770). The organization's loss for a period of eighteen months is represented by the sum between the organization losses for each employee and is 46,620 EUR (35,280+11,340).

If the organization decides to choose Case 1 then every time a new employee is integrated, they will have the same costs. If they choose to have a management of knowledge transfer, and this means Case 2 simulated in the EPC diagram, then the costs are increased, but when a new employee is integrated he will already have some documented information which can be accessed. Next, the situation of a second new employee for the organization

will be simulated for the Case 2 of the EPC diagram. This means that the second new employee will have access to the information documented by the previous employee. The table of efficiency will be updated in the next way:

Table 3. Employee efficiency rates in the context of second new employee

	Efficiency second new employee (%)	Efficiency experinced employee (%)
Mo1, Mo2, Mo3	0	90
Mo4, Mo5, Mo6	10	78
Mo7, Mo8, Mo9	30	90
Mo10, Mo11, Mo12	45	93
Mo13, Mo14, Mo15	75	98
Mo16, Mo17, Mo18	90	100

For this experiment the efficiency of the second new employee is not changed. He/she must learn from documents or from a mentor. The changes are notable for the experienced employee, because for him the allocated time for integration decreases and this means that he/she will be more efficient for the organization. The organization will have fewer losses for the experienced employee.

Based on the new efficiency for the experienced employee a new table of organization losses was calculated. The calculation is made in the same way as mentioned above. In the table below the organization losses are presented for the first new employee and for the second new employee.

Table 4. Organization losses for experienced employee

	Organization losses experienced employee (efficiency * salary) (EUR) - first new employee	Organization losses experienced employee (efficiency * salary) (EUR) - second new employee
Mo1, Mo2, Mo3	3780	1512
Mo4, Mo5, Mo6	3326.4	731.808
Mo7, Mo8, Mo9	2268	226.8
Mo10, Mo11, Mo12	1512	105.84
Mo13, Mo14, Mo15	453.6	9.072
Mo16, Mo17, Mo18	0	0
Total losses	11340	2585
AVG 3 months	1890	430

A statistic chart overview of the Table 4 is presented:

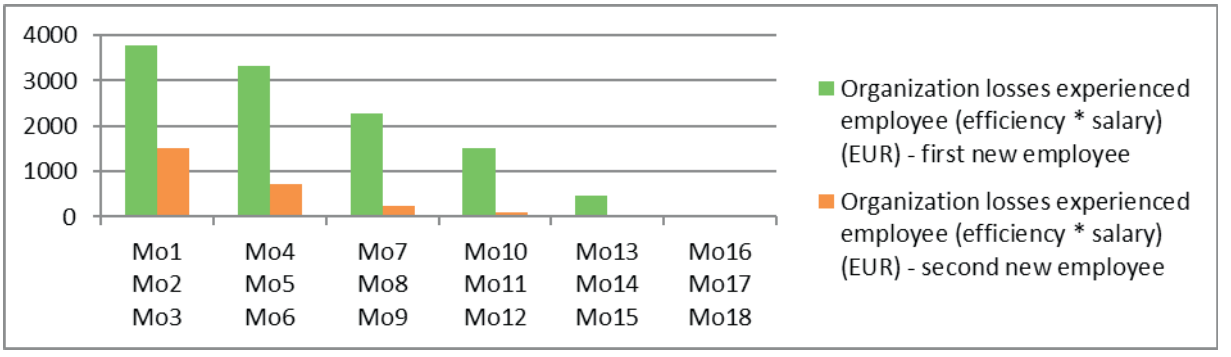

Fig. 3. Organization losses overview for experienced employee

The Fig. 3 reveals the clear differences between the costs of the organization. Based on these results, the present study simulates when the costs generated by the three additional months in Case 2 will be amortized. This is important because it shows that Case 2 can overcome Case 1 and is a better approach for any organization. In the table below the losses generated by each new employee's integration are presented for Case 2 of the ECP diagram.

Table 5. Organization losses cases

	Organization losses new employee (EUR)	Organization losses experienced employee (EUR)	Total losses	Losses overcome
Firs new employee	5880	1890	7770	7770
Second new employee	3920	430	4350	7770-4350= 3420
Third new employee	3920	430	4350	3420-4350 = 70
Fourth new employee	3920	430	4350	70-4350 = - 4280

In Table 5, we can see that the organization losses for the second new employee are decreased and this due to the fact that he/she will not need so much time to document the knowledge as the first new employee did. The rest of the values remain the same for any new employee. For the experienced employee the value 430 EUR (see Table 4) represents the losses for the additional three months integration.

