management

CONTENTS

Business Intelligence System Development Over Document Meta Data in the Oorganization

UDC 005. 21. 352 (497. 4)

Milija Suknović, Miloš Jovanović, Boris Delibašić, Milan Vukićević
Faculty of Organizational Sciences, Belgrade

Business intelligence is an active field of research and practice. Although the field is young, it offers a lot of solutions, mainly intended for better reporting and analysis, which would support the decision making process at all levels of decision making. As the decision process is part of every area of human endeavor, so are business intelligence systems becoming part of many different areas of management. Nevertheless, there are specific business topics for which there are still no record of business intelligence application. One such topic is Document Management Systems (DMS), which are also carrying informational potential for better decisions, that could be harnessed in building a business intelligence system. This paper describes such an effort, which solves the identified needs for quality information by building a business intelligence system over document meta-data within the organization.

1. Introduction

The decision-making process is the most important process in managing an organization. The theory defines management as a succession of choices, i.e., decisions and actions meant to bring the system into a desired state. Hence the importance of successful decision making is a precondition to a successful management, which is the primary objective of organizational management. As Peter Drucker, the founder of modern management, pointed out: "Making good decisions is a crucial skill at every level."

One basic way to support the decision-making process is to supply the decision makers with information. It is actually the support to the first phase of the Symon structure of the decision-making process [1]. The last two decades have witnessed the development of a number of tools and methods in the field of business operations, under the name of Business Intelligence and for the purpose of aiding the first phase of decision making. The general principle is "the right information in the right time, to the right user", which stresses the provision and presentation, rather than the method in which the available information from the environment is made use of.

Business intelligence systems are meant to enhance the improvement of a number of criteria of the decisions made: the risk reduction and the effectiveness, at significantly lower costs (of resources and time) for consuming new information and, consequently, for decision making. This has become possible due to enormous advances in the information technologies development, in the fields of both data storage and data processing.

Business intellingence actually links two sides: the management needs for information for the purpose of making better decisions and a multiple growth of the available data.

The goal of the business intelligence is, therefore, to integrate and consolidate the data from different, often isolated information systems, as well as to allow for the decision makers to access all the data available in a simple, fast and flexible manner in order that they should acquire the information that would in turn advance the decision-making process. The business intelligence systems hence make the decision-making process faster and risk freer, which are the basic qualities of decision making.

2. Busines intelligence over documentation data in the organization

The digitalization era shows that the traditional methods of data storing are inefficient. The advantages of digitalization are numerous, and most evident are the following: a more reliable and efficient warehousing, easier search, copying, sending, etc. The disadvantages are that the digital records depend on the computer and on the electronic devices that make it possible for us to use them.

As far as the media forms are concerned, they have all found their digital match, from the text, to images, to sound, to film, etc. The paper media, called *treeware* in slang, are increasingly being abandoned in many areas of modern living, so it is with business. The digitalization of business documentation, however, is slightly slower due to legislation that demands high levels of reliability and confidentiality in order that the electronic documents should gain the legal power. Hence in the provisional solutions the electronic documentation is used alongside the paper documentation, which has the probative force in case of dispute. Such redundant storage of documents is, however, still used since it has more advantages than

disadvantages, which speaks in favour of the high quality of electronic documentation. The situation in Serbia is similar, the companies use the DMS systems to organize and have the insight into the documentation, whereas they keep the paper documents in case of dispute.

The Electronic Signature Act, enforced in 2004 [2], is meant to regulate the relability and confidentiality of electronic documents. For the time being, its application is limited, and the role of certification bodies is assigned only to the "PTT Serbia" and the Economic Chamber of Serbia. When the application of this act has been extended to an appropriate extent, the paper documentation will become inferior, which should improve the electrinic business operations in this country, and this is one of the objectives of this Act.

The Document Management System serves to efficiently 1) store, 2) organize, and 3) make the digitalized documentation available to the user, so that the user can browse through it. The document is transformed into a digital image, marked and indexed by meta data, which will be dealt with in the following chapters. Additionally, the fields in the document indexed in advance are entered into the electronic database, in order to facilitate the search.

The DMS users are all members of the organization with an access to the documentation, either by updating the documents within the transactions over documents, or by having an insight into the documents in other business processes. This covers a large portion of organization, therefore the improvements achieved by the DMS are not local in character; their implementation rather means benefits for the entire company. Figure 1 shows the image of the document filed in the DMS.

2.1. Documentation metadata

The metadata are the data that describe the data, referring to the data type, data purpose, values allowed, connections with other data, data history, etc.

The document is a form in which the data are exchanged in an organization. It implicitely defines the purpose of the data, as well as the manner in which the data is used. Since the document is a unit in defining business processes, each document stores the data that describe it additionally (time of creation, creation site, changes over time, users accessing to data, etc.).

It is important to differentiate between the basic data the document contains and the data describing the document itself (metadata). The basic data contains the contents, whereas metadata describes the structure of the document and of the data the document includes.

The basic data from the document are the reason the documentation is gathered and most often they are the subject of detailed analyses. The idea in this paper is to allow for the analysis of metedata on the documents in the organization, in order that new useful information should be obtained. Thus, for example, on the basis of such descriptions the reports can be made of the surveys of one type of documents in the organization, analyses of the document creation can be conducted, as well as the analyses of implementation and changes, etc. Such
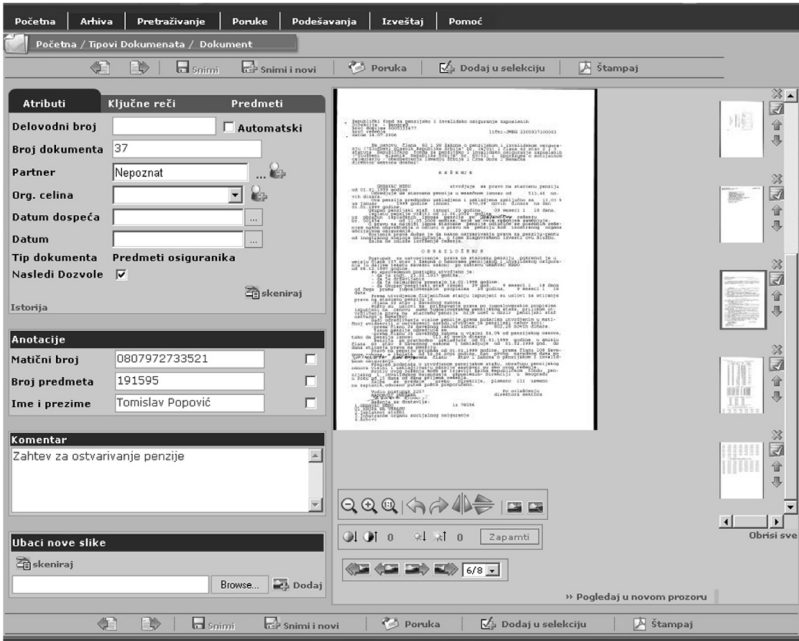

Figure 1. The image of the document filed in the DMS

information can show the state the business is in and foster the improvement of the business processes.

The DMS application also presents a generic OLTP system. The application relies on the metadata from the database that describe the fields of each defined document. Hence the base of such a system contains tables describing each of the document's attributes, whereas the concrete images of the document are stored in the tables generated by the application itself, unknown and non-existent prior to the implementation of the application in the given company. This practically means that the structure of the documents describing the business is generated by the user through the implementation of the application.

Therefore the structure of the database tables describing business operations is unknown prior to the implementation and use of the application in a concrete company, which will largely affect the creation of data warehouse, and especially the ETL procedures for warehouse loading.

The idea of developing a business intelligence system over the existing document management system came naturally. Namely, when the basic DMS application matured in use, and the databeses stored in it gathered a sufficient quantity of data, there was an opportunity to additionally use the gathered data on the documentation.

The basic DMS application offers an opportunity for browsing and insight into the documentation. It is accompanied by an application that ensures the tracking and controlling the life cycle of the document in the business processes. The users of these applications are the employees who make use of the documents in doing their business. On the other hand, the management users do not see much benefit from these applications, because they handle the documens in an infinitely granular form, on the level of the document. The management needs are viewed in dealing with the entire documentation, analysing its flows and identifying potential problems in business. Hence they are the target group in the development of new analytic functionalities through the business intelligence system.

Hence the idea for the application called *BI DMS* whose goals are the prompt, flexible, effective, all-inclusive management reporting itself, which will utilise the data from the existing DMS in use to improve the management operations.

Although the BI area is widely applied in practice, which can be seen in numerous reports and publications, the ap-plication of these systems over the data generated by the DMS was not identified in the publications available. This makes our effort all the more challenging, and its results have already earned positive criticism on being presented at a number of expert and scientific symposia [3,4].

3. Challenges solutions

The basis of the majority of BI systems is the data warehouse. It acts as a support and an adjusted environment for BI user applications for reporting and analysis. The task for the BI DMS application warehouse is to integrate data from the DMS system, transform it into suitable structure and image and make them available to user applications. In a wider context, it has to enable the integration with other information systems of the user company, so that the entiraly integrated data in the company should produce a higher synergy effect.

In building this application we created the warehouse following the suggestions and guidelines provided by the founders of this field, Ralph Kimbal and Bill Inmon, presented in the already mentioned books [5,6].

The data warehouse should include the data required for the analysis and structure them into the format suitable for this purpose. The needs for the analysis are viewed through: a) the previously required reports received as the queries of client-companies and b) potentially useful reports and analyses.

On the basis of these guidelines a data warehouse was built the description of which will be presented further on in this paper.

The problem with the initial DMS base is that, when a firm starts implementing the DMS application, the base does not contain any defined document the firm uses. Through the application, the users will define any document, with the field structure, field types and other constraints. The application then generates the tables in the base, in which the data from thus defined documents are stored.

On the other hand, the idea of the *BI DMS* application is to generate a framework for introducing business intelligence over any DMS user base, rather than developing the BI system for every user company individually. As the structure of the documents used by a given company is not known in advance, this data will be disclosed via the metadata the user utilized in defining the format of his documents.

This will be a biggest problem both in the warehouse designing and in establishing the procedures for warehouse refreshment.

3.1. Data Warehouse Schema

The warehouse schema should reflect its purpose in terms of the analyses required. In order to ensure a flexible analysis that includes the necessary and potentially useful reports, we will structure the data on the documents into the following concepts (subjects, according to Inmon):

Basic data on the document

Time of creation, change and usage of the document,

Type of the document,

Department of the company – document user

Partner with whom the document is exchanged,

Event (action) over the document.

