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AN APPROACH TO E-WORKFLOW SYSTEMS WITH THE USE OF PATTERNS

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ABSTRACT

In today's highly competitive and rapidly changing environment, e-businesses constantly have to modify their business processes, i.e. the flow of documents and tasks in a business also known as workflow. More flexible Workflow Management Systems are required to support these constantly changing processes. In this research a platform independent architecture for the design of e-workflow systems is illustrated. The architecture includes an information pool, namely a Workflow Pattern Repository, which contains patterns, which are repeatable solutions to reoccurring problems, in order to make the system more apt to change and assist the workflow designer/user in defining workflows faster and more accurately. The patterns in the repository are in the form of UML activity diagram templates. A straightforward input format for storing patterns in the repository is provided along with an example of its practical application.

KEYWORDS

Workflow, e-workflow, e-business, Workflow Design Patterns, Pattern Repository, Workflow Architecture, Exceptions.

INTRODUCTION

In today's globalised consumer society, businesses continuously have to adapt to changes in their environment in order to remain competitive or even survive. The phenomenon is even greater in e-business where technology and trends change even more rapidly. E-companies have to manage frequent organisational change and alter their business processes. This means they must constantly modify their workflow which requires flexible workflow management systems.

A workflow management system "completely defines, manages and executes 'workflows' through the execution of software whose order of execution is driven by a computer representation of the workflow logic"[1]. A workflow or workflow model is a definite description of a business process represented in such a way that it can be directly executed by a workflow management system [2].

Workflow systems embody explicit process and product models, i.e., a completely specified workflow design is required that can be modified to reflect the changes in organizations whenever they occur. A major limitation of traditional workflow systems is that they can, typically, only support simple, static and predictable processes, but not the dynamically changing and complex processes that are present in many contemporary e-business organisations [3]. This drawback of traditional workflow systems is an evident fact in modern businesses where workflows are often executed simultaneously, requiring interaction between them and where problems arise during the execution of a workflow that have to be handled properly.

Consequently e-workflow modelling must provide process support like traditional workflows do, but in such a way that the system is intelligent enough to deal with the new Internet business environment that is characterised by rapid, dynamic and discontinuous change. Previous research for tackling the limitations of traditional workflow systems has been presented in brief in a previous paper [3, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. Our proposed approach to a flexible e-workflow modelling system is based on the extensive use of design patterns.

Workflow design patterns can be seen as generalised solutions to recurring problems within the context of e-business. Tried and tested solutions can be reused to solve recurring problems within e-business environment that is characterised by many uncertainties and variations [5]. Patterns can describe control flow, data, resources or even exceptions. Exceptions are unexpected problems that may occur i.e. unexpected breakdown during the execution of a workflow process, a deadline expiry and any type of change in a business's environment. Workflow systems should support all four types of patterns and have the ability to allow them to interact. This way business processes would be more accurately defined and at the same time they would be easier to change.

This paper presents the proposed architecture of an e-workflow modelling system, accompanied by a description of the types of patterns it supports. There is also an example of a defined pattern in the pattern repository.

1 WORKFLOW AND ENTERPRISE RESOURCE PLANNING SYSTEMS (ERP)

In order to survive in today's global and knowledge economy contemporary e-business organizations and infrastructures require the support of critical business processes. Business processes are generally known to be the fundamental building blocks of an organization's success, and information technologies that focus and support process management and improvement have been successful in helping organizations to meet their corporate missions and to improve their competitive positions. For the last two decades, special interest has been directed towards two distinct technological solutions that improve business processes: Workflow Management (WfM) and Enterprise Resource Planning (ERP) systems. Both classes of systems focus on business processes, but the approaches taken by them are different [21]. A WfMS is implemented based on a process specification and execution paradigm. During the design and implementation of a WfMS, a workflow model is first created to specify organizational business processes, and then workflow instances are created to carry out the actual steps described in the workflow model. During workflow execution, the workflow instances can invoke legacy systems, databases, applications, and can interact with users [22]. ERP systems are often implemented around the idea of off-the-shelf applications [21]. To achieve better "fit" between the off-the-shelf applications and the needs of the organization, ERP systems must be configured by setting various application parameters. The more parameters an ERP application has, the more flexibility in configuring the business process [21]. However, the workflow model in conventional ERP systems is not explicitly specified because it is embedded in the applications and the parameter tables. One way to better understand these differences is to distinguish between flow logic and function logic. Function logic deals with a specific task, such as updating a customer record or calculating order discounts, while flow logic deals with combining many functions in some sequence to solve more complex problems such as processing an order. In ERP systems, flow logic and function logic are both embedded in applications and parameter tables. In contrast, a WfMS separates the two explicitly. Flow logic is captured in a workflow model, usually graphically represented, and function logic is captured in the applications, data, and people the model invokes. Thus, a WfMS enable developers to separate the flows among a system's components (applications, data, people) from the workflow model [22]. Workflow systems are process-centric, focusing on the management of flow logic. On the other hand, ERP systems are data-centric, focusing on managing function logic via a common homogeneous data infrastructure across the organization to support multiple applications.

The main goal of ERP applications is to provide an integrated solution to all business functions (financial, sales, human resource, *etc.*). The underpinning of shared data structures across many applications eliminates the need to pass data step-by-step among applications by accessing data from a common structure. ERP

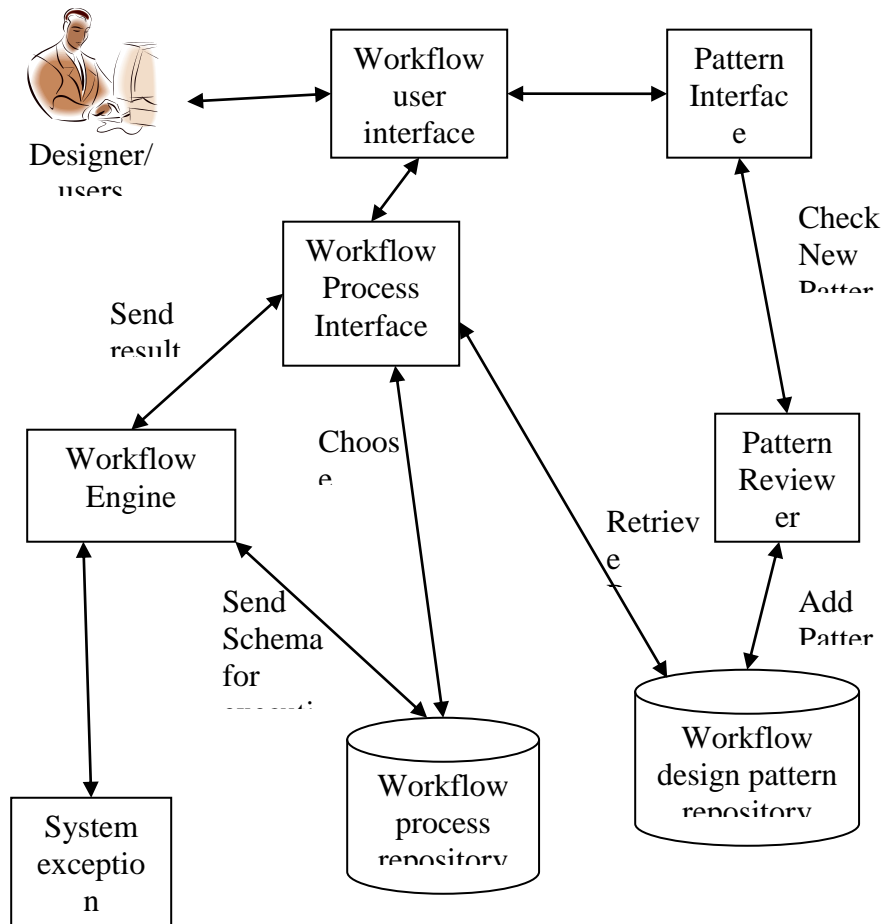
modules operate directly with common interoperable databases to ensure consistent information for all business functions. This makes the manipulation of data easy. During implementation, only data integration from interoperable databases needs to be considered. ERP systems are data-centric, and thus they are well suited for modeling transactional processes for which only data integration is needed. WfMSs are most suitable for modeling workflows involving humans and software systems, especially if the systems are autonomous and heterogeneous.

2. THE PROPOSED E-WORKFLOW SYSTEM ARCHITECTURE

Traditional approaches to workflow modelling mainly deal with the use of rules in specific contexts serving as a mechanism for workflow enactment and evolution [4]. In an e-business environment, focusing on specific context is extremely hard and impractical. Workflow modelling must be as flexible as possible and enable the implementation of a broad range of business processes. In this research we propose a platform independent architecture that uses patterns for workflow modelling. Patterns offer an abstract representation of knowledge and experience from good workflow designers. They can be reused to solve new problems. A workflow system that uses patterns requires a repository to store them and must be equipped with efficient retrieval and adaptation techniques to manage them. This becomes a base for long-term process improvements resulting in increased competitive advantage for e-business enterprises [3].

Figure 1, presents the proposed architecture for an e-workflow system and explains how it functions.

Fig. 1 Workflow System Architecture (adapted from Ndeta et al. [3])



Note that workflow process and schema are used interchangeably in this research. From within the workflow user interface the knowledge designer or user can interactively search the workflow design pattern repository or workflow process/schema repository. When a workflow process needs to be defined, the first step is creating a workflow schema. The designer can either create his own description of the workflow process from scratch or he can be assisted by process related knowledge in the form of workflow patterns from the knowledge workflow design pattern repository which provide predefined solutions for common problems. In order to do this, by using the Pattern Interface, he can browse through the categories of pattern templates that reside in the Workflow Design Pattern Repository. Once he has found the right pattern/patterns he can instantiate and customise them so that they will fit his needs. This modified pattern can also be sent to the Workflow Process Repository. Here the modified pattern, called a

workflow schema, is store so that it may be executed by the Workflow Engine when the user wishes to do so.

The user can access the workflow schemas he wishes through the Workflow Process Interface, which allows him to browse the workflow schemas that are in the Workflow Process Repository. With the help of this interface, the user may delete workflow schemas or send them to the Pattern Interface in order for them to be modified. If the user wants to execute a schema then, the selected workflow schema is then sent to the workflow engine for execution. The results are sent to the User Interface.

E-workflow execution may involve the modification of system and workflow relevant data, which can only be accessed by the e-workflow engine and not the pattern component, which is not involved with workflow instances and execution [3].

During the execution, problems may arise that have or haven't been considered in advance. These problems force the workflow to deviate from its defined state and are known as exceptions. Exceptions in the business process e.g. deadline expiry can be described in patterns and incorporated into the workflow schema to avoid problems. However, exceptions such as system breakdowns that have to do with the Workflow System and not the business process must also be handled. Designing alternative actions within the workflow schema for these exceptions would be a waste of designers' time. Therefore, there is a System Exception Handler that can catch and handle all possible technical problems.

Designers can also add new patterns to the workflow design pattern repository. After defining the pattern through the Pattern Interface, they may send the pattern to the repository. Before the pattern is stored, it must be reviewed in order to detect possible flaws in its format. This is the job of the Pattern Reviewer. The reviewer examines the input format of the pattern and its template. If the pattern is approved by the reviewer then it is stored in the workflow design pattern repository. On the other hand, if the reviewer finds possible mistakes or incompatibility problems, appropriate error or warning messages are sent to the designer. By using the Pattern Interface, the designer may also delete or modify any existing patterns. Before any modifications are accepted, they must be sent through the Pattern Reviewer.

2.1 Workflow Design Patterns

Workflow Patterns are used to describe business processes in such a way that they can then be executed by a workflow engine. In other words, they are used to create workflow schemas. Most problems in business processes modelling reoccur. This means that deviations of one pattern can be used to represent many business processes, since they often have similarities. By using patterns, the design of workflows becomes a faster and easier job. When a workflow designer is trying to

describe a common business process, he doesn't have to reinvent the wheel. Instead, he can use workflow patterns. Patterns encapsulate typical rules or a set of rules that capture the knowledge about the occurrence of an exceptional situation and the actions that can be performed to deal with it. They consist of predefined parts, parameterised parts, and optional parts and are viewed as a description of a problem, of a solution, and of the context in which this solution works [3].

Workflow patterns can be categorised, depending on the perspective used to view the workflow specification. Workflow control patterns describe activities in their execution order, i.e. sequential, parallel. An activity or task corresponds to a single unit of work. Workflow data patterns capture the various ways in which data is represented and utilised in workflows. Business documents and other data can flow, in a separate data channel, between business tasks allowing data to be transferred from one workflow to another and can qualify as pre or post conditions for other tasks. Workflow resource patterns depict the various ways that resources are used in workflows, such as the role of people or devices which are responsible for executing tasks [6, 7, 2].

Another important category of patterns are workflow exception patterns. During business processes many unexpected events may happen, i.e. system failure, running out of resources. These events are referred to as exceptions and can be described by certain patterns. The Workflow Management System should have handlers to deal with these exceptions. However, it must be noted that handlers can only be provided for expected exceptions. The workflow designer must incorporate all possible exceptions that may arise in the business process into his design. This should be done in a separate workflow schema so as not to overburden the original business process [8, 9]. Exceptions that are linked with system failure need not be described by the workflow designer, but they should be handled during execution time by a system exception handler.

Research on the formalisation of the above patterns has been done. However, in a real system, process, data and resource perspectives interplay. Therefore considering these patterns in isolation is not sufficient. Attempts to formalise the patterns by combining several perspectives have yet to be made [10].

2.2 The Workflow Design Pattern Repository

As mentioned earlier, the workflow design pattern repository serves as a pool of information to the designer or user, who can interactively search the repository for a suitable workflow pattern. This saves time and promises more accurate solutions to reoccurring problems.