The total losses for every case was calculated, the results are shown in Table 5 column "Total losses". In the column "Losses overcome" we see the calculation of losses done for each additional new employee and the goal is to show when the organization stops having additional cost for the three months added in Case 2. From the table, we can see that from the fourth new employee, the organization will not have additional costs to integrate the new employees for the three new additional months. At the fourth new employee the Case 1 and Case 2 simulated by EPC are equal in costs, but what is also important to mention is that starting from this point the organization will actually start to decrease costs for every new employee.

In conclusion the experiment above has two cases generated from the EPC diagram. The first case consists of a fifteen months integration process, with fewer losses for the organization, on the first view, but without a process of saving the tacit knowledge into explicit knowledge. The second case generated, considered the process of encoding the tacit knowledge into explicit knowledge but with three additional months and implicit additional losses. From the experiment it was observed that the Case 2 additional losses generated by the additional time could be overcome. Even more, from the fourth new employee the losses of the organization are decreased with every new employee. For the first case the cost will be always the same, nothing will be changed, because the second new employee will be in the same situation as the first one.

5. Discussion and conclusion

The present paper started from a model of knowledge management presented in another article (Plesa & Prostean, 2017). This model was proposed in the context of two automotive organizations which use Model Based Design technologies to develop software. The goal of the study was to validate the usability of the model in real life environments. The model of knowledge management is a model which encodes the tacit knowledge of organization into explicit knowledge. The tacit knowledge represents forty percent of the knowledge of an organization (Clarke & Rollo, 2001 quoted by Hamza, 2008) and this knowledge is owned by the employees. The above mentioned model was proposed in order to save at least a part of the tacit knowledge. The model of encoding the tacit knowledge in explicit knowledge has as main actors the new employee and the experienced employee.

The validation of the model was archived using Business Process Management (BPM) tools. An event-driven process chain (EPC) diagram from ARIS tool was used to develop the model. The diagram allows the simulation of the process. From this EPC diagram two possible cases were obtained. First case presents the integration process without the encoding of tacit knowledge and the second one with the encoding of tacit knowledge in explicit knowledge.

Further, I will discuss every research issue proposed by this paper. The first one was about the allocated time and costs of an organization to integrate a new employee using the model of knowledge and without using it. From the simulation of EPC diagram this two cases were simulated: in the first case, if the model is not used, fifteen months are needed to integrate a new employee and for the second one eighteen months are needed to finish the process of integration, but with additional costs. The Second research issue was about the efficiency of every employee and this point was also analyzed by this study. Regarding the efficiency levels, the organization's losses helped us to understand the impact for the organization.

The third research issue led to the analysis of whether the first case from EPC diagram can be overcome by second one. The second case from EPC diagram includes the process of encoding the tacit knowledge into explicit knowledge but it also adds three additional months. From the experimental results it was observed that from the fourth new employee the organization can overcome the first case.

The last research issue is about presenting the benefits of using the model proposed in another article (Plesa & Prostean, 2017) in real life environments. One benefit clearly defined by the experimental result is about the fact that from the fourth new employee the organization can overcome the first case presented by the EPC diagram. The first case from the EPC diagram presents the employee without encoding the tacit knowledge. This means that the next new employee will be in the same situation as the first one so the same resources are always spent. Meantime, for the second case when the tacit knowledge is encoded, the next new employee will have already documented information and can use it. Also the experiment revealed that from the fourth new employee the organization's losses will be decreased with every new employee. Another benefit which is not clearly specified by the experimental results but it is presented by the EPC diagram is: the explicit knowledge once documented could be accessed every time, by anyone without additional support.

The goal of the current paper was achieved through the presented experimental results. It was proved that having a process of knowledge management will help the organization to improve their costs. The process of knowledge management can start from the basic integration process of the new employees and can be extended at any level. The model proposed in another article (Plesa & Prostean, 2017) and analyzed in this study with the help of Business Process Management (BPM) approach was proved to be useful in real life environments for organizations.

The present paper limitations are given by the following parameters: the considered time, the simulation cases from the EPC diagram and the attributes set for this diagram. If the time is decreased then the amortization of cost is changed, also from the EPC diagram only 2 cases were considered with only the attribute of time set.

The future work can start with a comprehensive analysis of the mentioned limitations and if possible experiments in real life organizations environment.

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