These are the data that describe every type of document, regardless of its contents. Additionally, certain fields are stored for every document, that show the document contents and are defined by the user for the purpose of facilitating the browsing through the documents. In this way the currency amounts can be stored (in case of financial documents), as well as goods denominations (in case of sales receipts) etc. Since it is sometimes useful to include this data (contained in the given document) into the analysis, an appropriate site to do it will be a warehouse. Such data will be grouped into a separate concept:

Specific data from the document.

the granular structure of the warehouse as an elementary (atomic) unit of reporting. The selection of the granularity level is a critical decision of the architecture, since it restrains the possible analyses, while significantly affecting the performances.

For the purposes of the analyses in our case there are two levels of granularity that have to be covered. For the analyses of the **number of documents** (per customer, departments, partners, etc.) the atomic element is the document. For the analyses of the **usage of the documents**, the atomic element is the action (event) over a document (generation, transformation, view, etc.). The initial granulation is made possible by establishing measures over the *Document* table, whereas the second granulation is made possible by establishing measures over the *Event* table.

Another critical element of the design is defining the time dimension. In our case, time can be shown in the granulation of day, month and year, as well as in the day of the week. The time dimension is equal for both granulation levels. In the *Event* table it refers to the time a certain action over the document is conducted, while in the *Document* table the time refers to the time of the document creation (the time of creation in the organization, not the time of scanning and electronic archiving).
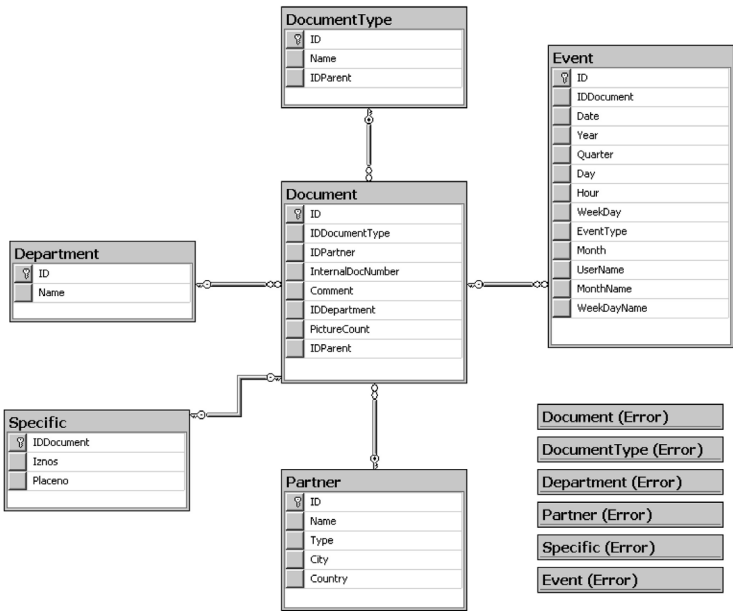
Figure 2. The schema of data warehouse BI DMS solution

The architecture of the warehouse schema is presented in Figure 2.

The schema is a *star schema*, where the basic table is the *Document*, over which the measures of the dimension model are computed. The table simultaneously defines

The tables with the "Error" suffix are the replicas of the original tables that contain only the data that are automatically found to contain errors or inconsistencies in the process of data clearing. They are kept because certain errors are impossible to remedy automatically.

Finally, the warehouse schema is designed in the relation model, using the *MS SQL Server 2005 platform* for database management. The data model is denormalized as related to the initial model from the transactional system, which is one of the defining characteristics of the data warehouse.

3.2. Building OLAP cubes

To support the need for flexible ad-hoc reports, several OLAP cubes are defined and built. The role of the OLAP cubes is critical in obtaining reports promptly and making queries easily.

The OLAP cubes are built over the data warehouse, creating specific multidimensional structures in which the measures are defined, pre-aggregated for performance purposes. The Analysis Services tools are used from the SQL Server 2005, with the HOLAP structure as the form of storage. The example of OLAP cubes application will be presented further on in the paper.

3.3. Establishing ETL procedures

In order that the data settle in the warehouse for further analysis, it is necessary that they should be retrieved from the original sources and adjusted to the data warehouse schema. The data source for the *BI DMS* warehouse is the transactional base of the *DMS* application. The base contains the preconditioned table structure for meta data in which the documents are described, as well as automatically generated tables for storing data from the concrete documents.

In the concrete execution of the ETL procedures it is necessary that the data source be defined for each data from the warehouse, as well as its required transformations. We will then proceed to systematiize the mapping of the data that require that ETL procedures be designed to load the warehouse.

As the databases of different organizations using the DMS vary by the document structure, as well as by the field names, it is necessary that specific ETL procedures should be designed for every organization that introduces the business intelligence system. Since the warehouse structure is known, it is only needed to point out to concrete fields in the database where the data required for the warehouse is stored. A special XML file is designed for the mapping which can define the data sources without having to design specific ETL procedures.

Using this XML file, the ETL procedures automatically retrieve the date fields out of the initial tables, namely those whose structure is not defined in advance. The data given in the XML file are the minimum required to carry out the ETL procedures over the concrete implementation of the DMS base.

The same XML configuration file served to define other parametres, too, such as defining the connections over bases, or determining the table filters (document types) we need in our analyses, and hence in our warehouse.

Another detail is important to mention in relation with the ETL procedures. As these procedures are long-lasting, it is important to ensure that these procedures encumber the operational base of the transaction system as little as possible. Hence the replicas of the tables from the sources are made prior to the execution of the ETL procedures, and the staging in the data transfer is designed. The replica of this base is deprived of any mechanism for referential integrity or other checks in integrity maintainance, since there are no data transformations in this interim database. This allows for the data to be retrieved from the operational base in a prompter way, and the procedures themselves continue to operate over the base replica. Additionally, these procedures are conducted at night, when the need for the operational base is minimal.

The procedures to accomplish the data mapping from the source to the warehouse are designed in the Microsoft SQL Server 2005 environment, using the *Integration Services* tools.

3.4. Quality of data

A special problem arising in the building of data warehouse is the data quality. Namely, a large number of records from the initial systems carry various errors, which, if not corrected, may affect the accuracy of the report to a large extent. As one of the founders of computer science, Charles Babbage, said: "garbage at the entrance, garbage at the exit", which means that the quality of output reports is directly affected by the data quality in the input. The problem is that the awareness of the need to improve the data quality comes not prior to designing the data gathering system, but after the already collected data are used. The business intelligence system is therefore one of the motivating agents forf focusing upon the data quality in the initial systems.

Most typical mistakes are the the wrongly spelt words. The computer understands the words "Miloš" and "Milos" as two different words, although people do not find (or do not see) this to be a mistake. In data processing or in the report, such names can be interpreted as

different names. Sometimes even the size of the letters can make a difference, and the computer may interpret the words "Beograd" and "beograd" as two different words. The errors in dates are also very common. They are most commonly caused by the different format of writing the date. Thus "1.20.2007." is not the same as "20.1.2007.", or "20.1.2207.". Additionally, such an error may be hidden, due to which the interpretation of the date "3.4.2007." may be ambiguous.

Errors are most commonly made when the user enters the data. The user interface that allowed the incorrect data to be entered is, however, also responsible for the arror. Although there are errors that cannot be prevented, a majority can. The concept of the Japanese firms "Poka-yoke" (Toyota) actually shows that it is possible that the systems themselves are created in such a manner that prevent any errors to be made. Well-conceptualized entry interfaces offer the user a limited input opportunity. Besides, the predefined input format sets of allowed values are designed for every input field, which largely prevents the user from making an error.

When errors are not prevented at the input, they can be identified in the system, which normally calls for a greater effort. It is of special importance that the data used in creating the report to be implemented in decision making be error-free, therefore specialsed procedures are created for clearing the identified and anticipated errors. Such procedures are most commonly activated within or after the ETL process in order that the data warehouse should be as "clean as possible". It is, of course, important to eliminate errors in the initial transactional systems as well, although this requires more effort.

These efforts reduce the errors in the business intelligence systems to a minimum. A smaller number of errors remain "hidden", i.e., correct in both the syntax and format, albeit, not in accord with reality. Such errors are identified by the report users themselves and these errors are potentially dangerous.

In conclusion, the data quality can seriously affect the quality of the business intelligence reporting, therefore it is necessary that as high as possible a quality should be achieved. This should be conducted within the business intelligence system itself ("healing treatment") as well as in the entire initial DMS system ("prevention").

4. User applications

The user applications are the ultimate visible interface of the business intelligence system towards the user. They are the reason for all the efforts made in the phases of building the PI that precede them. Directly implemented in the *BI DMS* solution are:
- predefined reports;
- dynamic reports, and
- the OLAP analysis with *drill-down* and *drill-through* options,

whereas the basis is set for further building of:
- key performance indicators (KPI)
- models for finding logics in the data (data mining),
- control boards (dashboards), etc.

The predefined and the dynamic reports offer the decisions makers a standard insight into the documentation. As the DMS is used by clients from various fields of business, the set of required reports appears to be client-specific. The situation is really more convenient as the
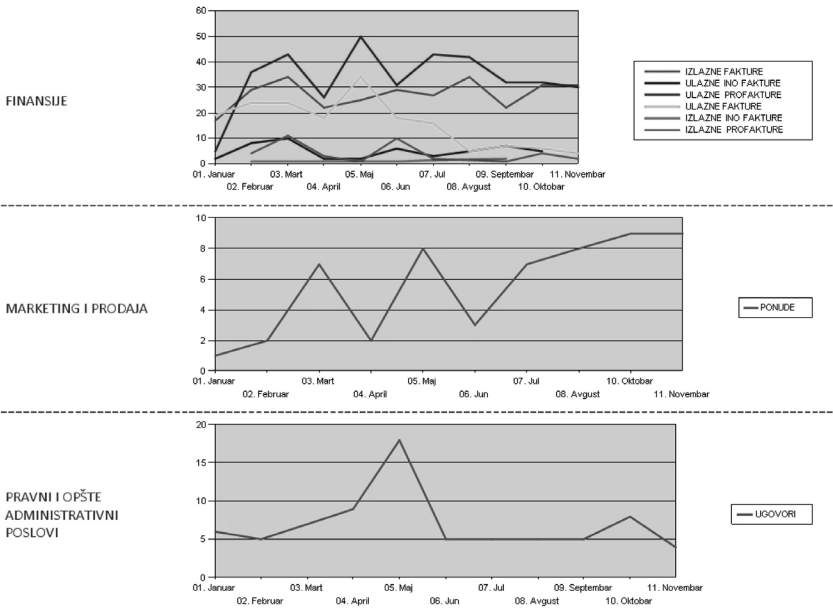
Figure 3. The report on document inflow into the company