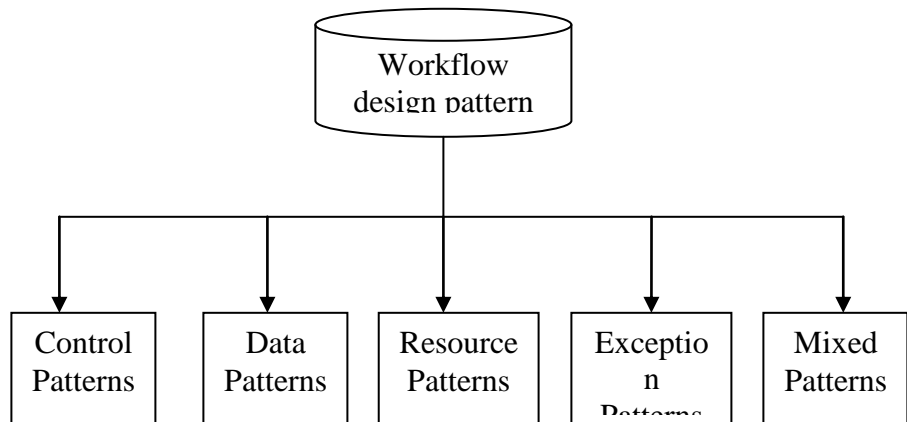
The proposed workflow design repository contains control, data, resource and exception patterns, in the form of abstract templates, that have already been

formalised in others' research. However, business processes are more complex than these simple formalisations that are all isolated from each other. There is a need for patterns that cover more than one perspective. Therefore the repository will also contain complete design patterns that describe whole business processes in an abstract template form, referred to as mixed patterns. The contents of the pattern repository are depicted in Figure 2.

When a workflow designer or user is faced with a problem, he can look up a solution for the problem at hand from the workflow design pattern repository. If the problem, or part of the problem, corresponds to a mixed pattern that is already in the repository then the designer can use the template and easily adapt the pattern to his needs. There may also be multiple workflow design patterns referring to one task, from which the designer will have to choose the one he considers most appropriate. If however, the problem the designer is solving happens to be something new, he can retrieve the simple formalised patterns (control, data, resource, exceptions patterns) that are in the repository and use them as a base for solving his problem. Either way less time and effort is spent in solving the problem and ensuring the soundness of the solution.

In order to help the designer choose the correct pattern, each time a pattern is used its history will be updated with information about the process it was used for. This way the pattern will become related to certain process structures and the designer will know for which tasks it is suitable.

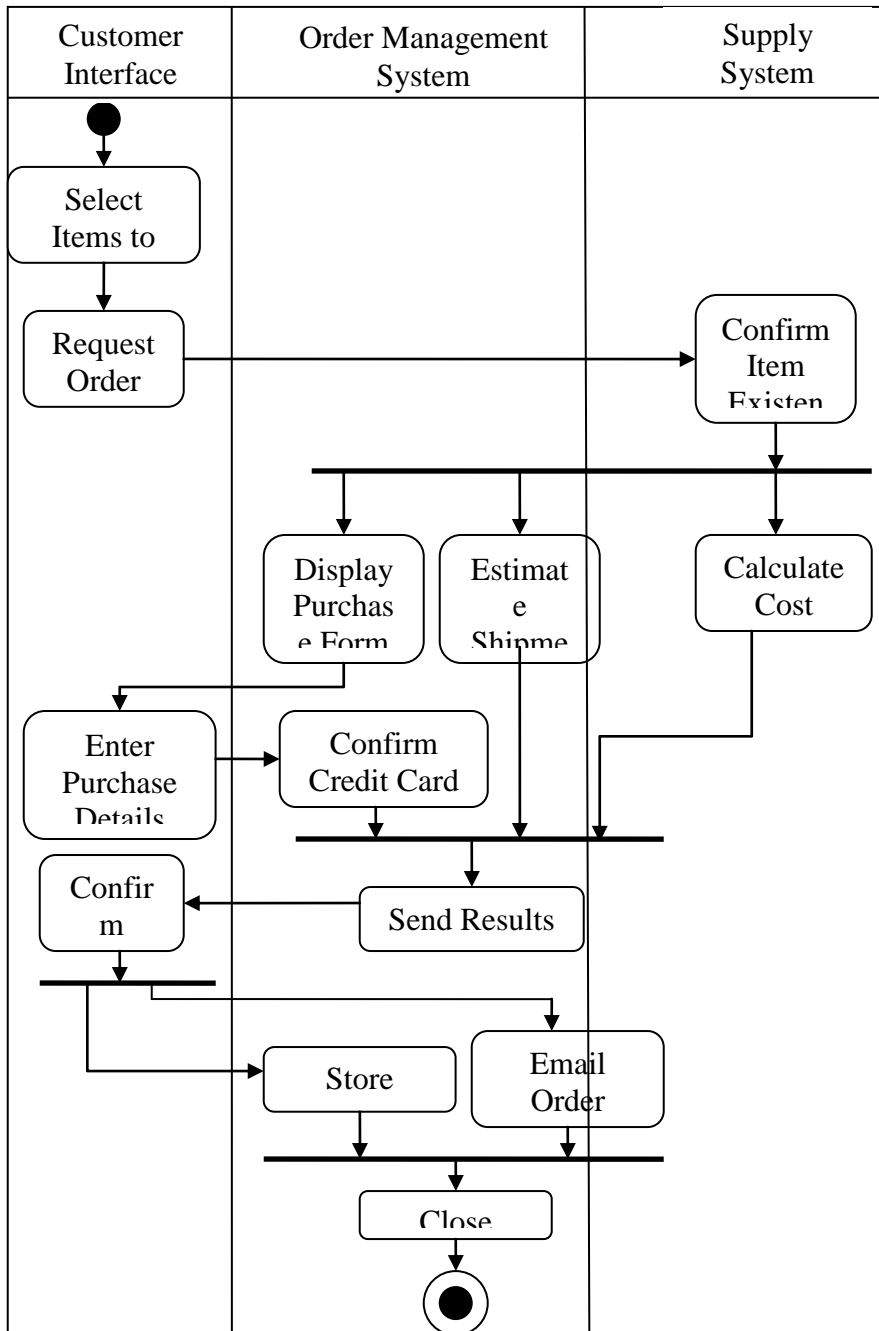
Fig. 2 Workflow Design Pattern Repository contents



The patterns in the repository shall be implemented in the Unified Modelling Language (UML), since it allows the modelling of the various perspectives i.e. process, resource and data perspective.

Each workflow design pattern specifies a set of tasks, together with the constraints and object flows between them. Thus, a workflow design pattern represents one possible means of achieving a given type of task by breaking it down into a particular structure of sub-tasks. Each workflow design pattern specifies a single level of structural decomposition. However, this decomposition refers to a further set of tasks, each of which may have corresponding workflow design patterns existing in the repository. These workflow design patterns may in turn be selected to specialise/instantiate the sub-tasks, and so a multi-level hierarchical process structure may be generated by the composition of many design patterns. Note that for any given task, there may be multiple possible workflow design patterns, expressing different ways of breaking the task down for different situations [3].

Fig. 3 E-shop Order Processing Workflow



The UML activity diagram, shown in Figure 3, depicts an order processing workflow of an e-shop. This workflow diagram can not stand alone. It is associated with the workflow of a bank so that the credit card can be verified. The

confirmation of the items' existence belongs to the Supply System that has its own way of working. Even the estimation of the arrival time of products could be represented by its own diagram. These three cases comprise the sub-workflows of the initial order processing workflow. Each needs to be defined with its own design pattern. In turn each of those patterns could depend on other workflows which would have to be separately defined as sub-workflows of the sub-workflow and so on.

The order processing workflow and its sub-workflows can be stored in the pattern repository as mixed pattern templates. These templates are related, so they must be linked to each other in some way, therefore requiring the pattern repository to maintain a history of process structure [3]. Templates should not only be linked in a vertical hierarchy, but also horizontally, meaning that one workflow's sub-workflow should be linked to the corresponding sub-workflows of similar workflows. This helps the designer who is searching for a way to implement an order process. Instead of having to search for patterns that correspond to the sub-workflows, he can immediately see which templates are related and choose the ones he wishes to use.

It is also important that each new pattern in the repository holds a sufficient description of when it is supposed to be used. This serves as a guideline to the designer who will have found many order processing pattern templates in the repository and will need to pick the most suitable one for his needs. As mentioned earlier, this description will be updated as the pattern is reused.

2.3 Format of Patterns in the Repository

In order to store pattern templates in the repository, the Pattern Interface should present the designer with a form of fields to fill in that will help define the pattern and assist in its correct indexing within the repository, thus avoiding the existence of unstructured and incoherent patterns. This pattern input format should be such, that when designers who want to reuse the pattern retrieve it, they will be provided with information about how and when the use of this pattern is appropriate. Based on the pattern format of Ndeta, et al. [3], Muylar and van der Aalst [10] and on already formalised patterns [2, 6, 7, 8] we decided that the following format would be suitable:

- *Name*: a concise name that uniquely identifies the pattern in the workflow design pattern repository. The name must relate to what the pattern does.
- *Author*: names the author and co-authors of the pattern.
- *Type*: refers to the type of pattern, i.e. control, data, resource, exception or mixed pattern.

- *Related Patterns*: names patterns that solve exactly the same problem, thus linking them horizontally into a structure that can be easily indexed.
- *Related sub-patterns*: contains the sub-workflow patterns of the current workflow and the sub-workflow patterns of the previous field.
- *Similar Patterns*: refers to patterns that solve similar problems and could possibly be of interest to a designer who trying to solve the current problem.
- *Classification*: allow users to browse by category, according to the categories and sub-categories of the workflow design pattern repository.
- *Keywords*: a set of user-selected terms that can be used to refer (i.e. select, search, etc) to the available patterns in the repository. This field allows one to give a more precise description of the topics of the pattern and helps distinguish the different patterns of a given category in the classification.
- *User Problem*: a description of the problem as the end user will see it i.e. what is the problem presented to the end user?
- *Intent*: briefly describes the main goal of a pattern, i.e. towards which problem it offers a solution.
- *Problem Description*: gives a detailed presentation of the problem.
- *Solution*: describes possible solutions to the problem
- *Guideline*: provides suggestions to the designer about possible usage and instantiation of patterns
- *Template*: contains the pattern template in the form of a UML activity diagram. The diagram is described in terms of events, conditions, and actions. Unlike events and conditions, which are the main parts of the pattern, the action part provides only suggestions. This reflects the fact that exception patterns focus on how to capture exceptions, rather than on how to fix reactions, which are application dependent. The template contains parametric fields to be filled in with specific values provided by the designer [4].
- *Sample usage*: a set of workflow-specific instantiations of patterns related to an application domain. The instantiations of the pattern template will show examples of how the template can be used. They show how patterns can be customised in different context and applications by illustrating how parameters of patterns can be supplied by the designer to produce a concrete workflow model [4]. The sample templates may be accompanied by an explanation of how they work.

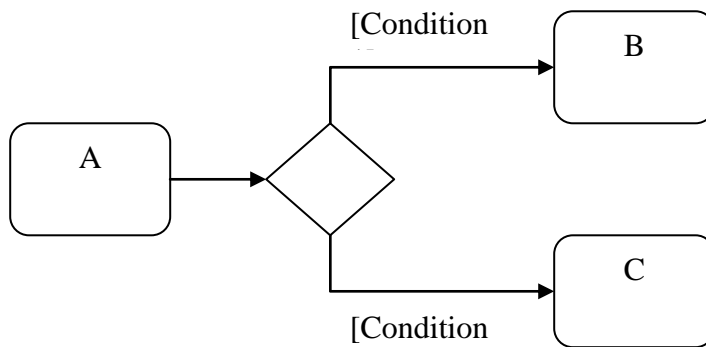
The mandatory fields to define a pattern are the Name, Type, Intent and Template fields. For simple patterns the field Problem Description is unnecessary since the problem is sufficiently described by the Intent field and the Solution field need not be filled in since the template offers a clear description of the solution. However, for mixed patterns the Problem Description and Solution fields should be compulsory, since the template might be too complex to understand without some written guidance. When a field is not filled in it won't show up on the pattern detail page.

Below is an example of the input format with its fields filled in. The pattern chosen is a simple, formalised control pattern.

- *Pattern Name*: Exclusive Choice
- *Author*: Wil van der Aalst, Athur ter Hofstede, Bartek Kiepuszewski, Alister Barros
- *Type*: control
- *Similar Patterns*: Parallel split, Multiple Choice
- *Classification*: simple control pattern
- *Keywords*: XOR, XOR-split, conditional routing, EOR, switch, decision, choose, either
- *Problem*: Choose one of many paths
- *Intent*: Allows the workflow process to split into one of several branches, depending on a decision or workflow data,
- *Guideline*: as many branches as needed may be added to the pattern

Fig. 4 XOR template

- *Template*:



- *Sample usage*:

Fig. 5. XOR with three branches for order confirmation

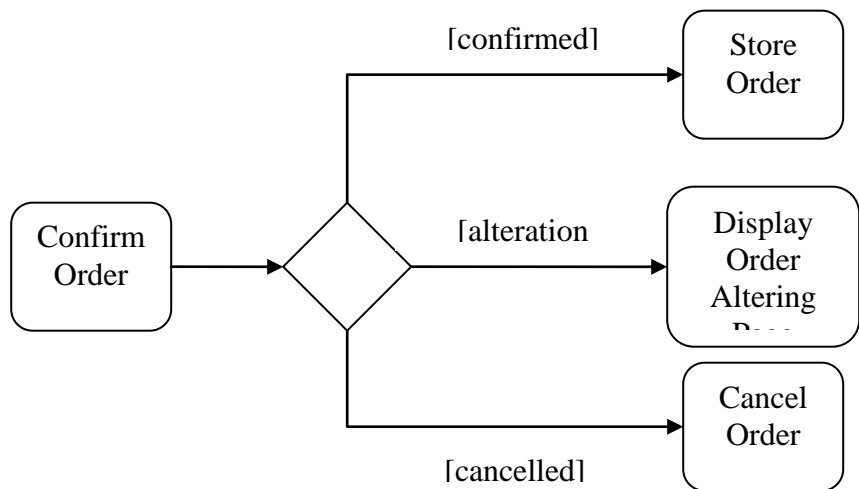
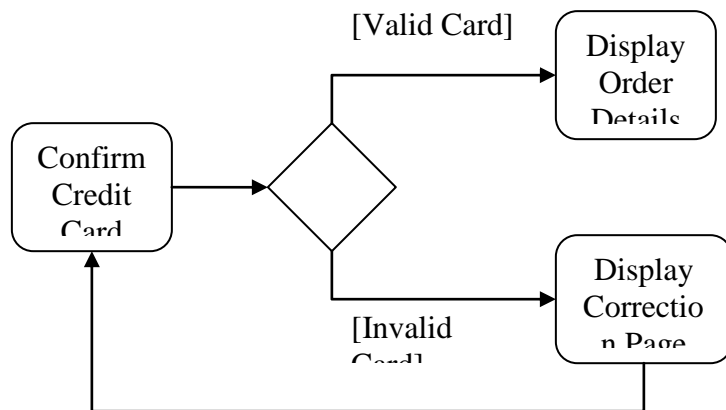


Fig. 6 XOR for cofirming credit card validity



3. CONCLUSIVE REMARKS

The continuously changing environment of the internet creates a need for flexible business processes that can be modified frequently, thus augmenting the requirements of Workflow Systems. By creating a system with a reliable exception

handler, a good pattern repository and a proper interface for accessing and managing patterns, workflow designers and users will find it much easier to define and execute appropriate workflow schemas.