	UGOVORI	PONUDE	TENDERSKA DOKUMENTAC
2006	49	46	5
2007	77	56	6
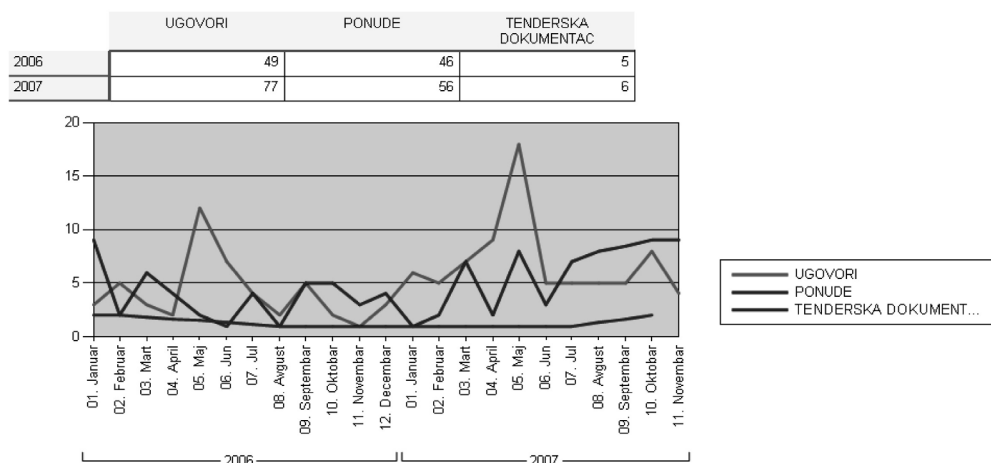
Figure 4. The report on the trends in offers, in closed contracts and in tenders

insights into the documentation and standard reports are rather similar for different users. The reports describe the conditions and the dynamics of the company's documentation, regardless of the concrete documents we have in mind. The reports built in such a way are rather useful in the future implementation of the *BI DMS* products. The examples of the predefined reports are presented in Figures 3 and 4. The reports are designed on the *SQL Server 2005 Reporting Services* platform. They show the quantity of documentation in use, as well as the trends over time.

The reports show various views on the maturity and usage of the company's documentation, classed by the document types, the time of creation/use, department, etc. The meaning of the report itself is the subject of interest of a concrete company's management, therefore they will not be described here, as they are presented as an illustration of the reporting capacity of a developed platform. It is important to stress that the reports are presented in a tabular and graphic forms simultaneously, in order that they be more comprehensive to the end user.

The OLAP analysis is another user application over the data collected in the data warehouse. The OLAP analysis helps realize the ad-hoc queries, from the overall surveys to the detailed insights into the data, in order to obtain useful information interactively. A significant advantage of the OLAP analysis is the speed at which complex reports are generated, which is one of significant problem of the classical method of reporting.

The OLAP cube, the basis of the OLAP analysis, is built by the *SQL Server 2005 Reporting Services* platform. One example of how the OLAP cube is used through the Microsoft Excel Pivot table is presented in Figure 5.
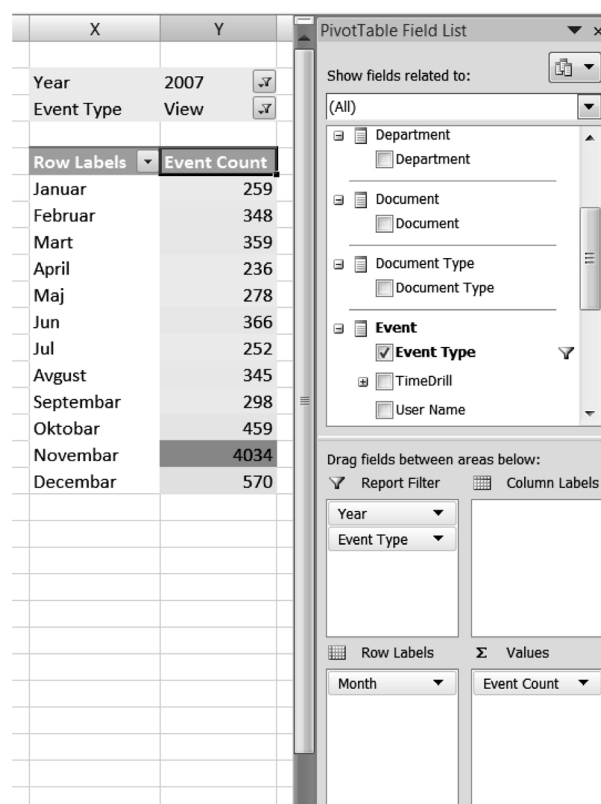
Figure 5. The example of the OLAP cube use through the Microsoft Excel Pivot table.

The OLAP analysis is used when we do not know which report will allow for us to learn something from the data. Guided by one report, the analyst creates another ad-hoc report, to get a better insight into the problem he identified in the previous report. It is in this way, from a generalized to a detailed description (*drill down*), the analyst gets to the concrete causes of problems identifiable in the data on documentation.

In addition to the *drill-down* function, the cube has the *drill-through* function that makes it possible to pass from

the report on the lowest level of granulation to the transactional system (in this case, the DMS) and view the problem in the DMS base itself. For example, the reports may display a problem with a certain type of document in a certain period, and we can go directly from the report to the DMS application and see the image of the concrete document in which the problem is identified.

As mentioned above, there are other applications that can easily be built over this type of business intelligence system, such as key performance indicators and others. The system can also be extended by new data gathered from initial systems. Such superstructures are planned for further improvement of the *BI DMS* application.

5. Nonfunctional requirements in the BI DMS Solution

The basic functionality of the business intelligence system is to give the decision makers an insight into the business operations (in this case, the state of the documents), through a set of reports and analyses. In order that such a system should function, it is necessary that attention be paid to the implicit nonfunctional queries. This primarily means the **system response**, which, it is believed, should not be longer than a few second for any report, regardless of its complexity. In addition, the presence of the business intelligence system **must not endanger the operation of the transactional system and the business operations in general**. Finally, the user applications have to be **intuitive and easy to work with**, since the end users are not computer experts and may easily get demotivated to use the BI systems if these appear to be too complex.

Table 1 systematizes the efforts made to fulfill these nonfunctional requirements in the *BI DMS* solution.

6. Concluding remarks

Working on this paper we acquired a significant experience in the field of the business intelligence systems implementation over the document data in the organization. This experience further helped make new insights into the problems arising in the real implementations of the business intelligence and the solutions possible to apply in specific situations.

Finally, there remains a set of open-ended problems that can be further explored and solved, such as:

- measuring the indicators of the data quality and improvements of the automatic error identification, using the statistical tools and the tools used for processing a non-structured text;

- monitoring the BI system implementation and proposing new reports that would correspond to the identified patterns in user behaviors;

- creating a port for the access to the business intelligence functionalities;

- merging with the reporting system from other areas of business operations;

- implementation of methods and techniques for data mining, in order to identify the dependencies in the usage and creation of the company documents.

Achievements in these research paths would complete the vision of a successful implementation of the business intelligence in this area and further contribute to the theory and the practice in the business intelligence field.

Nonfunctional requests	Implementation efforts
System responds promptly to the rquest for reports	• Created indices over the critical attributes of the tables • Denormalised tables in the warehouse • Preagregation of data in the OLAP cube
Minimum encumberment of transaction systems	• "Staging" base creation prior to transformation into warehouse • Automatic starting ETL procedures at night
User-friendly applications for non-computer expert personnel	• Using MS Excel application in the OLAP analysis • Retrieving the report from the internet browser, via web application • Vizualisation of analyses in the form of graphs
Easy implementation (adjustment) for a new DMS application user	• ETL procedures are adjusted by XML file transformation • Clearing procedures are isolated as separate SQL files, easy to add new clearing procedures to

Table 1. The Nonfunctional requirements and solutions in the BI DMS solution

REFERENCE

[1] Čupić M., Suknović M. (2008), Odlučivanje, šesto izdanje, Fakultet organizacionih nauka, Beograd

[2] Zakon o elektronskom potpisu (2004), Republika Srbija, URL: http://www.parlament.sr.gov.yu/content/lat/akta/akta_detalji.asp?Id=190&t=Z

[3] Becejski-Vujaklija D., Delibašić B., Jovanović (2009), Business intelligence model for electronic documents archive, XXIII EURO konferencija, Bon, Nemačka

[4] Jovanović M., Delibašić B., Suknović M., Bečejski-Vujaklija D., Vukićević M. (2008), Primena poslovne inteligencije na oblast sistema upravljanja dokumentima SYMORG 2008

[5] Inmon William (2005), Building the Data Warehouse, 4th ed, Wiley Publishing

[6] Kimbal R., Ross M. (2002), The Data Warehouse Toolkit, John Wiley & Sons

[7] Biere Mike (2003), Business Intelligence for the Enterprise, Prentice Hall PTR

[8] Chaudhuri S., Dayal U. (1997), An overview of data warehousing and OLAP technology, ACM SIGMOD Record 26, p65-74.

[9] Larson Brian (2006), Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw-Hill/Osborne

[10] Loshin David (2003), Business Intelligence: The Savvy Manager's Guide, Morgan Kaufmann

[11] Turban E., Aronson J.E., Liang TP., Sharda R. (2007), Decision support and business intelligence systems, 8th edition, Pearson Prentice Hall

Managerial implication of target costing

UDC 005.51 ; 657.05

Prof.dr. Vesna Milićević, prof. Dr. Bojan Ilić
Faculty of Organizational Sciences, Belgrade

In this paper we start from the multidimensional character of the company's objectives and the importance of achieving the targeted profit from the business success and the company development standpoints. We analyse the target costing and the way it is related to kaizen costing. We also present managerial implications of target costing in the conditions of a global economic crisis and recovery. The focus is on the managerial decision making related to costs reduction and achieving the targeted profit.

1. Introductory notes

From the point of view of management, the objectives of a company can be defined as the future conditions that the company aims to achieve and towards which its activities are directed in order that the company should fulfill its basic purpose of existance. The objectives should be clear and realistic, the measurable ones being paid special attention in management. In almost every organization there is a hierarchy of objectives, based on the range of impact as well as on the time dimension; however, the long-term and the short-term dimensions are not absolute categories, but depend on both the type of production and the environment.

It is of special importance that the objective should be attainable, having in mind the company's human, financial, physical and information resources, as well as the dynamics of economy and the complexity of the environment.

This context requires that the theory of the firm be analysed [1]. The theory of the firm was originally based on the assumption that the company's objective is to maximise the current or the short-term profit. The fact is, however, that the firm often sacrifices the current profit in favour of increasing the future, or long-term, profit. One good example are the expenditures for research and development, for new equipment, or for promotion. As regards the fact that both the short-term and the long-term profits are important, the theory of the firm has it that the company's primary goal is to maximise the firm value, which is expressed as the present value (PV) of all the anticipated future profits, where profit is the difference between the total income and the total expenses.

The behavioural theory of the firm starts with the objectives of individual groups. The firm is regarded as a coalition of a number of groups: managers, shareholders, employees and customers, all of which have different interests. The objectives are essentially the result of resolving the conflicts within this coalition.

The findings of the empiric research of the behavioural theory show that five goals are of special importance in making decisions as to the production and costs. These are: production goals, sales goals, market share, the goal related to stocks and the profit-related goal [2]. The production goal, which largely presents the requirements of the coalition members directly involved in the production, does not only relate to the level of production, but also to the changes in various periods in terms of achieving steady employment and successful planning.

The managerial theories rise in the conditions of an increasing importance of the corporations' market power, characterised by the separation of ownership and control over the capital. As regards the objectives of large corporations, *J. K. Galbraith* maintains that the actual decision-making power in corporations belongs to the technical, planning, and other specialized staff that introduce knowledge, talent and experience into the process of group decision-making [3]. According to this approach, the principal goals are the certain level of profit, i.e., the maximum growth rate, accompanied with earning the profit required for further investments.

The *W. Baumol* model includes the manager's goal to maximise the sales profit, treating profit as a limitation. In this sense, it is partly exogenously determined by the need to satisfy the shareholders, and partly by the company's internal requirements related to financing [2].

In the realistic conditions of the manager's autonomy in managing a corporation, a large number of corporate objectives can be identified. *P. Drucker* specifies eight areas within which he suggests that managers should plan their business goals: 1) market position (planning goals that indicate a desired position in comparison to competition); 2) innovation (of products, services, knowledge, production methods); 3) productivity; 4) resources (physical and financial); 5) profitability; 6) manager's activity and development; 7) the employees'

work and attitudes and 8) responsibility towards society, especially to customers [4].

The importance of objectives for an organization is primarily reflected in their impact upon the managers' decision-making, as well as upon exploiting the scarce resources available as efficiently as possible.

R. Marris argues that the primary goal of management is growth. It is important to note that the company can choose among a range of growth rates. Higher growth rates will mean more time and efforts in search of profitable investments, often more promotive activities towards the growth in demand, as well as a more intensive work in the fields of research and development. This means that a higher growth rate requires that a higher percentage of the current profit be allocated to financing these promotive-developmental activities and investments into new capacities, which is where the importance of the level of earned profit stems from [5].

It is important to point out that all the firm growth models assume that expansion requires a lot of financial means; the faster the growth rate, the more expensive the expansion.

In the market conditions of economy, the outcomes of entrepreneurial function are valuated through the company's profit. The profit category allows for the company to be assessed objectively and valued in the market that differentiates the companies as successful or unseccessful and is the arbitre of success in business. Note that the profit maximization as a company's objective enables the company to survive, grow and develop.

Generally, strategic objectives deal with the desires and conditions in which the company will operate over a longer period of time. Even so, they must not be arbitrary defined; they have to be clear enough to be taken into account when important managerial decisions are made.

Modern management insists that more recent methods of costing be used to achieve the planned objectives, primarily related to cost reduction and profitability. It is important here to have in mind the complexity of cost tracking, of measuring and of increasing the company profitability [6]. In this context, it is important to understand the relationship between the target costing and the kaizen costing in the process of implementing modern approaches to cost and profit management, which is especially demanding in the condition of global economic crisis and recovery.

2. Relevance of kaizen costing

A specific system of costing, *kaizen costing* is based on the kaizen concept. Kaizen (Ky'zen) is a Japanese term, a specific combination of two words and literally means "change (*kai*) in order to become good (*zen*)". The cost management adopted the kaizen concept as a concept of permanent improvement, ewhich means the continuity and a long-term approach to change. The kaizen strategy means slight, gradual improvements in a long-term perspective. The philosophy underlying the kaizen idea is that each employee can contribute to the method of manufacturing a product and improve the company's operations in some way, therefore, a succession of slight improvements may in time cumulate into a significant increase in efficiency such as a large new investment. This could be visualized by a rising line representing the work productivity in a coordinate system where the "*x*" axis presents the time period, and the "*y*" axis presents productivity, contrary to single substantial improvements, such as inventions or investments into equipment, that are made at a definite moment and would be represented by a gradually rising line.

The key elements of kaizen are as follows: quality, effort, will for change and communication. The manager who accepts the kaizen supports the continual process of imcremental improvements within an organization. The fundamentals of kaizen model comprise five elements: team work, individual discipline, high level of ethics, quality circles and suggestions for improvements. These give three key aspects of keizen: elimination of waste products and inefficiency, the "5 S" framework for good maintenance and standardization. The areas of the effects are quality management, cost management and logistics management. Through its impact upon manyfold functional parts of the organization, kaizen can eventually lead to a sustainable profit management.

The organization should first reduce or eliminate waste products and inefficiency resulting from excessive production, surplus stocks, returned products, waiting, installation, transport. The next building block, good maintenance is achieved through the "5 S" (in Japanese): (1) *seiri* – "cleaning up" in the sense of keeping only what is necessary for work to be done and what contributes to work simplification; (2) *seiton* – tidiness as increased efficiency by allocating material, equipment, etc; (3) *seiso* – cleanliness, so that everything looks appropriate and attractive; (4) *seiketsu* - "putting to order" in the sense of regularity and institutionalization of keeping things clean and organized as part of "visual management"; and (5) *shitsuke* – discipline referring to individual responsibility [7]. Standardization of practice is still very important, and management is in charge of

improving the standards. Moreover, the top management plays an important role in ensuring that kaizen, "5 S", and work standardization are widely implemented and coordinated, alongside the strict self-discipline of all employees, and their mutual collaboration. This is essentially a process-oriented management style, which has its vital behaviouristic dimension. The implementation of the kaizen strategy brings the change in the employee behaviour in its wake.

As regards the cost management, it is important that kaizen costing has a mission of cost reduction. This is the system of costing that focuses upon reducing costs in the manufacture phase as part of the overall life cycle of the product. Since the term kaizen in Japanese means slight incremental improvement of the process, rather than improvements through large-scale innovations, this is a reasonable approach to the manufacture phase, where big changes would incur high costs. The cost reduction goals mean continual engagement, that is, comparing target costs with actual amounts of reduced costs. Here, it is especially important that the employees know how to improve the processes, as well as that they are responsible in achieving standards of cost reduction. In case the amounts of targeted cost reduction are not achieved, an investigation is needed. Problems may arise in cases of hard pressure upon the employees as well as due to managerial focusing upon details.

In *Toyota*, a successful Japanese company, kaizen used to be stressed as a starting point for new reasoning and as an inspiration for high quality products and services focused on customers, which ultimately lead to a global business success [8]. The essence of kaizen is expressed in the following slogans: "*All roads lead to continual improvements*" and "*Always better*" rather than "*the best*".

3. Target costing and managerial decision making

Target Costing (TC) is a method of cost and profit planning focusing upon products with discrete processes of production towards reducing costs to targeted levels in one plan cycle. It takes into account the assumed customers ability to pay, that is, market prices. Since this way starts from target profit, the target costs may not be exceeded. The order of steps and the way of thinking in pricing the product in case of target costing differ from the traditional costing to a large extent. First and foremost, the marketing research does not stop in the starting phase prior to the product specification, but is run continually throughout the target costing process. Besides, more time is consumed in the specification phase and the product design phase in order to minimize

the demand for changing the product design in the course of the production process when this is considerably more expensive.

Generally, target costing uses a modified concept of the overall life cycle of a product or a service. This means that the costs of product maintenence and costs of "getting rid" of it are also included.

The target sales price of a product/service S_{tc}, as well as the target scope of realized products/delivered services are determined. The target profit margin P_{tc} results from a long-term profit analysis and is usually based on the returns on income from sales, since this ratio is most easily brought into relation with profitability for any product/service. The target cost C_{tc} is the difference between the target sales price of the product and the target profit margin. These relations are expressed by the following equation:

$C_{tc} = S_{tc} - P_{tc}$

Target costing is done for each product component too. This is the area of value engineering, which here represents the process of re-examining each of the product components in order to find out whether its costs could be reduced while retaining its functionality and its existing performances. In some cases the design may be changed, the materials used in manufacturing may be replaced or production processes may be redesigned. In practice, several iterations of value engineering are usually necessary in order that the final target costs are defined. The strategy orientation and the holistic approach are evident in building cross-functional teams whose members come from all business paths. There are also the external representatives of the value chain sections. The company establishes long-term business relations with them. Of special importance is the role of suppliers who may be requested to reduce the costs of certain components if necessary. This can result into the supply chain management which develops long-term cooperation between the business customers and the suppliers, the one that will be fruitful for both parties.

When implemented, target costing may cause certain difficulties, primarily in the communication among various parties involved in both the process and the employee motivation. It is successfully implemented not only in a large number of Japanese companies, but also in companies worldwide, as a broader approach to cost management and profit planning (e.g., in *Eastman*, *Kodak* and *Boeing* companies) [9, 10].

On the basis of research and comparison of more recent methods of costing, a conclusion can be drawn that target costing is a tool directly resulting from highly competitive markets in a variety of industries. It is

implemented to determine the desired costs of the product on the basis of the given competitive price, so that the product should yield a desired profit. In this way, the cost is determined by the price. The company using *target costing* must frequently apply strict measures of cost reduction or redesign the product or production process to remain profitable with the given market price.

Target costing encourages the firm to become more competitive, especially in industries where even smallest differences in prices attract the customers towards lower-price products. A good example of an industry implementing TC is the production of cameras. The camera producers such as *Minolta* know the market price of each production line of the cameras they produce, therefore they redesign the product (for example, add/take out certain properties, use less expensive parts and materials) and redesign the production process in order to reduce production costs to previously defined target costs [11]. The automobile industry also uses the TC [12].