The pattern repository must contain simple patterns that are used in all workflow definitions as well as complex patterns. The complex/mixed patterns must be well described so as not to confuse the designer/user. All these patterns are sent to the repository through the input format for pattern creation, which enables patterns' content in the workflow design pattern repository to be structured and predictable. Every time the pattern is used, it must be updated with information about the process it was used for, thus helping designers when they wish to reuse it. Future research in this field needs to consider formalising basic mixed patterns, designing patterns for authorisation management in Internet workflow and the design of a system exception handler.

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ORGANIZATION-ECONOMIC MECHANISM FOR FINANCIAL ENSURING OF MARKETING ACTIVITIES OF SMALL ENGINEERING ENTERPRISES

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ABSTRACT

The article outlines the features of marketing activity of small engineering enterprises (SEE), the usefulness of their union for joint financing their marketing activity is substantiated. It is argued that the best form of marketing efforts integration and cooperation is an association as a contractual organization that does not interfere in the function of its members, but only consolidates marketing activity. Based on this study, the organization and economical mechanism of creation and functioning of SEE Marketing Association is proposed and the financial terms of cooperation between SEE and consulting firms are investigated to ensure fair and favorable agreements on the amount of membership fees for enterprises – the members of SEE Marketing Association. The features and directions of the use of membership fees are studied and the benefits of the creation of such associations are shown. It was established that the activity of the SSE Marketing Association will focus on consolidating marketing efforts and professional mutual assistance of its members to meet the marketing interests, improving marketing activities, market research, protection of marketing interests of association members, forecasting market situations, finding new sales channels

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and organizing activities in them, selecting the most appropriate sales channels, effective solutions to the problem of planning the distribution of products between sales channels of members of the Association, development of proposals concerning elimination of undisciplined intermediaries.

KEY WORDS

small engineering enterprise, marketing efforts consolidation, marketing benefits, business association, marketing association, organization-economic mechanism.

INTRODUCTION

In a dynamic environment, small enterprises have a lot of distinctive features (flexibility, mobility, easy adaptation to changing circumstances) that aid in developing and stirring up their marketing activities. However, due to a small number or complete lack of marketing staff, these activities are conducted not systematically and with invoking other organizations such as consulting firms. Collaboration with such firms requires considerable financial costs, which are often beyond small enterprise powers. Such conditions aid in the emergence of enterprise associations for consolidating their marketing efforts.

LITERATURE REVIEW

Small enterprises have been the subject of study of many researchers. The development of an effective mechanism of economic security of small enterprises was considered in the work [3], where the objective, strategic priorities and means of strengthening economic security of small enterprises were substantiated. In the collective monograph [12], the problem of identifying the factors which influence the efficiency of small enterprises was studied, some domestic problems of these enterprises were shown and the directions of steady development of small business were indicated. The researches [6–9; 15] described the conditions of formation, development, management and support of small business. Financial aspects of small business functioning were studied in the work [1], where theoretical and applied problems of the formation and use of financial results of small enterprises, the management of their profits, expenses and income distribution were investigated. The authors of the monograph [14] studied the features of taxation of small businesses on the basis of alternatives. The aspects of cooperation and integration efforts of small enterprises received attention in [2; 10]. However, the specific character of associations of small enterprises in marketing is insufficiently studied and requires more substantial investigation.

The goal of the article consists in substantiation of establishing the associations of small enterprises to consolidate their marketing efforts, to highlight the mechanism of financing and functioning of the Marketing Association of small engineering enterprises.

The main material. According to the Economic Code of Ukraine (Ch. 1, Art. 119), small engineering enterprises (SEE) may create voluntary unions that promote the joint solution of problems of their economic activity [5]. Such economic unions can be established as associations, corporations, consortiums, concerns, industrial and financial groups, associated enterprises, holding structures, etc. [11, p. 35–37]. The advantage of associations consists in the relative legal simplicity of their establishing, voluntary cooperation of enterprises of the same branch, the low level of centralization of management decisions, free entry to other business unions, the possibility of accumulation of membership fees for large-scale joint activities, etc. Contrary to other forms of enterprise unions, an association does not limit and does not interfere in business activities of its members. The authors of the work [11, p. 35] suggest a definition of an association as “a contractual union established for the purpose of permanent coordination of economic activities of enterprises which combine their efforts by centralization of one or more production and management functions, development of specialization and consolidation of manufacture, organization of joint ventures on the basis of consolidation of their financial and material resources to satisfy their most economic requirements.”

Effective promotion of marketing activity of SEE requires considerable efforts and financial costs. To accumulate funds and combine efforts in the marketing field, we propose to create a Marketing Association of small engineering enterprises. Such a contract economic statutory association of small engineering enterprises is created for help in solving various problems of its members in the field of marketing. Cooperation of SEE allows them to increase their marketing activities by joint efforts in this field. Members of this Association pay fees which are used for market research, organization of joint promotional activities, joint advertising activities. The Association focuses on consolidation of marketing efforts and professional mutual aid in meeting marketing interests of its members, on increasing marketing activities, conducting market research, protecting marketing interests of association members, forecasting market situations, finding new sales channels and organizing activities in them, choosing the most appropriate sales channels, solving the problem of efficient planning of distribution of products between sales channels of Association members, elaborating the proposals for replacement of undisciplined intermediaries, etc.

We propose to create a governing body of SEE Marketing Association as follows: the General Meeting of SEE Marketing Association, the Council of SEE Marketing Association, the Board of Administration and the Auditing Commission consisting

of representatives of the managing staff of the members. Such a structure of a governing body provides clearness and transparency of the receipt and use of membership fees, identifying priority areas of market research and directions of marketing activities, etc.

The practice of SEE work shows that for effective implementation of their marketing activities they should invoke outside organizations which can execute marketing tasks adequately and on a large scale, but this practice requires considerable marketing costs. Creating associations allows SEE, being its members, to implement their marketing activities effectively without overpaying to consulting firms. An association cannot interfere in the business activities of its members, but can be authorized to represent their interests [11].

High risk of losses causes the necessity of diversification of marketing activities concerning their resulting component – sales. This approach requires the analysis of a large number of sales channels to choose the most effective of them. Small business cannot solve this problem adequately and at the low costs without assistance. The way to consolidate marketing efforts of small engineering enterprises consists in creating a marketing association of such enterprises which provides integration and information interchange for selection of the most appropriate product distribution channels. For each enterprise such processes require considerable time and costs; in the case of cooperation on the basis of economic union the work done by the association is not duplicated, but its use by members of a marketing association. A marketing association provides that its members pay membership fees. The size of fees should be differentiated depending on the volume of annual turnover and should be directed to research conducted separately for each SEE, i.e., if an enterprise pays greater fees because its turnover is higher, then it can use more marketing information. If an enterprise does not conduct activities in the course of a year, it does not pay membership fees, but also cannot use marketing association service. If an enterprise is unprofitable and it does not pay membership fees, its participation in a marketing association of SEE stops or can be continued on a credit basis, provided that such a decision is made by the majority of members. The authors of the work [16] developed a method for planning optimal distribution of output between sales channels which is recommended to use as a tool for diversification of marketing activities during functioning of SEE marketing association. Its essence lies in analysis of sales channels, both actually and potentially used, individual study of characteristics and conditions of use of these channels by particular SEE. The activities of SEE Marketing Association focuses on joint solving a problem of optimal planning of production distribution between sales channels of the association members. The practice of small engineering enterprises shows that their products, as a rule, do not compete with each other, allowing them to combine marketing efforts without increased risk of information transmission to competitors. With the accumulation of funds in the SEE Marketing Association and joint use of them for special

purposes, a member of the Association can receive marketing information more efficiently and about more sales channels, as well as conduct joint marketing activities, order printed products and monitor market situation involving smaller costs.

The practice of domestic and foreign consulting firms provides reasons enough to assert that there are different forms of payment for service of such firms: pay by the hour; undifferentiated fixed payment; percentage of the value of consulting object or result; combined payment [13, p. 59]. Firms providing consulting services in the domestic market (including such as “Macro Consulting Group”, “ProConsult”, LLC “Dreberis”, marketing company “BBS”, LLC “Andar Service”, “West Ukrainian Information and Analytical Foundation”) , as a rule, use the third (sometimes the fourth) payment option for their service. This choice is due to the fact that during the lengthy research the costs of service with pay by the hour is too high; fixed undifferentiated payment may lead to such a situation that financial results which can get an enterprise may be significantly lower than the value of money spent. A survey of a number of administrative personnel of SEE and of consulting firms shows that consulting firms get profit about 7–15% for the study of sales channels.

As it was shown above, small enterprises have a number of features that determine the characteristics of their marketing activities, in particular, they have small marketing staff or do not have it at all. This feature forces the need for cooperation of SEE with consulting companies or the creation of a public union – ESS Marketing Association, which exists owing to membership fees its participants (as a rule, 1% of annual turnover). This amount is justified by practice of cooperation between small enterprises and firms providing consulting service. Accordingly, the funds of each enterprise – a member of SEE Marketing Association – are taken into account separately for correct use of obtained joint marketing information and organizing joint marketing activities. These funds may be accumulated and spent not only on the study of sales channels, but also on other types of marketing activities such as printing services, special offers, etc. Creation of an association also allows avoiding duplication of research conducted by SEE. If one small enterprise in its marketing activities uses services of the «P», analyzing its work and cooperation conditions, and another small enterprise also wants to use services of the distributor «P», then the funds, which would be saved by combining efforts to study this distributor, can be directed to other types of marketing activities for both SEE.

On the basis of analysis of the literature [4, 17], the practice of activities of associations, consulting organizations and small engineering enterprises and using our own investigations, we present the mechanism of creation and functioning of ESS Marketing Association (Fig. 1).

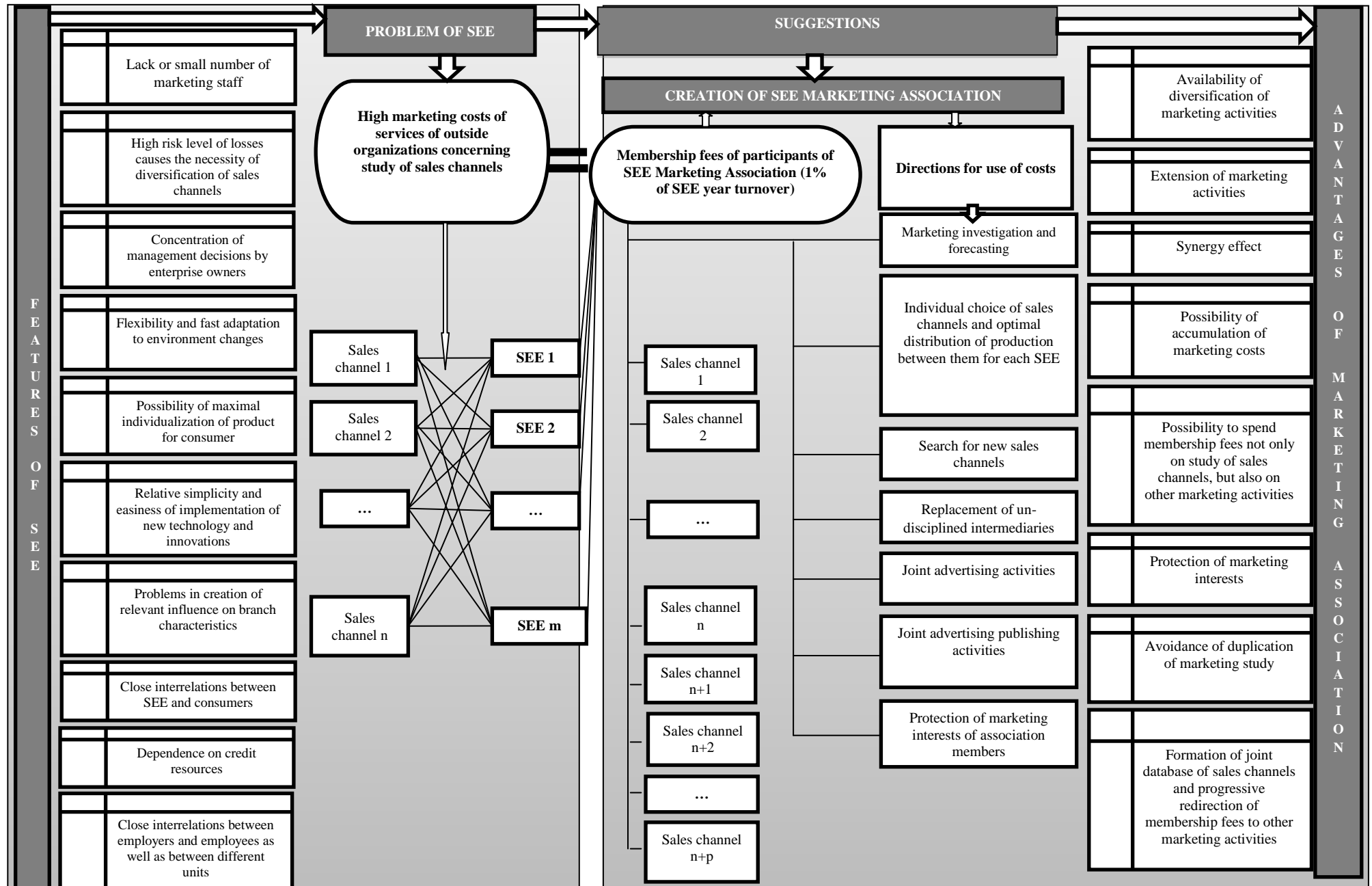


Fig. 1. Mechanism of creation and functioning of SEE Marketing Association

Practice of small engineering enterprises shows that their marketing expenses do not exceed 5 % of average annual turnover. This value was obtained by a survey of managers of domestic SEE. According to obtained data concerning five domestic SEE (private enterprise «Electrosvit», public joint-stock company «Crane Building Firm ‘Strila’», limited liability company «Robitnya», private joint-stock company «Brotep-Eco», open joint-stock company «Autolyvmash»), money spent on marketing service from outside organizations concerning investigation of sales channels and promotion of production in them is presented in Table 1.