The *Toyota* company introduced the method of target costing in 1960's to achieve high quality and desired properties of products, at competitive prices. It is well known that *Toyota* is one of the leading automobile producers in the world, which was evident in the conditions of the global economic crisis too. This company is very successful in placing high quality vehices at competitive prices.

It is important to note that target costing is an approach in which cost management plays an important role. In implementing target costing the company plans, or designs the product to achieve the desired profit, fulfilling the expectations of customers as to the quality and the properties of the product. The balancing of costs, properties and quality is effected through designing, manufacturing, sales and servicing the product, but the stress is on the first phase, the design. When the alternatives in this area are analysed and the selection is accomplished, *Toyota* is shown to have a maximum flexibility in selecting the options that affect the production and all the other costs of the product, such as the costs related to the customer service and technical guarantee.

When the product design has been completed and the production starts, the cost consequences of the selection of properties and production methods are fixed until the next change in the model. As a result, the development of proper, cost effective design is of critical importance. In this way, the concept of target costing stresses the application of the designing process to improve the product and reduce costs, that is, with time and material saving.

From the managerial point of view, target costing is a technique that assumes that the company defines the allowed, or permissible, i.e., target costs for a product or a service starting from the given market price, so that it should earn a desired profit, which is especially applied in the conditions of global competition and the customers' increased expectations.

The company has at disposal two options to reduce costs to the target cost level.

1) by introducing new production technology, by implementing advanced cost management techniques, such as activity based costing and by achieving higher productivity;

2) by redesigning a product or a service, since decisions related to designing affect the whole life cycle of costs and can contribute to a significant reduction in total costs.

A large number of companies implement both options. The target costing, having a clearly set objective, is shown to motivate both the managers and the employees.

In the designing process, a large number of automobile, software and other commodity producers have to determine a number and type of properties that will be included into periodical updating and modernizations using cost and market analyses. The target costing, based on the functionality and cost analysis is found to be an appropriate managerial tool for these companies. Target costing is implemented by an increasing number of companies worldwide: *Toyota, Honda Motor Company, Boeing, Intel* [13]. Thus they compete on the basis of price and functionality defining.

Target costing can also be viewed from the aspect of its individual phases. The analysis of the target costing implementation shows that it is conducted in five steps:

1) defining market cost;

2) determining desired profit;

3) computing target cost;

4) implementing value engineering to identify the ways of reducing production costs;

5) implementing kaizen costing and operational control for further cost reductions [14].

Often, we deal with two approaches to the profit determining itself. The desired profit is usually determined by the product unit, which means that, if the product price falls, and the target cost falls proportionally, the profit will remain unchanged after the change in the price, presuming that the quantity of

products sold does not change for the company. The other approach is determining the desired profit as a percentage of returns on sales.

Target costing implements the value engineering to reduce product costs by analysing the balance among different types of production functionality, or cost characteristics, and especially total production costs. An important first step in value engineering is the customer analysis in the new or modified product designing phase. The customer analysis identifies the customers' critical preferences that determine the desired functionality of the new product.

The type of value engineering to be implemented will depend on the product functionality. In case of one group of products, including automobiles, software, and varied products of electronics such as cameras, audio and video equipment, functionality can be added or withdrawn in a relatively easy manner. These products often appear in new models or are innovated, therefore the customers' preferences change. The manufacturer selects a group of properties that will be incorporated into each new model of the product.

For the other group of products, functionality is designed as part of the product, rather than added to it. This is true for specialized equipment, e.g., construction equipment, heavy trucks, specialized medical equipment. Contrary to the former group, here the preferences of customers, the professionsl customers, are relatively constant.

It is logical that target costing is more useful to the products of the former group, since the company is more independent in dealing with a larger number of characteristics/properties. A usual type of value analysis in such companies is the functional analysis as a process of examining the performances and costs of each of the product properties and functions. The aim of the analysis is to determine the desired balance of functionality and costs. The desired level of performances for each function is achieved by keeping the costs of all the functions below the target costs level. Benchmarking is often used in this phase to determine which properties ensure competitive advantage to the company [15]. The examples for this are the *Olympus* and the *Nissan* companies [16, 17]. It is characteristic that the *Nissan* company, one that has both internal and external suppliers of parts and components, implements target costing on both levels – the level of costs and the component level.

The design analysis is a usual form of value engineering for the products in the latter group, the industrial and specialized products. The designing team prepares several possible designs of a product, each of which has

similar properties, with different levels of performances and different costs. Benchmarking and the value chain analysis help in the selection of design which includes both low costs and competition. The designing team works together with the cost management experts to identify the design that best satisfies the customers preferences, but does not exceed target costs.

It is characteristic that the implementation of target costing means the collaboration of cost managers, product designers, supply managers, production managers and marketing managers, all towards an understanding of costs of different characteristics and options. This means an affirmation of cross-functionality, which may even lead to the change in organizational culture.

The fifth step in target costing is the implementation of kaizen, as well as operational control to further reduce the costs. Kaizen is conducted in the production phase after the effects achieved by value engineering and by an improved design, when new production methods, managerial approaches such as total quality control, but also new managerial techniques related to operational control are developed. Kaizen assumes continual improvement, which means continual attempts to find new ways of cost reductions in the production process with a given design and functionality. Figure 1 presents the relationship between the steady and the falling market prices in the business with intensive/high competition, target costing and kaizen [modified after 14].

Target costing is increasingly implemented as it enhances the customer satisfaction due to focusing upon value for the customers, reduces costs, has a more efficient and a more effective product design, helps the company achieve the desired profitability on new or redesigned products, facilitates the coordination among the cost management, designing, production, marketing along the cost life cycle and along the sales life cycle.
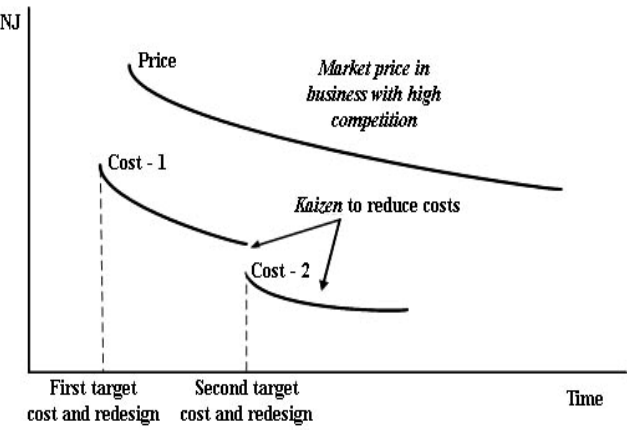
Figure 1. *Relationship between market prices, target costing and kaizen*

4. Conclusion

On the basis of the above mentioned we can conclude that, as regards the planned company objectives, the managerial implications of more recent costing methods are highly significant. Our focus is the connection between the target costing and kaizen costing as relevant recent costing methods whose implementation becomes increasingly important in modern companies. It should contribute to improving the company's long-term business success. We should also have in mind that this is the concern of managers in the conditions of an ever more intense competition and fast changes in the company's environment.

The importance of target costing as a particular managerial tool is especially evident in the conditions of the global economic crisis and recovery. From the point of view of management, cost reduction and achievement of target profit is,in this context, of vital importance.

REFERENCES

[1] Salvatore D., *Managerial Economics in a Global Economy*, Oxford University Press, 2006

[2] Bridge J., Dodds J., *Planning and the Growth of the Firm*, Croom Helm, London, 1978

[3] Galbraith J. K., *The New Industrial State*, New American Library, 1971

[4] Drucker P., *The Practice of Management*, Pan Books Ltd. London, 1968

[5] Marris R., Wood A. (editors), *The Corporate Economy*, MacMillan, London, 1973

[6] Milićević, V., Ilić, B., *Kompleksnost merenja i povećanja profitabilnosti preduzeća*, Ekonomski vidici, br.3, 2005.

[7] Imai, M., *Kaizen:The Key to Japan's Competitive Success*, Random House Business Division, New York, 1994

[8] www.toyota,com

[9] www.kodak.com

[10] www.boeing.com

[11] www.konicaminolta.com

[12] www.honda.co.jp

[13] www.intel.com

[14] Blocher, E., Stout, D., Cokins, G., Chen, K., *Cost Management, a Strategic Emphasis*, McGraw-Hill, Irwin, Boston, 2008

[15] Camp.R., *Benchmarking: The Search for Industry Best Practices That Lead to Superior Performance*, Productivity Press, 2006

[16] www.olympus.com

[17] www. nissan-global.com

A Model of Supply Chain with Possible Transshipmens Between Retails

Mohamed Abu Gaben[1], Slobodan Krčevinac[2], Mirko Vujošević[2]
[1]*Al Quds Open University, Gaza, Palestine, mohamedgubeen@yahoo.com*
[2]*Faculty of Organizational Sciences, Beograd, mirkov@fon.bg.ac.yu*

A supply chain with three stages - manufacturer, distributor and retail facilities - is considered. Stochastic demand is met on retail level. Retail facilities replenish their inventory periodically from the distribution centre and this is supplied from manufacturer on a periodical basis. Retail inventory is reviewed at the end of each period and new order is placed to the distribution centre. The following two supplying replenishment rules are considered: a) there is no transshipment between retails, and b) transshipment between retails is allowed. A mathematical model was developed for minimizing total inventory cost when demand is deterministic. The model was implemented using the AMPL modelling language. Optimal solutions for different scenarios, i.e. different sets of deterministic demand, are obtained using this model. These solutions are used as input data for new model which finds a compromise solution to minimizing the total regret. The total regret is defined as the sum of the differences between the total inventory cost obtained using compromise solution and the total inventory cost obtained using optimal solution for a given scenario. Experimental results show that implementing transshipment between retails may reduce total inventory cost.

1. Introduction

Inequalities in demand often result into the shortage of supplies in some retail facilities, while others report surpluses, regardless of their being part of the same supply chain. The classic rules of supply and the appropriate transportation models do not assume the redistribution of supplies among the retailers, that is, transshipment to the retail facility from another one. The shortage in supplies lasts as long as the delivery arrives from a supplier or from a distribution centre (DC). A logical issue that needs to be discussed is wheter a transshipment of supplies among retailers is possible and whether it pays. This paper is devoted to this very issue and offers a model to analyse various scenarios of the potential supplies redistribution.

The study of the phenomena in the supply chains [1,2] shows that the firm's performance is increasingly dependent on the performance of the chain it is part of. In order that the efficiency be improved, the issues of transportation, stocks and information support, as well as new rules for the chain operation are analysed. One modern approach is the implementation of transshipment and supply redistribution [3,4]. The modern information- communication infrastructure has allowed for the transshipment concepts to be implemented in dealing with the consumer commodity, and not, as it was earlier the case, only in dealing with relatively expensive products (e.g., automobiles) whose delivery, by a rule, takes time. The chain and the issue description discussed in this paper is presented in the next chapter. The third chapter brings a mathematical model, its translation into the algebraic modelling language AMPL [5], and the data used in the experiments.

The findings and the analysis of these are presented in the fourth chapter, whereas the fifth chapter offers brief concluding remarks related to the research the findings of which are presented below.

2. Problem description and formulation

Redistribution is defined as a process of cross, lateral, transfer of stocks from one retail facility (RF) with a surplus of stocks to another RF that reports a shortage. The stocks redistribution among the RF is often a less expensive and a more convenient option compared to the increase in the number of deliveries from the supplier. It is one method to reduce the risk of the shortages in the product supply. Besides, redistribution increases the frequency of supplies and shortens the time of delivery which could otherwise be unacceptably long due to long distances between the suppliers and distribution centres, or due to the orders being extremely small. This is also the way to reduce the storage charges and the costs of stock-outs.

In case of the classical model, the RF orders are placed to the suppliers in advance, before it can be predisted what the demand will be like in the following period. Transshipment is the method of reallocation of stocks in accordance with the demand realized in the previous period. The transshipment of stocks helps reduce the costs of storage of defficient stocks in the sales facilities where the realized demand is not in accord with the planned one. Transshipment of stocks is considered to be an effective method of dealing with stohastic demand as well as of improving the performance and the reliability of the chain.

The stocks transshipment concept, however, requires that the communication and information exchange in the supply chain be increased. The Internet and other modern communication technologies ensure efficient ways of communication among the agents in the supply chain. Contrary to the traditional systems of business information exchange – EDI (Electronic Data Interchange) that only really big firms could afford, the information exchange mechanism provided by the Internet technologies and the mobile computer science is now available and affordable to small firms too. Therefore, the requirement that communication should be efficient for the purpose of the stocks transshipment concept implementation is today easy to satisfy via the Internet.

We will here analyse the impact the transshipment concept has upon the business policy of stocks ordering and replenishment. We will observe a single supplier system, with a centralized distribution centre and a large number of RFs, Figure 1. The supplier delivers periodically to the distribution centre, and the redistribution of stocks among the RFs is possible in the intervals between the two deliveries. The transshipment is reviewed at the end of each period and the redistributed products can be used to meet the demand in the periods to come. Contrary to the research so far, this model explicitly includes the time of delivery and observes the problem of a number of periods when the stocks transshipment can be used to meet the demand not only in the next, but also in any following periods.

The first step in the development of the model with a possible stocks transshipment is to define the way the supply chain functions. Here the following assumptions are made.

The assumptions:

1. One supplier meets the total demand of the RF network.
2. The supplier delivers to distribution centres in the network, which further deliver to the RF.
3. The location and number of RF are specified.
4. The capacities of distribution centres and of RF are infinite.
5. The transshipment of goods can be made between any two retail facilities.
6. If the RF reports the shortage of goods in the period t, the sales are considered as lost. Furthermore, there is an additional cost due to the loss of customer loyalty.
7. Each RF first uses its stocks to meet their own demend and only then, if requested, can send the surplus to other RS points.
8. Transshipments takes place at the end of each period, for the purpose of meeting the demand in the following one.
9. The supplier delivers to distribution centres on the basis of several (five) periods (i.e., at the beginning of every week, if a period is longer than a day), while the deliveries from distribution centres and the redistribution are shopped in all periods (i.e., daily).
10. The value of demand in the preceeding period serves to anticipate the demand in the period to come.
11. The surplus of stocks cannot be returned to the supplier.
12. The costs of keepng stocks can formally be viewed as costs of stocks self-redistribution.
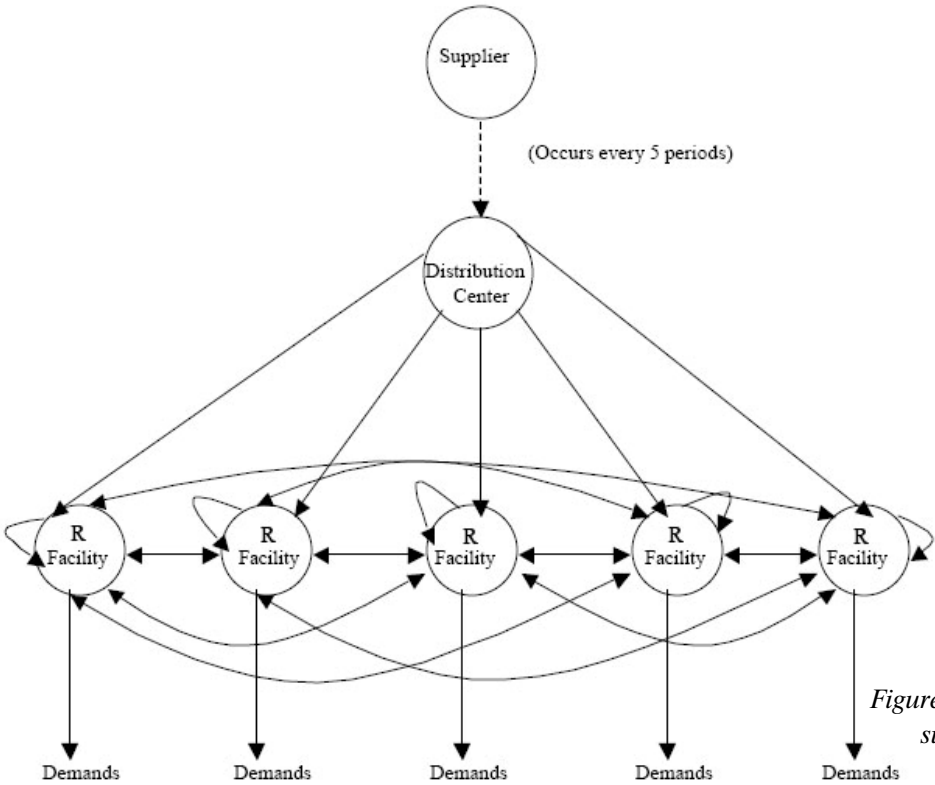13. There is no competition among the RS points.

Figure 1. Topology of supply chain

In this network, the RFs receive goods before the demand has been met. Over time, the stocks in each RF are used to meet the demand in the respective period. At the end of the period, the surplus of supplies can be retained or redistributed to other sales facilities. In either situation the goods can be used to meet the demand in the subsequent period. Figure 2 presents the time flow with core events.

The original task set before the system designer and the planner is to define the policies of stock supply and redistribution in order to minimize the total costs incurred in the operations within the given supply chain. These costs include: fixed costs of supplies, delivery charges, costs of storage and costs of shortages. As regards the stohastic character of demand, the total costs are also random costs. This means that a solution that could best meet one demand, need not be optimal, may even prove to be a very unfavourable solution if another, different demand arises. Hence the approach to solving this problem is adopted that is based on experimenting and simulation of various scenar-

ios. One scenario is defined by the number of periods and the respective values of demand. These values are previously defined randomly, according to the adopted function of the demand probability distribution. Then the optimum solution to stocks and transport management, that is, the optimum scenario solution is worked out for the generated values of demand, viewed as deterministic input data.

The more different scenarios, the more optimum solutions. In the end, the task is set to find a solution whose performances (costs) least deviate from the individual optimum costs of the concrete scenarios. This ultimate solution is a compromise and it need not be identical to any other individual optimum solutions obtained in analysisng a concrete scenario. The compromise solution, optimum in a way for all the scenarios viewed as a whole, is presented by the quantities to be periodically transported from the supplier to the distribution centres, from the distribution centres to each RF and by the value of the transshipment among the RFs.

Appendix B
Network Time Flow
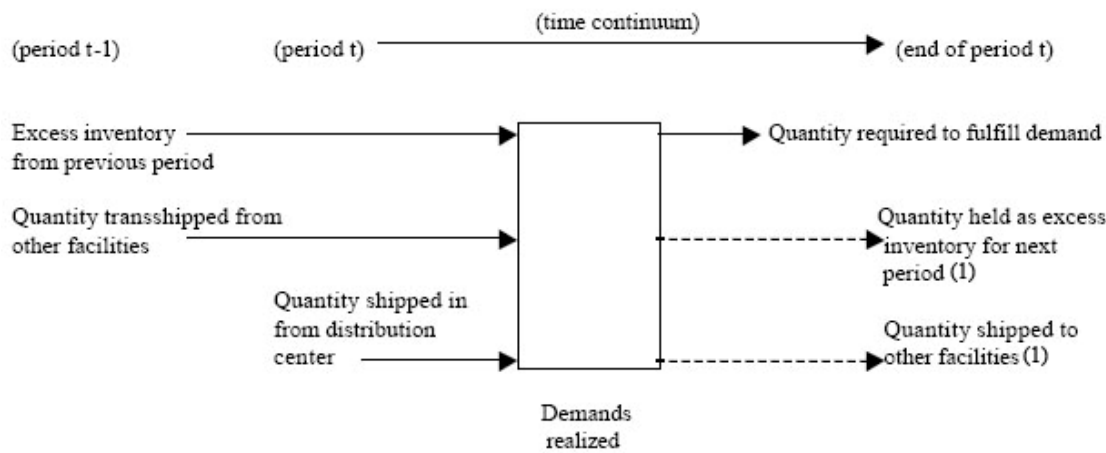
Figure 2. Time flow in the supply chain

In order to examine the effectivity of the compromise solution, the function of the multiscenario model objective is defined as the total regret taken as a sum of regrets per scenario. The regret per scenario is in turn defined as the difference between the costs incurred when a compromise solution is applied to this scenario and the costs incurred in applying the optimum solution to the scenario.

3. Mathematical model

In formulating a multiscenario model we will use the notation adjusted to the requirements of the AMPL modelling language, [5].

3.1 Notation

Indices and sets

K – set of all the scenarios indexed by k,

W – set of all distribution centres indexed by w,

I – set of all RS points indexed by i and j,

T – set of time periods indexed by t ; $t = 1$ denotes the period 1.