Table 1 The amount of annual marketing costs of small engineering enterprises, % of average annual turnover

Name of the enterprises	Years				
	2010	2011	2012	2013	2014
LCC «Robitnya»	2.5	3	3.7	4	3.9
PJSC «Brotep-Eco»	1.1	1.8	2.5	2.34	2.7
OJSC «Autolyvmash»	2.9	3.8	3.86	4	4.2
JSC «Crane Building Firm ‘Strila’»	1.56	2.3	3.4	3.75	3.8
PE «Electrosvit»	1.7	1.99	2	2.3	2.7

Note: prepared by the authors on the basis of a survey of managers

Based on Fig. 1, it is recommended to set the membership fees of participants of SEE Marketing Association at 1% of annual turnover. To determine the economic benefit of creation of such an association we present a forecast of annual marketing costs of small engineering enterprises to 2017 inclusive. The results are shown in Fig. 2.

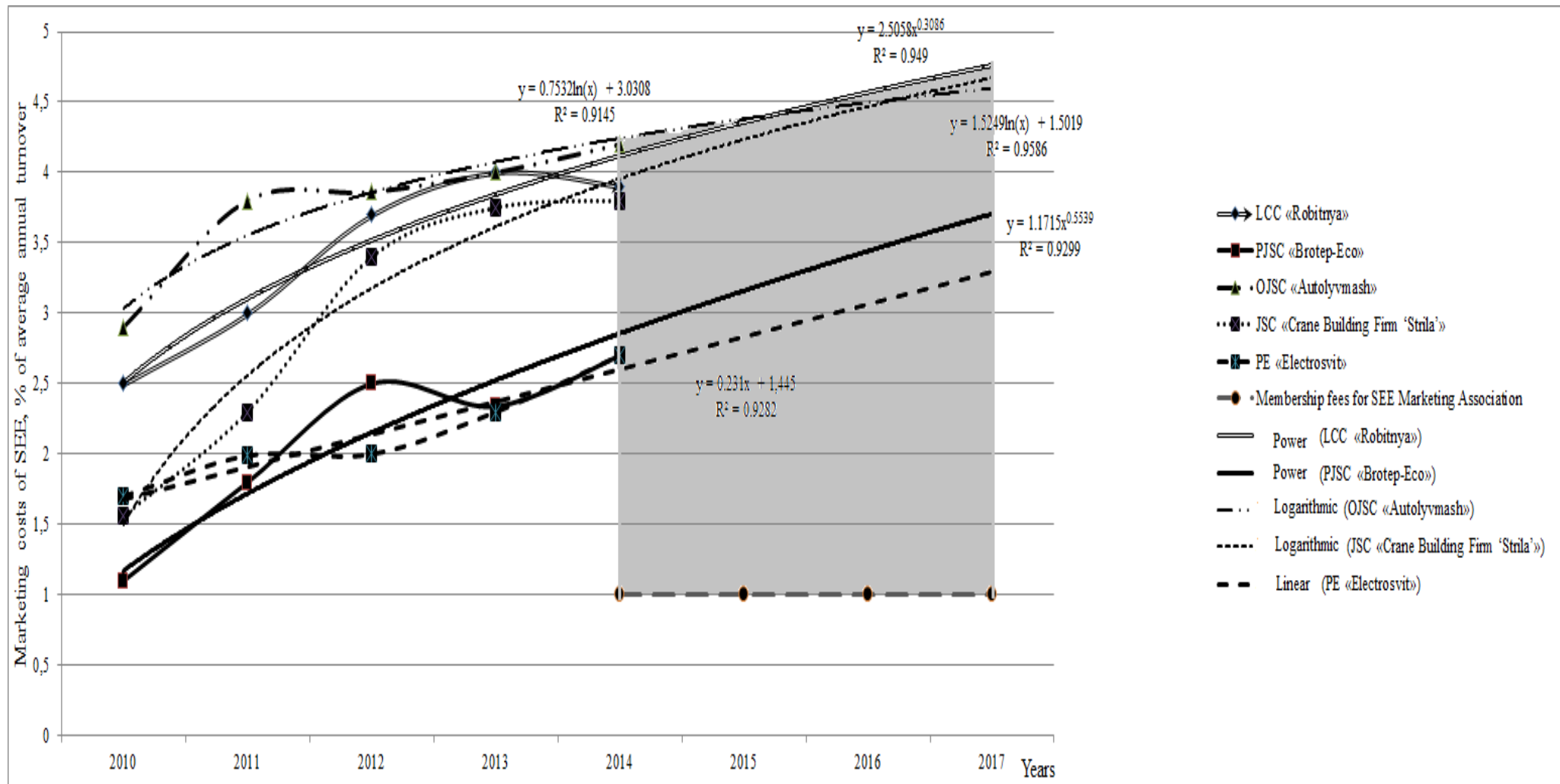


Fig. 2. Graphical interpretation of economic benefit of creating the SEE Marketing Association for several SEE.

Legend to Fig. 2:

■ The value of forecasting cost efficiency of creating the SEE Marketing Association, %.

As it is seen from Fig. 2, average marketing costs of SEE are 2.5% of the average annual turnover. Forecasting of marketing costs has been carried out using spreadsheet Excel. In particular, for LCC «Robitnya» the power model $y=2.5058x^{0.03086}$ has been chosen with the value of approximation reliability $R^2=0.949$ which testifies to correctness of the model. For example, in 2017 forecasting cost efficiency of joint financing marketing activities of LCC «Robitnya» will be 3.75% of average annual turnover of the enterprise: 4.75% (expected marketing costs) minus 1% (membership fees for SEE Marketing Association). Forecasting of marketing costs for PJSC «Brotep-Eco» has been realized using the power model $y=1.1715x^{0.5539}$ with $R^2=0.9299$ testifying to correctness of a choice. For OJSC «Autolyvmash», forecasting has been carried out using the logarithmic model $y=0.7532 \ln(x)+3.0308$ ($R^2=0.9145$); for JSC «Crane Building Firm 'Strila'», the logarithmic model $y=1.5249 \ln(x)+1.5019$ has also been used with $R^2=0.9586$; for PE «Electrosvit», the linear trend $y=0.231x+1.445$ has been used ($R^2=0.9282$). According to forecasting of economic efficiency of joint financing marketing activities, such efficiency for PJSC «Brotep-Eco» in 2017 will be 3.68% of average annual turnover: 4.68% (expected marketing costs) minus 1% (membership fees for SEE Marketing Association). Similarly, we get 3.58% for OJSC «Autolyvmash», 3.67% for JSC «Crane Building Firm 'Strila'», and 3.35% for PE «Electrosvit». The obtained results indicate that creation of SEE Marketing Association would be worthwhile. The forecasted membership fees can be held at 1% of average annual turnover due to new members.

Hence, the expected efficiency of SEE Marketing Association will grow every year, primarily due to expansion of the database concerning cooperation with sales channels of SEE and saving money by joint marketing research, which can be spent on other marketing activities, increasing the number of the association members, consolidation of marketing activities of the association members (synergy effect). Over time, association activities can be expanded by providing consulting service to other engineering industry companies and to firms from related branches.

CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

Our studies provide the bases for statement that small engineering enterprises should consolidate their efforts for qualitative, systematic and low-cost marketing research and thereby ensure them the opportunity to compete in the domestic market by the implementation of large-scale engineering marketing activities at a high level. Based on the examined characteristics of small engineering enterprises, we substantiate the necessity of creation of SEE Marketing Associations, which would ensure diversification of marketing activities. The mechanism of funding and functioning of an association is described; the benefits of membership of SEE in SEE Marketing Association are outlined. Further research will be related to the legal and regulatory aspects of establishing such associations, formulation a statute, election of a governing body, etc.

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STATISTICAL EVALUATION OF WORK PERFORMANCE FACTORS

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ABSTRACT

The paper deals with work performance as a complex of different areas and views. The goal of the presented paper is to evaluate the dependences between various work performance aspects and various types of companies. It is based on an empirical research, which was realized with help of a written questionnaire, and statistical evaluation of gained data. The results should show to which extend the type of company influences approach to work performance and the correlations between individual aspects of performance.

KEY WORDS

Performance, indicator, measurement, correlation, SPSS

INTRODUCTION

The performance of human resources is a very fertile area of research, education and practical entrepreneurial activity. Measuring work performance is quite difficult task, but very important, too. It has to be accentuated that measurement of performance is necessary for effective personal management.

The problem is how to measure such complex entity as work performance and what aspects of performance should be considered.

This paper works with individual work performance factors and tries to find relations and connections among each other. Its goal is to describe the relations among individual aspects of performance.

To fulfill this goal, a statistical analysis of empirical data is performed. As main tool IBM SPSS Statistics program is used and the method of correlation analysis is carried out. The research was realized in 2012 and the statistical evaluation of gained data is presented in this paper.

The following text explains the research methodology and presents literature review and gained results.

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1 METHODOLOGICAL PROCEDURE

For gaining primary data a questionnaire based research was realized. The goal of the research was to evaluate the level of monitoring quantitative and qualitative indicators in small and middle enterprises, to evaluate the importance of indicators for work performance measurement and to identify importance of work performance factors from the view of performance areas and time approach.

The basic set comprised limited liability companies with residence in Moravian-Silesian region that were listed in the database of European databank to the date of 20. 1. 2012. The size of the basic set was 6254 companies. The sample set was designed with help of random systematic selection and its size was 625 companies. The respondents were representatives of these companies, one for each.

For the research purposes a questionnaire form was designed that consisted of specific parts.

The first part concentrates at mapping and evaluating present situation in the companies, according to application of quantitative and qualitative indicators and complex approaches to performance measurement.

The next part deals with part areas of performance, which importance should be evaluated by the respondents. The choice of these part areas of performance relies on the theoretical background. As work performance areas were considered quantity of output, quality of output, relations at workplace, ethical approach, organizational culture, identification with organization and work safety.

The third part of questionnaire form pursues performance measurement from the time factor view. The fourth part is constituted of a question group, which are used to evaluate the importance of individual performance indicators. Identification questions are placed at the end of the form.

Distribution of the questionnaires, resp. of the link to the electronic form was realized through e-mails and electronic questionnaires were filled through Google Apps. The responds were gained from 196 companies with the respond rate of 31 %. One form was excluded for the purposes of next processing. The results are based on 195 questionnaires.

The structure of respondents was built as follows. All of them were limited liability companies with less than 250 employees, small and middle companies, where the strongest representation had companies with less than 10 employees (49 %), followed by companies with more than 10 but less than 50 employees (34 %) and companies with more than 50 but less than 250 employees (17 %). From the view of entrepreneurial sector, the strongest was tertiary sector (46 %), followed by secondary (33 %) and primarily sector (21 %). The questionnaire was determined to persons engaged in human resources management in the researched companies. The respondents taking part in the research consisted of company owners (51 %), managers on different levels of management (37 %) and human resources officers (12 %).

The evaluation of data was based on the statistical program IBM SPSS Statistics.

2 THEORETICAL BACKGROUND

It has to be accentuated that high level of attention is dedicated to measuring work performance (Bol, 2011; Feraru, Ciucescu, 2010; Gabel, Harker, Sanders, 2011; Janssens, Steyaert, 2009).

For the purposes of research concept and its realization the following theoretical background was taken into consideration. From the literature research came out factors which characterize work performance.

For performance measurement it is necessary to work with its indicators, resp. criteria (Wagner, 2009), metrics (Učeň, 2008; Krajčík, 2011), value metrics (Truneček, 2004) and norms (standards) of performance (Koubek, 2004), which can be classified from different point of views (Šuleř, 2008; Walker et al. 2003; Sidor-Rzadkowska, 2004; Wagnerová, 2008). The classification of these indicators to quantitative and qualitative seems to be crucial for practical application.

It is important to discuss the components of work performance. Work performance is understood among others as output of work activity (Armstrong, 2007; Mayerová, 1997; Wagnerová, 2008).

Wagnerová (2008) specifies work performance as output of specific work activity reached in given time and under given conditions. The quantity and quality of output represent in this context quantitative and qualitative component of work activity result.

Relations at workplace are accentuated by Koubek (2004) and the ethical approach in the context of performance mention Vodák and Kucharčíková (2007), resp. EFQM Excellence Model (Nenadál, 2004).