Input parametres

n – number of time intervals,

s_w – unit cost of delivery from the supplier to the distribution centre w,

c_{wi} – unit cost of delivery from the distribution centre w to the RF i,

f_{ij} – unit cost of redistribution from RF i to RF j,

u – unit cost of shortage in supplies,

g_w – fixed costs added to the w distribution centre location,

d_{ik}^t – demand in RF i in the t period for the k scenario,

D – the factor ensuring that deliveries from the supplier are effected upon the expiry of five

 periods,

h_i – initial inventories in RF i,

$q_t = \{1$, if the t period is the period in which the supplier delivers to distribution centres, 0,

 otherwise $\}$

v_w – initial inventories in the distribution centre w

Managerial variables

X_{ijk}^t – the quantity redistributed from RF i to RF j in the period t for the scenario k;

Y_{wi}^t – the quantity delivered from the distribution centre w to RF i in the period t;

Z_w^t – the quantity delivered from the supplier to the distribution centre w in the period t;

Performances

O_k – the amount of minimum costs (optimum value) for the scenario k;

P_{ik}^t – the amount of shortage od stocks in RF i, at the end of the period t for the scenario k;

R_k – regret per scenario k;

$U_{ik}^t = \{$ 1 if there is a shortage in stocks in RF i in period t for the scenario k, 0 otherwise $\}$

3.2. The TRANSSHIPMENT model

On the basis of the assumptions and the adopted notation, a TRANSSHIPMENT model was created to describe the supply chain from the supplier, to the distribution centre, to the retail facilities (RFs). The stohastic character of demand in the RFs is described using different scenarios and the regret concept described earlier in the paper. The TRANSSHIPMENT model is an optimisation model used to devise a compromise optimum solution to minimize the expected value of regret for a larger number of scenarios.

$$\text{minimum} \quad \Sigma_k R_k \tag{1}$$

$$p.o.: \quad R_k = (\Sigma_w\ g_w + \Sigma_i\ (h_i f_{ii} + \Sigma_t\ (uP_{ik}^t + \Sigma_w\ (s_w Z_w^t \tag{2}$$
$$+ c_{wi} Y_{wi}^t) + \Sigma_j\ f_{ij} X_{ijk}^t))) - o_k \qquad \forall\ k$$

$$\Sigma_w\ Y_{wi}^t + \Sigma_j\ X_{ijk}^{t-1} \geq d_{ik}^{t-1} \qquad \forall\ k, i, t\ \text{in}\ 2..n \tag{3}$$

$$\Sigma_w\ Z_w^t \geq \Sigma_{t-5,t-1}\ \Sigma_i\ q^t d_{ik}^{t-1} \qquad \forall\ k, t\ \text{in}\ 6..n \tag{4}$$

$$\Sigma_w\ Y_{wi}^1 + h_i - d_{ik}^1 - \Sigma_j\ X_{ijk}^1 + P_{ik}^1 = 0 \qquad \forall\ k, i \tag{5}$$

$$\Sigma_w\ Y_{wi}^t + \Sigma_j\ X_{jik}^{t-1} - d_{ik}^t - \Sigma_j\ X_{ijk}^t + P_{ik}^t = 0 \quad \forall\ k, i, t\ \text{in}\ 2..n \tag{6}$$

$$\Sigma_j\ X_{ijk}^t \leq D(1 - U_{ik}^t) \qquad \forall\ k, i, t \tag{7}$$

$$P_{ik}^t \leq d_{ik}^t U_{ik}^t \qquad \forall\ k, i, t \tag{8}$$

$$\Sigma_i\ Y_{wi}^t \leq v_w + \Sigma_{t2=1,t-1}\ (Z_w^{t2} - \Sigma_i\ Y_{wi}^{t2}) \qquad \forall\ w, t \tag{9}$$

$$Dq^t \geq Z_w^t \qquad \forall\ w, t \tag{10}$$

Model 1. TRANSSHIPMENT

In the above model the objective function is presented in (1) and (2) and expresses the total regret, where the formula (2) defines the the regret value for the k scenario. The constraint (3) reflects the assumption that demand is predicted on the basis of the previous period demand value. In the constraint (4) we imply that the amount of goods ordered from the supplier in each delivery period has to be based on the total demand incurred since the previous delivery period. The constraints (5) and (6) specify that the amount of goods delivered to one RF equals the demand in this facility plus the amount of stocks transshiped from this facility to others.

The constraint (7) refers to the fact that no transshipment is allowed from a given RF until its demand has been met. The constraint (8) says that the amount of shortage in one RF cannot be larger than the demand in that same facility. The constraint (9) does not allow the shipments from the distribution centre to be larger than the shipments received from the supplier. Finally, the constraint (10) says that the supplier can deliver goods to distribution centres only in set periods.

Prior to working this model out, it is necessary that optimum solution o_k for each individual scenario k be found. Hence a single-scenario model was created where the objective function is expressed by the total costs, while the constratints in the functioning of the supply chain are the same as in the previous model. The inputs to this model are the deterministic values of demand in each RF plus the shipment and storage charges. The model helped find the optimal solutions of o_k for each k scenario. These values were used as inputs for calculating the regret in the TRANSSHIPMENT model.

3.3 Data

In preparing the data we had to take several important characteristics of real issues into consideration. For example, it was important that the shortage costs be reasonably higher compared to shipment charges. If the costs of the shortage in supplies are too low, there will be no motivation to replenish the inventory by ordering from the supplier. Similarly, the data must reflect the realistic fact that in everyday practice it is cheaper for the RF to order goods directly from the distribution centre, rather than through another retail facility, which can be written as follows:

$$c_{wj} < c_{wi} + f_{ij}, \qquad \forall\, w, i, j$$

in addition, for the transshipments to be economically meaningful, it is necessary that the transshipment costs

be lower than the storage charges in one RF and the shortages costs in another. This requirement can be written as follows:

$$f_{ij} < f_{ii} + u, \qquad \forall\, i, j$$

To simplify the presentation, we decided to model the demand in the RF as an independent random variable with a normal distribution where the means and variances for the facilities differ, however not much, since RF are supposed to operate in similar markets. Independence in this case means that the demand in one RF does not affect the demand in another. It is also assumed that the demand in one facility cannot be transferred to another.

To illustrate this supply chain we chose a single supplier, single distribution centre and five retail facilities (A, B, C, D, E) network. Table 1 shows the parametres used to generate demand in each of these objects.

RF	A	B	C	D	E
Mean	100	90	90	110	130
Standard deviation	10	10	8	10	15

Table 1. Demand in retail facilities

Using the random number method in the MS Excel, and on the basis of Table 1, we generated 50 random values of demand for each of the RFs. This fulfilled the needs of 5 different scenarios, 10 time periods per each of them. The scenarios helped model the unpredictability of demand and the potential variations in real demand.

3.4 AMPL model

The TRANSSHIPMENT model was translated into the computer executive variant using the AMPL modelling language. The database listing containing the AMPL model is the following:

AMPL Model1. TRANSSHIPMENT.mod

```
set SCENARIO; # scenarios
set DISTCENTR; # distribution centres
set MP; # retail facilities
set PERIOD;

param numperiods>=0;
param costsw {DISTCENTR} >=0;
param costwf {DISTCENTR, MP} >=0;
param costff {MP, MP} >=0;
param short>=0;
param fixed {DISTCENTR} >=0;
```

param demand {MP, PERIOD,SCENARIO} >=0;
param weight >=0;
param initial Inventory {i in MP}>=0;
param shipping period {t in PERIOD} binary;
param initial InventoriesDC{w in DISTCENTR}>=0;
param optimal {s in SCENARIO}>=0;

var shortamt {i in MP, t in PERIOD, s in SCENARIO}>=0;
var shipff {i in MP, j in MP, t in PERIOD, s in SCENARIO}>=0;
var shipwf {w in DISTCENTR, i in MP, t in PERIOD}>=0;
var shipsw {w in DISTCENTR, t in PERIOD}>=0;
var shortage {i in MP, t in PERIOD,s in SCENARIO} binary;
var regret {s in SCENARIO};

minimize total regret: sum {s in SCENARIO} regret[s]; #objective function (1)

subject to Regret per Each Scenario {z in SCENARIO}:
regret[z]= (sum {w in DISTCENTR} (fixed[w])+
sum {i in MP} (initial Inventories[i]*costff[i,i] +
sum {t in PERIOD} (short*shortamt[i,t,z]+
sum {w in DISTCENTR} (costsw[w]*shipsw[w,t]+costwf[w,i]*shipwf[w,i,t])+
sum {j in MP} costff[i,j]*shipff[i,j,t,z]))) - optimal[z]; # regret (2)

subject to Previous Demand1 {i in MP, t in 2..numperiods, s in SCENARIO}:
sum{w in DISTCENTR} shipwf[w,i,t] + sum{j in MP} shipff[j,i,t-1,s] >= demand [i,t-1,s]; # constraint (3)

subject to Previous Demand2 {t in 6..numperiods, s in SCENARIO}:
sum {w in DISTCENTR} shipsw[w,t]>= sum{t-5..t-1, i in MP}
(Shipment period[t]*demand[i,t,s]); # constraing (4)

subject to Balance in Period1 {i in MP, s in SCENARIO}:
sum {w in DISTCENTR} shipwf[w,i,1] + initial Inventories[i] - demand[i,1,s] -
sum {j in MP} shipff[i,j,1,s] + shortamt[i,1,s]=0; # constraint (5)

subject to Balance {i in MP, t in 2..numperiods, s in SCENARIO}:
sum {w in DISTCENTR} shipwf[w,i,t]+sum {j in MP} shipff[j,i,t-1,s]
- demand[i,t,s] - sum {j in MP} shipff[i,j,t,s] + shortamt[i,t,s]=0; # constraint (6)

subject to shiplimit {i in MP, t in PERIOD, s in SCENARIO}:
sum {j in MP} shipff[i,j,t,s]<=weight*(1-shortage[i,t,s]); # constraint (7)

subject to shortagelimit {i in MP, t in PERIOD, s in SCENARIO}:
shortamt[i,t,s] <=demand[i,t,s] * shortage[i,t,s] ; # constraint (8)

subject to shiplimitfromDC {w in DISTCENTR, t in PERIOD}:
sum {i in MP} shipwf[w,i,t]<=initial InventoriesDC[w]+sum {t2 in 1..t-1}
(shipsw[w,t2] - sum{i in MP} shipwf[w,i,t2]); # constraint (9)

subject to ShipToDC {w in DISTCENTR, t in PERIOD}:
weight*Shipping period[t] >= shipsw[w,t]; # constraint (10)

The following listing is a database type .dat containing the input data for the AMPL Model1. TRANSSHIPMENT