The organizational culture as an important factor of competitiveness is to find by Vysekalová and Mikeš (2009) and Armstrong (2007). From the long-term point of view the key aspect of performance is the adaptability of culture. This adaptability is characterized by organizational learning, customer orientation and readiness to change (Lukášová, 2010).

Kasper and Mayrhofer (2005) and Towers Perrin (2008) mention identification with organization and its indicators. Competences as a part of performance in the sense of knowledge, abilities and skills are referred in Mayerová (1997), Mathis and Jackson (1988) and Koubek (2004). Pilařová (2008) defines competences as complex of knowledge, skills and attitudes, that enable individual to reach required performance.

Regarding to the strategic and complex approach to the human resources in the companies it is necessary to take in account the time aspect of performance (Proyecto Meritum, 2002; Covey, 2009; Covey, 2008; Hroník, 2008; Likierman, 2010; Hroník, 2006).

Covey (2009) distinguishes present production P and production capability to future PS. It is necessary to balance these two aspects because excessive result orientation leads to resources wear off. Hroník (2008) notes that not only present results but also the long-term performance are expected from managers.

The effect of work complexity is the need for complex approaches to performance measurement. One example is Balanced Scorecard method (Kaplan, Norton, 2005).

3 RESULTS

The respondents were asked to evaluate the importance of individual areas of work performance, whereby scale 1–5 was used. Value 1 interpreted the highest importance of the area and value 5 the lowest. Average values of evaluation for the performance areas were calculated with following formula (Řezanková, 2010):

$$\bar{x} = \frac{\sum_{j=1}^k x_j n_j}{n}$$

For each area of performance were calculated modal categories x_{Mo} , median \bar{x} , ordinal variance dorvar, resp. discrete ordinal variance, and normalized ordinal variance norm. dorvar (Řezanková, 2010):

$$dorvar = 2 \sum_{i=1}^{K-1} (P_i(1 - P_i)),$$

$$norm. dorvar = \frac{2dorvar}{K-1}.$$

Identified values of ordinal variance are presented in the table 1.

Table 1 Ordinal variance of performance areas

Performance area	Modal category x_{Mo}	Median \bar{x}	Dorvar	Norm. dorvar
Quantity of output	3	3	1,1	0,55
Quality of output	2	2	0,82	0,4
Relations at workplace	4	4	1,34	0,67
Ethical approach	3	3	1,3	0,65
Organizational culture	4	4	1,31	0,66
Identification with organization	2	3	1,34	0,67
Competences	2	2	0,94	0,47
Work safety	2	2	1,04	0,52

Source: author

Ordinal variance dorvar takes values within the interval $\left\langle 0; \frac{K-1}{2} \right\rangle$, in this case $\langle 0,2 \rangle$. Normalized ordinal variance norm. dorvar takes values within the interval from 0 to 1. The highest values were indicated in the case of relations at workplace, identification with organization and ethical approach. At the other end the lowest values of ordinal variance were assigned to quality of output, competences and work safety.

For evaluation of next variability measures were identified values of variances for each area of performance:

$$s_x^2 = \frac{\sum_{j=1}^k (x_j - \bar{x})^2 n_j}{n}$$

As the next step were indicated values of standard deviation, according to formula (Řezanková, 2010):

$$s_x = \sqrt{s_x^2}.$$

Calculated values are presented in the table 2.

Table 2 Performance areas – variance and standard deviation

Performance area	Average evaluation \bar{x}	Variance s_x^2	Standard deviation s_x
Quality of output	1,84	0,6	0,77
Competences	1,97	0,77	0,88
Work safety	2,08	0,92	0,96

Quantity of output	2,44	0,99	0,99
Identification with organization	2,74	1,44	1,2
Ethical approach	2,96	1,38	1,17
Organizational culture	3,42	1,39	1,18
Relations at workplace	3,43	1,46	1,2

Source: author

As it can be seen in table 2, the highest values of variance are reached by ethical approach, organizational culture, identification with organization and relations at workplace. The lowest values were identified in the case of quality of output and competences.

In the context of the fact, that the values in the questionnaire come out of quantifiable scale, which is point determined, is the variance not the best statistical characteristic. It was therefore calculated relative coefficient of differentiation P_d :

$$P_d = \frac{4s_x^2}{R^2} \quad (3.6),$$

where s_x^2 stands for variance and R for variance range. This coefficient shows, to what extent the promoted scale extend was used by respondents in their answers. By the values of relation differentiation coefficient P_d lower than 0,3 can be proclaimed, that the differentiation of evaluation is very low (Stáfková, Dufek, 2004).

The result values of relative coefficient of differentiation are shown in the table 3.

Table 3 Relation differentiation coefficient of performance areas

Performance area	Relative coefficient of differentiation P_d
Quality of output	0,15
Competences	0,19
Work safety	0,23
Quantity of output	0,25
Identification with organization	0,36
Ethical approach	0,35
Organizational culture	0,35
Relations at workplace	0,37

Source: author

The table 3 shows, that the differences in the evaluations of respondents are relatively low. The value of relation differentiation coefficient P_d moves in the the range from 0,15 to 0,37, whereby half of the areas take values lower than 0,3. These results represent low level of evaluation differentiation of respondents.

In the next part of questionnaire was examined the importance of performance areas from the time factor view. Respondents evaluated the importance of present and past performance and of perspective of future performance. The perspective of future performance was evaluated by the respondents as more important, it gained average value of 2,03. The present and past performance

were evaluated by the average value of 2,68. Determined indicators of location and variability measures of the results are presented in following tables.

Table 4 Ordinal variances for time perspective of performance

Time factor view	Modal category x_{Mo}	Median \bar{x}	Dorvar	Norm. dorvar
past and present performance	3	3	1,05	0,53
perspective of future performance	2	2	0,99	0,49

Source: author

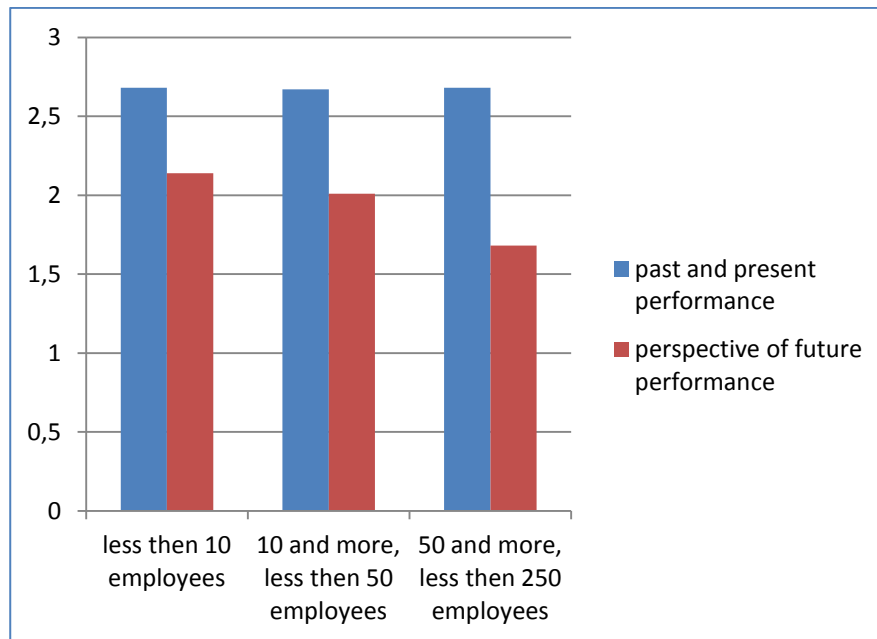
Table 5 Relation differentiation coefficient for time perspective of performance

Time factor view	Average evaluation \bar{x}	Variance s_x^2	Standard deviation s_x	Relative coefficient of differentiation P_d
past and present performance	2,68	0,92	0,96	0,23
perspective of future performance	2,03	0,79	0,89	0,2

Source: author

According to variability measures the established data show very low values, what can be proved primarily through low levels of ordinal variances dorvar and norm. dorvar and through relative coefficient of differentiation P_d . Differentiation of respondent evaluation was therefore very low. It was proved that the future performance is more important than present performance, what corresponds with the strategic approach to human resources management. Perspective of future performance was evaluated with better values than performance in past and presence having no regards to number of employees in researched companies as is showed in the figure 1.

Figure 1 Performance from time factor view according to number of employees



Source: author

In the next step of result evaluation an analysis of dependence of each variables was realized, which was processed with statistical programme IBM SPSS Statistics.

For evaluation of performance area importance according to entrepreneur sector Kruskal-Wallis test was used, whereby the zero hypothesis by this test assumes that all groups are characteristic with the same value of median of explained variable and vice versa the alternative hypothesis suggests that at least one median is different from others (Řezanková, 2010).

Table 5 Kruskal-Wallis test for level of monitoring indicators and entrepreneur sector
Test Statistics^{a,b}

	What attention gives your company to monitoring and evaluation of qualitative metrics of work performance?	What attention gives your company to monitoring and evaluation to quantitative metrics of work performance?
Chi-Square	0,110	3,548
df	2	2
Asymp. Sig.	0,946	0,170

a. Kruskal Wallis Test

b. Grouping Variable: companies due to sector

Source: author, IBM SPSS Statistics

As the presented values show, on the 5% significance level it is possible to state that the zero hypothesis about sameness of medians in individual groups of companies according to entrepreneurs sectors is not rejected. It was proved that level of monitoring quantitative and qualitative indicators does not depend on entrepreneur sector.

Table 6 Kruskal-Wallis test for performance areas and entrepreneur sector
Test Statistics^{a,b}

	Quantity of output	Quality of output	Relations at workplace	Ethical approach	Organizational culture	Identification with organization	Competences	Work safety
Chi-Square	5,308	8,625	23,336	10,326	14,854	6,493	7,780	4,780
df	2	2	2	2	2	2	2	2
Asymp. Sig.	0,070	0,013	0,000	0,006	0,001	0,039	0,020	0,092

a. Kruskal Wallis Test

b. Grouping Variable: companies due sector

Source: author, IBM SPSS Statistics

By evaluating researched performance areas can be stated, that on 5% significance level the zero hypothesis about sameness of medians can be rejected in the case of quality of output, relations at workplace, ethical approach, organizational culture, identification of organization and competences. Evaluation of these areas is statistically dependant on the variable entrepreneur sector. By importance of quantity of output and work safety was found no statistical relevant dependence on entrepreneur sector.

Table 7 Kruskal-Wallis test for time factor and entrepreneur sector
Test Statistics^{a,b}

	Past and present performance	Perspective of future performance
Chi-Square	5,825	7,585
df	2	2
Asymp. Sig.	0,054	0,023

a. Kruskal Wallis Test

b. Grouping Variable: companies due sector

Source: author, IBM SPSS Statistics

In the case of performance areas according to the time factor view can be on 5% significance level stated that the importance of past and present performance is not dependant on entrepreneur sector. In the case of future performance perspective was the independence on this significance level rejected.

For evaluation of correlation between company size and individual performance areas Spearman's coefficient of ordinal correlation was used, which evaluates order of values of variables by respondents. The coefficient takes values within interval $(-1; 1)$. When same orders of both variables are found by respondents, coefficient acquires level 1, which means positive correlation, resp. direct dependence. If values of X variable in ascending order mean values of Y variable in descending order is the level of coefficient -1, whereby it represents negative correlation, resp. indirect dependence. Zero level means linear independence (Řezanková, 2010).

With the help of Spearman's coefficient of order correlation was realised evaluation of dependence between level of monitoring of indicators and performance areas importance and size companies due to number of employees. Values of coefficient and minimal significance levels, at which zero hypothesis can be rejected, were gained with programme IBM SPSS Statistics and are shown in table 8.

Table 8 Spearman's coefficient of order correlation for performance areas and company size

	Company size	
	Spearman's coefficient	Minimal level of significance for rejecting H_0
Monitoring of qualitative indicators	-0,034	0,634
Monitoring of quantitative indicators	-0,208	0,004*
Quantity of output	0,042	0,557
Quality of output	-0,043	0,550
Relations at workplace	-0,222	0,002*
Ethical approach	0,125	0,083
Organizational culture	-0,195	0,006*
Identification with organization	-0,267	0,000*
Competences	-0,284	0,000*
Work safety	-0,059	0,417
Past and present performance	-0,006	0,939
Perspective of future performance	-0,159	0,027*

Source: author, IBM SPSS Statistics

With asterisk those variables are marked in the table, for which it is possible at 5% significance level to reject the zero hypothesis about zero coefficient, which means, that marked variables are dependant at company size. In the case of monitoring of quantitative indicators, relations at workplace, organizational culture, identification with organization, competences and perspective of future performance is possible to state, that with growing number of employees in company these variables are evaluated as more important. These variables represent mostly soft, qualitative aspects of performance. The levels of coefficient is placed between -0,284 and -0,159, the strength of dependence is lower.

In the next step correlation between individual performance areas and time factor is evaluated.

Table 9 Spearman's coefficient of order correlation for performance areas and time factor of performance

	Past and present performance		Perspective of future performance	
	Spearman's coefficient	Minimal level of significance for rejecting H_0	Spearman's coefficient	Minimal level of significance for rejecting H_0
Quantity of output	0,253	0,000*	-0,038	0,599
Quality of output	0,063	0,384	0,228	0,001*
Relations at workplace	-0,031	0,671	0,389	0,000*

Ethical approach	0,063	0,389	0,111	0,125
Organizational culture	-0,082	0,255	0,198	0,006*
Identification with organization	-0,046	0,522	0,375	0,000*
Competences	-0,083	0,252	0,374	0,000*
Work safety	0,118	0,102	0,074	0,307

Source: author, IBM SPSS Statistics

The asterisk shows, that on 5% significance level the hypothesis about zero coefficient was rejected. As the presented values show, on this significance level the dependence at importance of past and present performance was proved only in case of quantity of output. The level of Spearman's coefficient is in this case 0,253, it means positive correlation and lower dependence strength.

In the case of future performance perspective statistical dependence was discovered in more cases. It can be stated, that at 5% significance level importance of future performance perspective is dependant with quality of output, relation at workplace, organizational culture, identification with organization and competences. In all cases positive correlation was detected, whereby Spearman's coefficient takes vales within 0,198 and 0,389. The strongest dependence is by relation at workplace, identification with organization and competences. In these cases respondents with higher importance of future performance perspective evaluated as more important these performance aspects, too. They all represent qualitative characteristics of performance.

In the appendix is shown correlation matrix, where Spearman's coefficient values between performance areas can be found. Positive correlation of higher strength was detected between quantity of output and quality of output (0,431), relation at workplace and organizational culture (0,620), relations at workplace and identification with organization (0,635), relation at workplace and competences (0,399), ethical approach and organizational culture (0,436), identification with organization and competences (0,473). Especially significant is dependence between relations at workplace at one side and organizational culture and identification with organization at the other side.

As it comes out from Spearman's coefficient values for individual performance indicators due to company size, it was proved in a lot of cases direct correlation between company size and importance of qualitative indicators, the strongest correlation was in case of work satisfaction, work attitudes, competence level, organizational culture level and team work ability. With growing company size grows then importance of these indicators, which have qualitative character.

4 DISCUSSION

The gained data and its statistical analysis yielded interesting expert results. Author of this paper is aware of the fact that different circumstances could provide different results.

For example Pheng and Chuan (2006) obtained data of 124 respondents for their research which examined impact of variables on work performance of project managers. They determined team relationship as "the most important variable affecting the performance of project manager". Job security was at the other end of the scales. These results are in contrast with performed research where relations at workplace were evaluated as the least important.

A research by Horáková (2005) presents yet another point of view. 1075 respondents evaluated satisfaction in various aspects of work. Among the high ranked factors belonged again relations at workplace, at the other end landed such hard factors as remuneration.

CONCLUSIONS

As the theoretical background shows, components of work performance can be understood as quantity and quality of output, relations at workplace, ethical approach, organizational culture, identification with organization, competences and work safety. Above all, the time aspect of performance has to be taken into consideration.

The presented results have shown interesting relations between individual aspects of work performance and dependences of these aspects according to type of companies.

The data showed that the level of evaluation of differentiation was relatively low.

It was proved that perspective of future performance is more important than past and present performance in all types of companies.

Various entrepreneur sectors influence the understanding of importance of individual performance areas. Most of these areas importance level depend on entrepreneur sector; the only exceptions are quantity of output and work safety. Divergences were found by time factor view. Importance of past and present performance doesn't depend on sector, but importance of future performance is dependant.

Influence was indicated in case of company size, too. With growing number of employees in company such performance areas are evaluated as more important as relations at workplace, organizational culture, identification with organization, competences and perspective of future performance. It can be stated that the larger companies take more in account the importance of the qualitative aspect of performance. Company size influences importance of individual performance indicators. Larger companies understand as more important such indicators as work satisfaction, competence level or team work ability.

It was proved that the importance of past and present performance correlates with the importance of quantity of output. Companies with more accents on quantifiable work outputs concentrate more on past and present concept of performance. It is interesting that companies laying more accents on future performance take more in account the qualitative and less quantifiable performance areas as relations at workplace, identification with organization and competences.

It can be assumed that the companies understand the importance of qualitative areas of performance and of the perspective of future performance. Furthermore this understanding is stronger by larger companies.

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Appendix 1 Correlation matrix of performance areas

			Correlations							
			Quantity of output	Quality of output	Relat. at work.	Ethical appr.	Organ. culture	Ident. With org.	Compet.	Work safety
Spearman's rho	Quantity of output	Correlation Coefficient	1,000	,431**	,012	,163*	-,183*	,005	,153*	,348**
		Sig. (2-tailed)	.	,000	,868	,024	,011	,943	,033	,000
		N	194	194	194	192	194	193	194	193
	Quality of output	Correlation Coefficient	,431**	1,000	,310**	,171*	,128	,332**	,373**	,232**
		Sig. (2-tailed)	,000	.	,000	,017	,074	,000	,000	,001
		N	194	195	195	193	195	194	195	194
	Relations at workplace	Correlation Coefficient	,012	,310**	1,000	,347**	,620**	,635**	,399**	,002
		Sig. (2-tailed)	,868	,000	.	,000	,000	,000	,000	,975
		N	194	195	195	193	195	194	195	194
	Ethical approach	Correlation Coefficient	,163*	,171*	,347**	1,000	,436**	,244**	,055	-,042
		Sig. (2-tailed)	,024	,017	,000	.	,000	,001	,449	,559
		N	192	193	193	193	193	192	193	192
	Organ. culture	Correlation Coefficient	-,183*	,128	,620**	,436**	1,000	,388**	,155*	-,160*
		Sig. (2-tailed)	,011	,074	,000	,000	.	,000	,030	,026
N		194	195	195	193	195	194	195	194	
Ident. With org.	Correlation Coefficient	,005	,332**	,635**	,244**	,388**	1,000	,473**	,118	
	Sig. (2-tailed)	,943	,000	,000	,001	,000	.	,000	,104	
	N	193	194	194	192	194	194	194	193	
Competences	Correlation Coefficient	,153*	,373**	,399**	,055	,155*	,473**	1,000	,241**	
	Sig. (2-tailed)	,033	,000	,000	,449	,030	,000	.	,001	
	N	194	195	195	193	195	194	195	194	
Work safety	Correlation Coefficient	,348**	,232**	,002	-,042	-,160*	,118	,241**	1,000	
	Sig. (2-tailed)	,000	,001	,975	,559	,026	,104	,001	.	
	N	193	194	194	192	194	193	194	194	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: author, IBM SPSS Statistics

ACTUAL PROBLEMS OF BUSINESS RISK IN SME SEGMENT. CASE STUDY FROM SLOVAKIA

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ABSTRACT

The aim of this article was to define, quantify and compare the significant attributes of business risk for small and medium-sized enterprises (SMEs) in the selected regions of Slovakia. The data was collected through a questionnaire. The whole research was conducted in the Bratislava region on a sample of 102 SMEs, in the region of Trenčín on a sample of 105 SMEs and in the Zilina region on a sample of 168 SMEs. Thus we compared important factors of business risk in the most economically developed region of the Slovak capital to the average regions of Trenčín and Zilina. On the basis of the results of our research, we can conclude that the most important business risk is market risk in all regions. The average value of perceived market risk was higher than 50%. For this reason entrepreneurs have indicated the existence of negative trends in performance and profitability of their companies.

KEY WORDS

Small and medium-sized enterprises, regional differences, business risk, market risk

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INTRODUCTION

Small and medium-sized enterprises (SMEs) have become an increasingly important component of economic development representing a substantial proportion of the national economies all around the world (Karpak and Topcu, 2010). In this context, Henderson and Weiler (2010) indicate that SME can be characterized as major engine of economic growth.

SMEs have specific features and fulfil important tasks in an economic system. SMEs, which clearly dominate in terms of their number in any economic system, contribute significantly to higher employment and the GDP, help to create more intensely competitive environment which has a great importance in relation to prices and quality of products and services. It is evident that SMEs have a negative impact on unemployment rates.

Entrepreneurship in segment of SMEs represents the actual and interesting area of theoretical research and practical applications.

In this article there are examined business risks and changes that have occurred in this area field after the economic crisis in the economic system of Slovakia.

1 IMPORTANT ATTRIBUTES OF BUSINESS RISK IN SME SEGMENT

Business risk could be defined as an option (uncertainty), that actual business results achieved would deviate from the results assumed, and furthermore these variations may be (Hnilica, Fotr, 2009): *desirable* (towards higher profits), or *undesirable* (towards loss); *different* sizes from small deviations when the results are close to those planned, up to a large extent of deviations (significant business success in case of desired deviation or significant financial difficulties and bankruptcy in case of adverse deviations).

Risks that are specific for small businesses according to the Risk Management Guide for Small Businesses processed by the organization of *Global Risk Alliance*:

- *Financial risks* – are associated with management of the cash flow, receivables and payables, taxes, budgetary requirements and others,
- *Organizational risks* – are associated with the insuring of internal organizational needs of the company whether they be cultural issues, structural or human,
- *Legal risks* – are related to compliance with applicable legal standards in the country,
- *Operational risks* – are associated primarily with planning, operational activities, resources and mutual cooperation between the different functional areas of the enterprise,
- *Market, business risks* – are associated with placing the product on the market, with the business growth, commercial success, lifetime of the product or service, the service and etc.,
- *Security risks* – are associated with compliance with the safety and health at work in a given subject, security has a range from the individual level, through a public safety to security products in the enterprise,
- *Strategic risks* – are associated with the identifying and securing of appropriate business strategy from the very identification and evaluation of opportunities through decision-making to determine the long-term strategic objectives,
- *Technical risks* – are related to the operation of all machinery and equipment that the enterprise uses in its business activities, in particular the maintenance, renewal, safety assessment and depreciation,
- *Criminal risks* – are associated with ensuring of security of commercial premises, property and persons, information, technology and so on,

- *Reputation risks* – are associated with securing and maintaining of corporate reputation,
- *Service risks* – are associated with provision of additional services to the customer; in particular, the after sales service, product quality, customer communication,
- *Project risks* – are associated with the preparation and actual implementation of projects in various fields,
- *Risks of the management of interested parties* – are the risks that include identification, establishment and maintenance of appropriate relationships between internal and external interested parties,
- *Technological risks* – are related to the implementation, management, maintenance and renewal of technologies used by the business company. (Risk management guide for small businesses, 2005)

Sources of the business management risks can be briefly summarized into the following areas: improper changes in the management system; lack of strategic focus of the company, respectively insufficient support of strategic thinking; inability to predict the development of an external environment; poor quality of planning; insufficient monitoring of implementation, results and impacts; lack of management skills (professional, conceptual); poor flexibility in decision-making (wrong decisions due to lack of necessary information); increasing of centralization of decision-making; poor interpersonal relationships in the workplace; communication problems between co-workers and management; unclear definition of competence and responsibilities; inadequate reporting arrangements (reporting); lack of interest by the staff and the failure to address complaints; poor cooperation between the business units, and failure to use real development potential. (Hudáková, In Belás et al., 2014 a)

In 2013 the Association for Financial Professionals in cooperation with Zanders Treasury and Finance Solutions held an international survey called „Treasury Risk Survey“ that was focused on *global trends in the corporate risk management*. According to that survey the European companies consider as the most threat to their business the following risks (CFO, 2013): liquidity risk, exchange rate risk, and reputational risk.

Particularly important issue of SMEs is a financial gap because many of these companies have a very limited access to an external financing. Even before the economic downturn, some of the small businesses had troubles with making funds necessary for growth and innovation available for them. Due to the financial crisis, banks are even less willing to lend to companies in many countries, which further exacerbated problems that companies are facing already. (European Commission, 2011)

In this context Dierkes, Erner, Langer and Norden (2013), state that companies in the segment of SMEs are smaller, more informational opaque, riskier, and more dependent on trade credit and bank loans. According to Canales and Nanda (2012) small businesses, and particularly young small businesses, have little internal cash flow to finance their operations and are also associated with significant asymmetric information.

Di Giuli, Caselli and Gatti (2011) state that for small and medium enterprises credit availability is a very important element for their development. Covaci (2008) adds that SMEs are perceived as being more risky than big companies, because they present a high sensitivity to economic shocks while disposing of an inferior capacity to absorb variations.

Neuberger a Rätke (2009) report, that small firms are characterized by higher information asymmetry and credit risk. This point of view is also supported by Kirschenmann and Norden

(2012). In this context Fidrmuc and Hainz (2010) state that the major factors for SMEs default are classified according to high indebtedness, low profit, and low liquidity.

According to Fetisovová, Vlachynský, and Sirotko (2004) and *The Business risks* (2013), among the basic business risks of SMEs it can be included limited access to loans, small capital strength, increased competition, high tax burden, low level of managerial skills, low level of diversification, administrative complexity, risk of failure, relationship between work and private life.

According to Fetisovová et al. (2012), financial and economic crisis had serious implications on the performance of small and medium-sized companies in the European Union. Gross production of SMEs within countries of EU27 by 5,5 % in 2009 was decreased. Insufficient effective demand was the most urgent issue for 29% of these SMEs. Authors report that the demand on domestic markets of E27 will continue to be weak. The approach to financial resources for SMEs represents a serious problem for these companies. However, in the short term, it is less urgent than lack of demand on the domestic market.

2 RESEARCH OBJECTIVES AND USED METHODOLOGY

The aim of this article was to define, quantify and compare the significant attributes of business risk for small and medium-sized enterprises in the selected regions of Slovakia.

The research on business environment was conducted in 2013 in the selected regions of Slovakia through a questionnaire survey. In the Bratislava region (BA) 102 SMEs have been reached; in the Zilina region (ZA) 164 SMEs have been reached; in the Trenčín region (TN) 105 SMEs have been reached. Companies' data was provided by their owners.

These regions have been chosen because it enables us to compare business environment in the most economically developed region to the averagely developed regions. Our aim was to measure the differences among these regions and to define their significance.

The Bratislava region is located in the west and southwest part of Slovakia. It has an area of 2,053 km² which means it is the smallest region of Slovakia. The number of inhabitants was 628,686 and the unemployment rate was 5.4 % in 2011. The Bratislava region is the region with the best economic performance and creates 26 % of the total Slovak GDP. The economy of the Bratislava region contains all the economic sectors based on the traditional industrial production of goods. The most important industrial sectors there are the chemical, automotive, electronic and food industry and the mechanical engineering. Over the last few years, the Bratislava region has become a European centre of automotive industry representing 30 % of the overall Slovak export. (Bratislava region, 2014)

The Trenčín region has an area of 4,502 km², has about 600,000 inhabitants, the GDP per capita reached 10,744 EUR in 2010, the registered unemployment rate was at 10.89 % in 2012 (significantly below the overall Slovak average of 14.44 %).

The Zilina region has an area of 6,800 km². Total population is up to 700,000 and the population density is 102 inhabitants per km². The unemployment rate was raised to 11.91 % in 2011. The GDP per capita was 10,794 EUR in 2011.

In our research in the Bratislava region, the largest share of surveyed companies was comprised of SMEs operating in trade activities (33%), followed by construction firms (12%), manufacturing companies (7%), transport companies (1%) and agricultural enterprises (1%). The remaining share was formed by companies operating in other sectors.

In the Trenčín region, the structure of companies was as follows: manufacturing companies (21%), trade companies (21%), construction companies (18%), transport companies (4%) and agricultural firms (5%). The largest portion of companies operated in other sectors (31%).

In the Zilina region, the structure of companies was as follows: 17% of companies operated in the manufacturing sector, 21% in the trade sector, 17% in the construction sector, 6% in the transport sector, 1% in the agricultural sector. The largest portion of companies operated in other sectors (38%).

From the total number of 102 surveyed firms in the Bratislava region, 54% of them were doing business more than 10 years, 19% of them between 5 and 10 years, 27% of them between 1 and 5 years. Therefore it can be stated that the research was examining quite experienced entrepreneurs from this region. The size structure of companies was as follows: 83% were micro-enterprises, 12% were small enterprises and 5% were medium-sized companies.

From the total number of 105 surveyed companies in the Trenčín region, 54% of companies do their business more than 10 years, 25% do their business from 5 to 10 years and 21% do their business from 1 to 5 years. The size structure of the companies was as follows: 62% were micro-enterprises, 31% were small enterprises and 7% were medium-sized enterprises.

In the Zilina region, of 164 surveyed companies 38% do business more than 10 years, 32% represents firms which do their businesses from 5 to 10 years and 30% of surveyed companies do businesses from 1 to 5 years. Thus companies surveyed in this region were equally distributed from the perspective of business duration. As for the size structure, 66% was represented by micro enterprises, 20% were small companies and 14% were medium-sized enterprises.

In line with the findings of previous research, we hypothesize the following:

H1: The most important business risk at the moment is market risk. There are no regional differences in the perception of market risk.

H2: An average value of the perceived market risk in all regions is higher than 50%.

H3: The economic crisis has reduced the performance of SMEs in Slovakia by at least 15%. There are no regional differences in the structure of the responses of entrepreneurs.

H4: The economic crisis has reduced the profitability of SMEs in Slovakia by at least 10%. There are no regional differences in the structure of the responses of entrepreneurs.

In this article there was used Pearson's chi-square to determine whether there are statistically significant deviations between the compared data sets and theoretical frequencies.

Chi – square (good correlation test) is defined as follows. In scientific research there is tested the hypothesis $H_0: \pi_i = \pi_{i,0}$, where $i = 1, 2, \dots, K$ (K is the number of categories) and $\sum \pi_{i,0} = 1$, against the alternative hypothesis $H_1: H_0$ is not applicable. Unless constants $\pi_{i,0}$ are equal, then the null hypothesis can be expressed as $H_0: \pi_1 = \pi_2 = \dots = \pi_k$. For $n\pi_{i,0} \geq 5$ is used Chi – square statistic given by the relationship

$$\chi^2 = \sum_{i=1}^K \frac{(n_i - n\pi_{i,0})^2}{n\pi_{i,0}}$$

where $n\pi_{i,0}$ is the theoretical (expected) occupation of the i -th category in the selection of the range of n . This random variable assumes that the hypothesis H_0 is valid, Chi – square distribution with $(K - 1)$ degree of freedom, ie $\chi^2 \sim \chi^2 [k - 1]$. The calculated of the given value of the test criterion of χ^2 therefore is compared with quantile $\chi^2_{1-\alpha} [K - 1]$. (Řezánková, 2007)

In the calculations of the Chi-square and p-value there was used a freely accessible calculator that is available at: <http://www.socscistatistics.com/tests/chisquare2/Default2.aspx>.

For the detection of statistically significant differences in the answers to each question there was used a Z-test available at: <http://www.socscistatistics.com/tests/ztest/Default2.aspx>.

3 RESULTS AND SHORT DISCUSSION

The perception of business risks and their intensity in the Slovak Republic are shown in Table 1.

Table 1. Business risks and their intensity in the Slovak Republic

<i>You are facing many risks in your job. Which of them do you consider as the key ones? Please select maximum of three answers</i>	BA	TN	ZA	p-value****: BA:TN/BA:ZA/TN:ZA
1. Market risks (lack of contracts)	82*/56.58**	87*/53.27	132*/51.30	0.6455/0.9840/0.6241
2. Financial risk (poor access to financing)	55/31.94	53/30,10	96/32.95	0.6171/0.4593/0.1936
3. Operational risk (inability to handle processes)	21/24.17	15/20.71	37/30.09	0.2301/0.7039/0.0930
4. Personnel risk (poor staff)	42/30,77	50/31.04	63/30.89	0.3524/0.6527/0.1362
5. Legal risk	17/32.01	34/37.50	61/28.76	0.0088/0.0003/0.4179
6. Security risk (accidents, incidents, etc.)	30/28.76	29/20.28	54/24.73	0.7718/0.5485/0.3576
Chi-square/p-value*** BA:TN/ BA:ZA/TN:ZA			3.3572/0.4999//4.6734/0.3225// 4.8723/0.3007	

Notes: * means the number of respondents, ** means the average impact of perceived risk,***this chi-square and p-value compares the structure of all responses, i.e. it examines if there are significant differences within the regions concerning all answers,****p-value compares the structure of the answer in each individual row by using the Z-score method, BA-Bratislava region, TN-Trencin region, ZA-Zilina region.

The Hypothesis 1 was confirmed. In our research it was found out that the most important business risk at the moment is market risk. Based on our own calculations, it was found out that there are regional differences in the perception of market risk. This fact was confirmed by the value of the test criteria (p-value=0.6455/0.9840/0.6241)

At the same time, it was found out that there are no statistically significant differences in the structure of assessed risks in individual regions, which was confirmed by the values of the test criteria (p-value=0.4999/0.3225/0.3007).

The Hypothesis 2 was also confirmed. It was found out that the average value of perceived market risk in all regions is higher than 50%. Paradoxically, the highest intensity of perceived market risk was found in Bratislava region, which can be considered to be the most economically developed.

One possible explanation is that most probably in this region the entrepreneurs feel a stronger competition, which in their perception may be converted to a higher degree of market risk.

The most important business risks which were perceived by entrepreneurs in the Czech Republic were as follows: market, financial and personnel risks. Market risk was identified as a key risk by the largest number of entrepreneurs, that means 79.44% of them in the Czech Republic (Belás et al., 2014 b)

In Table 2 there are presented the results of research on the decline in performance of SMEs in Slovakia compared to the pre-crisis period.

Table 2. Decline in performance of SMEs in Slovakia

By what percentage your current performance has been decreased compared to the pre-crisis period?	BA	TN	ZA	p-value**: BA:TN/BA:ZA/TN:ZA
1. up to 10%	23	20	28	0.5485/0.2077/0.5619
2. from 11 to 20%	11	12	33	0.8493/ 0.0444 /0.0688
3. from 21 to 30%	18	22	34	0.4902/0.5687/0.8337
4. from 31 to 40%	9	14	9	0.2731/0.2627/ 0.0168
5. from 41 to 50%	5	3	11	0.4533/0.5687/0.1802
6. Other answers (over 50%, performance increased, I haven't done business)	32	34	49	0.8729/0.7949/0.6672
The average value of decline of performances in %	18.73	17.45	18.78	-
Chi-square /p-value* BA:TN/ BA:ZA/TN:ZA			4.0731/0.3963//5.6675/0.2253// 9.9112/0.0420	

Notes: *this chi-square and p-value compares the structure of all responses, i.e. it examines if there are significant differences within the regions concerning all answers, **p-value compares the differences in structure of the answers in each individual row by using the Z-score method.

The Hypothesis 3 was partially confirmed. It was found out that compared with pre-crisis period, the performance of SMEs in Slovakia have decreased by at least 15%. At the same time, it was found out that there are regional differences in the structure of the responses of the businessmen in Trncin and Zilina regions (p-value=0.0420). Our results suggest that there are some differences in the structure of responses of entrepreneurs, for example businessmen in the Žilina region compared with entrepreneurs in the Bratislava region significantly more reported that their performance is reduced in the range of 11-20% (p-value = 0.0444). Similarly, the entrepreneurs in the Trenčin region compared with the entrepreneurs in the Žilina region statistically significantly more frequently reported that their performance is reduced in the range of 31-40%.

Average performance decrease is represented by 15.80% in the Czech Republic in the same period. (Belás et al., 2014 b)

In Table 3 there are shown the results of our research in profitability of SMEs in Slovakia.

Table 3. The decline in profitability of SMEs in Slovakia

How your company's profitability has changed compared to the pre-crisis period?	BA	TN	ZA	p-value**: BA:TN/BA:ZA/TN:ZA
1. Significantly decreased (more than 20%)	31	32	43	0.9920/0.4593/0.4473
2. Slightly decreased (0-20%)	28	38	61	0.1770/0.1010/0.8650
3. Is stable	28	20	35	0.1527/0.2543/0.6455
4. Slightly increased (0-20%)	7	7	21	0.9522/0.1236/0.1074
5. Significantly increased (more than 20%)	5	4	4	0.6965/0.2801/0.5157
6. I was not doing business before the crisis	0	3	0	-
The average value of the decline in profitability in %	11.76	14.31	12.01	-
Chi-square* /p-value* BA:TN/ BA:ZA/TN:ZA			2.9558/0.5653//6.3969/0.1714// 3.2542/0.5162	

Notes: *this Chi-square and p-value compares the structure of all responses, i.e. it examines if there are significant differences within the regions concerning all answers, **p-value compares the differences in structure of the answers in each individual row by using the Z-score method.

The Hypothesis 4 was confirmed. The economic crisis has reduced the profitability of SMEs in Slovakia by at least 10%. At the same time, it was found out that there are no regional differences in the structure of the responses of the businessmen (p-value=0.5653/0.1714/0.5162).

For comparison purpose there could be mentioned, that in the same time in the Czech Republic the average decrease in the profitability amounted in 10.44% (Belás et al., 2014 c)

The worsened conditions for business for SMEs have gradually transformed into tightening approach of commercial banks to finance these companies.

The global financial crisis has caused considerable concerns about what the banks' practices will be in relation to the loan financing of the corporate sector. The current signals confirm that banks in the Czech Republic and Slovakia have tightened the conditions for their clients. (Geršl and Jakubík, 2011)

Within our research, we asked entrepreneurs how the lending policies of commercial banks have changed compared to the pre-crisis period. 36.28% of the Bratislava region entrepreneurs stated the approach of banks has worsened compared to 2008 and only 8.82% stated the approach has improved. 14.71% of them declared no difference in the approach and 40.20% could not answer this question. Similar results were obtained in the other two regions. 47.62% of the Trencin region entrepreneurs stated the approach has worsened, whereas 11.43% stated the approach has improved. 31.10% of entrepreneurs in the Zilina region declared a worse attitude of banks and 12.20% of them a better commercial banks' attitude compared to 2008. These findings are compatible with the studies of the European Commission (2011), Di Giuli, Caselli and Gatti (2011), Dierkes, Erner, Langer and Norden (2013), and Kirschenmann and Norden (2012).

In this context Canton, Grilo, Monteagudo, and Zwan (2013) state better accounting information, firm size and firm age found a positive relationship for getting a bank loan. Psillaki, Tsolas, and

Margaritis (2010) state that the company performance is negatively related to default. They have also shown that, firm efficiency has enough explanatory power to perform better than the financial indicators.

Generally, Slovak entrepreneurs evaluate the approach of the State to their needs and interests negatively. For instance, the Business Environment Index in relation to Slovakia, which is prepared by the Business Alliance of Slovakia, fell in 2011 to the historically lowest level since 2001 (Business Alliance of Slovakia, 2012).

Business environment in Slovakia was negatively perceived by 56% of companies in 2013. This results from the economic survey of the Slovak Chamber of Commerce (2014) among its members, which regularly takes place at the end of the year. A positive evaluation was showed only by 2% of respondents and the remaining 42% declared that the business environment has not changed compared since 2012. The national economic policy was negatively rated by 44% of respondents, while in the year on year comparison, negative evaluations decreased by 6 percentage points. Only 4% of business entities perceived the government measures as positive and nearly a half, namely 48%, assessed the economic policy neutrally. More than 38% of respondents suggested to the government taking actions in the field of tax burden and reducing administrative burden. Participants in the survey suggested, for example, returning to a flat rate of income tax, reducing the rates of Value Added Tax, or taking effective measures against tax evasion. Approximately 33% of business subjects required fundamental improvements in law enforcement and taking measures to accelerate solutions of commercial disputes. The greatest risks to businessmen were the following: high tax burden, poor law enforcement or cronyism and corruption in public procurement (Slovak Commercial and Industrial Chamber, 2014).

Despite these facts, the entrepreneurs in our research have showed large dose of business optimism. In the Bratislava region, up to 90% of entrepreneurs stated that they believed that their company will survive in next five years in surveyed research. This share was represented by 90% in Trencin region and Zilina region.

CONCLUSIONS

The aim of this article was to define, quantify and compare the significant attributes of business risk for small and medium-sized enterprises in the selected regions of Slovakia.

Our research showed there are few regional variations in the assessment of important attributes of business risk in the SMEs segment in Slovakia.

In our research it was found out that the most important business risk at the moment is market risk. Based on our own calculations, it was found out that there are no regional differences in the perception of market risk.

It was found out that in comparison with pre-crisis period, the performance of SMEs in Slovakia decreased by at least 15%. At the same time, it was found that there are some regional differences in the structure of the responses of the businessmen in Slovakia.

The economic crisis has reduced the profitability of SMEs in Slovakia. At the same time, it was found that there are no regional differences in the structure of responses of Slovakian entrepreneurs.

Although it is clear that there are certain limitations to our research (e.g. the number of companies involved into the research), it is expected our article has brought significant incentives for the formation of business environment in Slovakia.

Our future research will focus on examination of the relationships among personal characteristics of entrepreneurs, the propensity to risk and their financial performance.

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MEASURING WEBSITE QUALITY OF THE INDIAN RAILWAYS

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ABSTRACT

Websites are being widely used for commercial purpose in both private and public sectors. Whether such widespread use and dependency on web enhances the satisfaction among its users or not is to be understood. The objective of the present study is to examine and analyze the quality of the website of the Indian Railways.

The Indian Railways website quality was compared with a perceived ideal website. The attributes for assessing the website quality of a railways were developed on the basis of pertaining literature review, interview with some of the web site users and with personal observations. In the present study the mean value in case of the Indian Railways is 36.28 and in case of perceived ideal website the mean value is 45.06. The F-statistic value is 52.75. The result allows us to infer that the Indian Railways website quality is not on the mark compared to what the users expect in a perceived ideal website.

The implication of the present study is that the Indian Railways should focus on the quality of its website for increased user satisfaction and for enhancing its image.

KEY WORDS

Website Quality, Indian Railways, Users Perception, Evaluation.

1. INTRODUCTION

Quality can be defined in many ways depending on what product or service it is related with or who i.e. customer, or producer is defining it. The American Society for Quality defines quality as a subjective term for which each person has his or her own definition. In technical usage, quality can have two meanings: the characteristics of a product or service that bear on its ability to satisfy stated or implied needs, and a product or service free of deficiencies.

Indian Railways, a premier public sector enterprise of the country is the largest rail network in Asia and the worlds' second largest network of employees under the one management. Indian Railways is a multi-gauge, multi-traction system covering a total of 108,706 km of track. This track includes 86,526 KM route of broad gauge (1676 mm) line of which 16,001 km has been electrified. It has 18,529 km of meter gauge (1000 mm) line, and 3,651 km of narrow gauge (762/610 mm) line.

Indian Railways runs around 11,000 trains everyday, of which 7,000 are passenger trains. It has 7566 locomotives, 37,840 coaching vehicles, 222,147 freight wagons, 6853 Stations, 300 Yards, 2300 Good sheds, 700 Repair shops, and 1.54 million work forces.

A government holding enterprise, Indian Railways is all set to compete with the private players in the airlines sector. Private airlines like Deccan Airlines have already announced that their competition is not with the other airliners in the country but with the Indian Railways. The Indian Railways Catering and Tourism Corporation has launched an on-line ticketing facility which can be accessed through its website www.irctc.co.in. Presently this facility is available at 758 locations in the country covering about 96% of the total workload of passenger reservation. Keeping the trend alive the Indian Railways through its associate www.irctc.com has also started, on a pilot basis an Interactive Voice Response System at 98 stations.

Through its own intra-net "Railnet" it has networking between Railways Board, Zonal Headquarters, Divisional Headquarters, Production Units, and Training Centres etc. At the International level, Indian Railways construction division is executing different projects in Malaysia, Bangladesh, and Indonesia.

Of the 13 million passengers served by the network everyday, nearly 12 million are unreserved passengers. To cater to this huge segment, computer based ticketing system has been launched for all stations in Delhi area and it is reported that in due course it will be launched throughout the country. With this, unreserved tickets can be issued even from locations other than the boarding station and will reduce crowds at booking offices and stations. A pilot project for issuing monthly and quarterly season tickets through Automated Teller Machines has also been launched in Mumbai last year and has been found to be very successful. Another pilot project for purchasing tickets including monthly and quarterly season tickets through Smart Card has been launched by Indian Railways.

Rail Tel Corporation has been created to make a nationwide broadband multimedia network by laying optical fiber cable along the railway tracks. Optical Fiber based communication system will further improve Indian Railways telecommunication systems. Optical fiber cable lying has increased to 7,700-route kilometer last year. This system will provide better operational and passenger amenities and additional revenue to Indian Railways.

The Internet is offering customers and businesses an altogether new way of transacting. It's a new and very powerful channel, through which customers are coming closer to businesses. Everyday more and more people are joining this networked world. However some of the Websites give a very good experience of using while some other cause frustration, which results in dissatisfaction among the users. Tolerance level for poor quality on the web of the people is decreasing day by day. Collett & King (1999) demonstrate that nearly 78% of the online shoppers never make it to the checkout line. Getting customers to the website of a company is one thing, making them to purchase is just another. Avery (2000) reported that the quality and the usability of the site determine the turning of visitors into buyers. He notes that the Web quality and usability are key factors in differentiating companies doing business on the Web - for every dissatisfied customer who complains, there are nine who leave the site, shop somewhere else and tell ten other people about their bad experience. Companies must address issues of quality and usability on their sites, this will help in ensuring customers return to Websites.

If a Website is going to be one of the important sales channels, then it is imperative that the companies must address the concerns of Website quality. It is necessary to identify what the customers expect from a Website. Ignoring this dimension of Website requirement may lead to decreased customer satisfaction. The present study is an effort in this direction. The objective of the study is to evaluate the Website quality of Indian Railways.

2. OTHER RELATED STUDIES

Much research has been conducted which has discussed and proposed measures to evaluate Websites, measures ranged from number of hits (Jaspersen, 1996); server log analysis (Murphy, 1999), usability of Website (Nielsen and Norman, 2000); user satisfaction (Stevenson et al., 2000). Websites service quality measurement has also been addressed through WebQual (Barnes and Vidgen, 2000), WebQual™ (Loiacono et al., 2002) and E-Qual (Kaynama and Black, 2000). These studies involved an examination of literature and exploratory research to identify elements of service important in Website from consumers' perspective. Stressing the importance of users requirement for the organizations, Sweeney and Lapp (2004) writes 'understanding consumer perceptions of the Website experience, such that consumers can contribute to the firm's productivity and simultaneously enhance their own outcomes is vital for managers'. They further noted that the value of Website is not recognized at all unless the Website meets some basic standards. These include up to date information, working of links, speed of loading, degree of control, and search across Web pages within a Website.

Chang and Arnett (2000) identified factors associated with website success in the context of electronic commerce. The factors identified were information and service quality, system use, playfulness, and system design quality. Their propositions were a.) Organizations should seek ways to improve information and service quality provided through Websites; b.) Customers rather than the organizations should control the on-line transaction process. c.) Cultivate hedonic pleasures in the website by motivating customers to participate, promoting customer excitement and concentration, and including charming features to attract customers and to help them enjoy the visit; d.) System design quality have direct relationship with website success.

Zeithmal et al. (2001) reported 11 dimensions for electronic service quality based on focus-group research with customers who shop on the Internet; these are mentioned in the Appendix. Russell and Taylor III (2003) conceptualized 10 dimensions of web site quality; these are also mentioned in the same appendix. In Indian context one of the leading offshore developers e-Zest Solutions evaluates Websites based on ten different aspects of each site. These include purpose, functionality, download time, ease of navigation, usefulness of content, overall graphic presentation, ease of contact and responsiveness, online catalogue, secure payment processing, and effectiveness of marketing. In Indian context no study could be found which has tried to evaluate the quality of a Website keeping in mind user's experience.

3. METHODOLOGY

3.1 Data Collection

The Indian Railways Website quality was compared with a perceived ideal Website. Respondent's expectations were captured with regard to their perceptions of an ideal Website quality and their actual experiences of accessing the Indian Railways Website. The attributes for assessing the Website quality of Indian Railways were developed on the basis of pertaining literature review, interview with Website users and with personal observations. A framework was developed for understanding customer satisfaction with users of Websites. A total of 62 respondents, users of

Websites were selected randomly. Respondents included were drawn from various organizations, industries, age groups, and occupations. All variables in the survey were measured on a five point Likert scale from 5 (Most important) to 1 (Least important).

3.2 Data Analysis and Results

Responses obtained were statistically tested for their significance. One-way ANOVA was applied to analyze the data. F-test gave the following result, as shown in the table below.

Table 1 Single Factor ANOVA

SUMMARY

Groups	Count	Sum	Average	Variance
Ideal Website	62	2794	45.06452	28.32364
Indian Railways	49	1778	36.28571	54.79167

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2109.285	1	2109.285	52.75945	5.94E-11	3.928193
Within Groups	4357.742	109	39.97928			
Total	6467.027	110				

The ANOVA test above shows the significance of the differences in the two groups. At a very small 'p' value (of 5.94E-11), the null hypothesis that there is no significant difference between the Ideal and Railways Website quality is rejected. In other words as is clear by the observed 'F' value of 52.75, which is bigger than the critical 'F' value (of 3.92), there lies a statistically significant difference in the Indian Railways and Ideal Websites.

4. DISCUSSION

The items in the questionnaire included were Continuous Connectivity, Quick Response and Help Whenever Needed, Ease of Access, Options to Pay, Buy, & Search, Content Usefulness, Ease of Navigation, Simple to Use and Properly Structured, Confidence & Clarity of Data Generated, Privacy & Security of User, Aesthetics, and Customization/Personalization. Out of the 11 dimensions of Website quality reported by Zeithmal et al. (2001) the dimensions which are common are Quick Response and Help whenever Needed, Ease of Access, Options to Pay, Buy, and Search, Ease of Navigation, Privacy and Security of User, Aesthetics, and Customization/Personalization. We additionally found Continuous Connectivity, Content Usefulness, Simple to Use and Properly Structured, Confidence and Clarity of Data Generated as important attributes of Website quality. Russell and Taylor III (2003), additionally reported Server Reliability, Speed of Page Loading, Transaction Time, and Domain Name as important determinants of Website quality. The employee-related dimension of service quality, which is important for excellent service quality, does not exist on the Internet; this becomes an advantage of the Internet, because consistency of service is almost ensured. However, it also requires that the potential for problems be eliminated because there is no helpful, well-trained employee immediately available to correct the situation.

The result of the study rejects the null hypothesis of no difference of Website quality of Indian Railways compared to an ideal Website. The ideal Website average value of 45.06 is greater than the Indian Railways Website average value of 36.2 (Table 1), that shows Website quality of Indian Railways is statistically significantly lower. The Indian Railways Website scores high on confidentiality and maintaining the privacy/security of users, however for an ideal Website there are more important dimensions like clarity of data produced, quick response, content usefulness, continuous connectivity, simple to use and properly structured, and ease of accession. Chang, (2000) also reported that security is only a necessary condition but not a sufficient condition of designing a successful website: a secure Web market does not guarantee customers. A successful website is one that attracts customers, makes them feel the site is trustworthy, dependable, and reliable and guarantees customer satisfaction. Therefore it can be concluded that secured transaction is a pre-condition for transacting through a website.

5. CONCLUSION

If more and more Indian Railways customers use Website for their ticketing related works then it would be beneficial to the Railways as it would be saving in the cost of printing of stationeries for both reservation ticket and application form printing. Occasionally it was found that the Indian Railways front side staff is busy so if its Website takes on some customer contact related work then the customer service would increase and thereby relieving some of the front-end employees work.

If because of some reason the site takes time for processing the request then there should be a clear message informing the browsers for the same. Like some of the Indian airliners, Indian Railways should provide the facility of multiple itineraries planning in its Website. Codenames of all the stations should be provided rather than of only bigger stations. Messages like “station code is invalid” etc. frustrates the browser. Unless the enquired station is a starting station it is very difficult to get the connecting train schedule. It is revealed during the survey that sometimes it takes the whole day to plan an itinerary. In the course of accessing the Indian Railways Website one frequently gets the message “Unable to retrieve due to communication failure”. After receiving this message if the request is resubmitted then there is no indication whether the request is being reconsidered and processing is on or nothing is happening. For messages like “Could not retrieve trains list.... selected class has no trains”, the Website should give an option to change the class or any other selected field, before automatically resetting the window all over again. At times it becomes highly confusing when Website returns the message “Class is not available” for the unavailability of train on a particular day.

Additionally as this survey has demonstrated that there should be a mechanism in place to monitor the satisfaction of Indian Railways Website users. Any dissatisfaction if at all there in users of Website should be seriously addressed to. Though ticketing through Web is an added facility in the form of new channel and has nothing to do with the main function of providing transportation utility to its customers but as the survey suggests people expect reasonably good browsing experience. Moreover Websites provide an opportunity for enhancing service quality therefore Indian Railways should continuously strive to find ways to improve quality of its Website. It is not enough to register Web presence in today's networked environment, but as the study suggests quality Web service and experiences during the Web encounter are equally important. Certainly Railways should enhance the quality of its Website by considering the relevant attributes and also increase the awareness among its customers so that more and more people use its Website for their ticketing and other travel concerning work. This will help Indian Railways to provide a better experience to its customers and that too without incurring much additional cost.

6. LIMITATIONS

Although these results provide some important insights about the customer satisfaction and contents, continual monitoring of the development and functionality of Websites will be needed. The data presented should be enlarged both cross-sectional and longitudinally for having a better picture of dynamics of Web-enabled ticketing. The sample frame used for this study may not necessarily be representative of all the Website users. Also there may be some quality attributes other than those included in this study that vary in importance, which may be associated with distinct motivations and experiences in Website usage. Therefore the needs of different user groups in terms of their extent of desired involvement with Websites need to be identified. Hence future research need to explore these aspects. Also the electronic marketplace on the Web in India is not yet much popular and hence there is a limited knowledge for consumers as to how to pursue electronic ticketing activities on the Web.

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APPENDIX

e-Service Quality (e-SQ) dimensions by Zeithaml et al. (2001)

Access
Ease of Navigation
Efficiency
Flexibility
Reliability
Personalization
Security / Privacy
Responsiveness
Assurance / Trust
Site Aesthetics
Price Knowledge

Quality attributes specific to Web site service (Russell and Taylor III, 2003)

Ease of Use
Clarity of Information and Instructions

Server Reliability

Speed of Page Loading

Transaction Time

Aesthetics

Privacy and Security

Domain Name

Human Backup

Transaction Reliability