AMPL Model1. TRANSSHIPMENT.dat

```
set SCENARIO:=1 2 3 4 5;
set WRHSE:= W;
set FACIL:= A B C D E;
set TIME:=1 2 3 4 5 6 7 8 9 10;

param numperiods:= 10;
param initialInventoryDC:= W 0;
param costsw := W 2;
param short:= 25;
param fixed:= W 10000;
param weight:= 10000;
param optimal := 1 74450
                2 78805
                3 81698
                4 79836
                5 82178;

param initInventories:=    A 0
                           B 0
                           C 0
                           D 0
                           E 0;

param costff (tr):   A B C D E:=
                         A 1 2 3 4 5
                         B 2 1 2 3 4
                         C 3 2 1 2 3
                         D 4 3 2 1 2
                         E 5 4 3 2 1;

param shipping period:= 1 1
2 0
3 0
4 0
5 0
6 1
7 0
8 0
9 0
10 0;
param costwf (tr): W:= A 1
B 1
C 1
D 1
E 1;
param demand :=
[*,*,1]:
1 2 3 4 5 6 7 8 9 10:=
A 85 107 91 96 89 131 109 114 89 123
B 75 97 81 86 79 60 82 84 84 82
C 71 91 79 97 95 67 99 71 103 96
```

```
D 97 118 102 111 125 84 116 116 118 104
E 110 142 118 131 153 94 119 131 108 127
[*,*,2]:
1 2 3 4 5 6 7 8 9 10:=
A 75 95 96 84 105 104 96 122 102 107
B 66 91 96 67 95 96 91 96 100 87
C 72 95 107 91 90 86 73 85 87 89
D 97 114 101 100 114 111 112 121 127 107
E 163 139 141 132 170 102 124 121 133 152
[*,*,3]:
1 2 3 4 5 6 7 8 9 10:=
A 93 113 103 77 106 114 98 116 107 106
B 90 96 103 92 81 80 101 75 91 94
C 99 87 88 94 101 81 99 89 77 76
D 110 123 123 100 125 90 123 115 115 106
E 145 123 139 141 156 148 154 121 123 158
[*,*,4]:
1 2 3 4 5 6 7 8 9 10:=
A 117 114 89 107 109 100 106 115 99 103
B 101 106 110 86 95 75 96 90 84 93
C 95 108 100 90 93 95 97 86 91 83
D 116 101 102 122 107 84 124 110 93 112
E 134 113 130 152 115 124 136 142 136 126
[*,*,5]:
1 2 3 4 5 6 7 8 9 10:=
A 98 97 96 110 103 114 114 96 100 131
B 89 104 72 102 84 95 87 72 88 103
C 85 98 96 89 87 89 95 86 90 81
D 101 103 102 101 105 120 110 115 104 100
E 104 165 95 146 133 153 118 163 130 109;
```

AMPL Model1. TRANSSHIPMENT.dat

4. Results of the experiment

The Model1.TRANSSHIPMENT.mod with Model1.TRANSSHIPMENT.dat input data was devised on the Intel Pentium 4 (Northwood), 2 GHz, 1GB DDR-SDRAM. A GLPSOL solver, component part of "Open Source" of the GLPK package (GNU Linear Programming Kit) was used, and this is meant for solving the problems of linear and mixed even number programming [6]. The package consists of a large number of GLPK API routines written in the C language and can be retrieved from the user application. The GLPSOL solver can be used autonomously for solving problems formulated in the following formats:

- LP/MIP model in GNU LP format,
- LP/MIP problem in fixed MPS format,
- LP/MIP problem in freeMPS format,
- LP/MIP problem in CPLEX LP format,
- LP/MIP model written in GNU MathProg modelling language.

The GNU MathProg modelling language is a subset of the AMPL, however, since it is open for general use, there are no limitations as to the number of variables nor limitations enforced by the AMPI – 300 x 300 student version.

We were concerned with solving three varieties of the model:

1. Model1.TRANSSHIPMENT that considers a possible distribution between the RFs.
2. Model2.NoTRANSSHIPMENT which considers the case identical to the previous one, however, without the possibility of transshipment, i.e., RF are independent from each other.
3. Model3.Deterministic which does not consider the randomness of demand as the two previous models do, using the scenario concept, but is otherwise identical to the previous model.

The results obtained are as follows:

1. The model had a total of 1815 variables, of which 250 even-number, and 250 binary, and 1026 constraints. There were 8390 non-zero values in the constraints matrix.
2. The optimum value for the objective function TotalRegret is 22896.
3. The total costs and the total regret for the three previous cases are shown in Table 2, where the %Difference is given as related to the costs of the deterministic case:

Table 2. Optimization results

	Total costs	Total Regret	% Difference
Transshipment allowed case	419863	22986	5.77 %
No transshipment case	425686	28719	5.23 %
Deterministic case	396967	-	-

The deterministic case was expected to display minimum costs, since the future demand is known precisely. In such circumstances the safety inventory is not necessary and this reduces the storage charges. Besides, planning helps eliminate the costs of shortages. The deterministic model is also the easiest problem to solve. Contrary to the deterministic model, the cases with and with no transshipment have to find compromise solutions.

In the case with an allowed transshipment among the RFs, the total costs are somewhat lower compared to the costs in the no transshipment case. A more thorough analysis of the two cases, however, can be conducted by observing the storage policy and the frequency of stock-outs. The results of the analysis are shown in Table 3.

Table 3. Optimization results analysis

	Number of shortages	Frequency of shortages	Maximum shortage amount	Average value of shortage amount
Transshipment allowed case	8	3,56 %	13	7,25
No transshipment case	15	6,67 %	40	12,8

A conclusion can be drawn that the number of shortages almost doubles when transshipment is not allowed, since the RF has to meet an increased demand in a given period and hence stores the inventory ordered for the future periods, and this may reasult in shortages in other RFs. On the other hand, in case the transshipment among the RFs is allowed, the RF in which the demand is lower than predicted can share the surplus with the facility reporting the shortage. In this case new transshipment costs emerge, however, the storage charges and the shortage costs are avoided. Also, the maximum and the mean values of the shortage amount is by far more favourable in the transshipment case than in the case without it.

Table 4 shows the differences between the average values of total inventory in one period in both cases under consideration.

Table 4. Optimization results analysis

	Average inventory quantity stored over a period
Transshipment allowed case	14,89
No transshipment case	27,83

As seen in Table 4, there is a significant difference in the inventory quantity stored in the RFs. This is an important argument in favour of introducing the transshipment type system if the RFs dispose of small warehouse capacities or if we deal with perishable or seasonal goods.

Another interesting characteristic for analysis is the behaviour of safety inventory, that is, to what extent the transshipment type systems reduce the amount of safety inventory due to risk pooling. Table 5 shows the results of this analysis.

Table 5. Delivery analysis

	Total delivery to DC	Total delivery to RF	Mean value of deliveries to RF	Standard deviation of quantity delivered
Transshipment allowed case	5549	4785	106,33	21,47
No transshipment case	5556	4895	108,78	23,21

On the basis of the data from Table 5 we can conclude that the quantities of goods delivered to DC or RFs are only slightly smaller in the transshipment allowed case. The explanation of this can be found in the model formulation. Namely, the model requires that the goods be ordered in accordance with the demand in the previous periods. If the model were based on the respective demand distributions, a more significant effects of risk pooling could be expected in the cases where transshipment is allowed. Similarly, if the input data for the demand distribution and the cost parametres were different, a significant effect of transshipment upon the safety inventory could be expected.

5. Conclusion

The model presented allows for the analysis of different supply policies, as well as different replenishment policies in the supply chain. The experimentally obtained findings with hypothetic but really possible data lead to the conclusion that the system with the transshipment in the supply chains may significantly reduce the costs in the stohastic demand cases, especially if the storage charges and shortage costs are high. It must, however, be pointed out that the systems with transshipment require a higher level of organization, trust and communication among the agents in the supply chains compared to the systems with no transshipment.

The model presented could, naturally, be improved in various directions – by the analysis of the model sensitivity to different cost parametres, as well as by the analysis of its implementation in various industries or in stocks management of different products. The model can also be extended by introducing a larger number of distribution centres and the problems of assigning the RFs to distribution centres. A crucially substantial improvement of the model would be an explicit introduction of the stohastic programming method instead of the scenario method, however, the introduction of a significantly larger number of scenarios would also prove to be interesting.

REFERENCE

[1] Chopra, S., Meindl P., *Supply Chain management – Strategy, planning, and opertaion.* Prentice Hall, Upper Saddle River, 2001.

[2] Voss, S., Woodruff D.I., *Introduction to computational optimization models for production planning in supply chain,* Springer Verlag, Berlin, 2003.

[3] Herer, Y. "Lateral Stock Transshipments in a Two-Location Inventory System with Fixed and Joint Replenishment Costs" , *Naval Research Logistics*, 46, 525-547, 1999.

[4] Robinson, L. W, "Optimal and Approximate Policies in Multiperiod, Multilocation Inventory Models with Transshipments", *Operations Research*, 38, 278-295,1990.

[5] **[**Fourer, R., "*AMPL, A Modeling Language for Mathematical Programming* "*,* Danvers, MA: Boyd and Fraser Publishing, 1993.

[6] http://www.gnu.org/software/glpk/, 2007

Four Dampillars against the Errone ous Spreadsheets

UDC: 004.94 ; 005.311.6

Prof dr Konstantin Kostić
Faculty of Organizational Sciences, Belgrade

A review of the papers from past EuSpRIG conferences shows that they may be classed into four distinct areas: tools, education, auditing and management..

1. Introduction

User-friendly, flexible and widely applicable, spreadsheets are used to support numerous business functions and frequently take roles for which the implementation of any other solutions would be too slow or too expensive. As a result, the spreadsheets have silently grown into the key components in the analyses and reporting processes in numerous organizations, including the critical areas of financial reporting.

There is ample evidence that errors in spreadsheets are usual and by no means trivial. The number of errors in spreadsheets is proportional to the number of errors occurring in other intellectual activities and they are caused by the fundamental limitations of the human intellect, not only by carelessness. The warning "be careful" cannot by itself eliminate errors, nor can it reduce them to at least an acceptable level.

The research so far, presented in the papers at the annual conferences of the EurSpRIG – European Spreadsheets Risk Interest Group can be classed into four groups:

Tools – methodologies and software used in spreadsheet modelling
Education – raising awareness, training and research
Audit – methods and software toold in spreadsheet auditing
Management – standards and controls in development management

The first letters of the names of these areas make up the word TEAM. This proved to be rather apt, since the thus created word further explains that the team work is the key to solving spreadsheet problems in corporations: implementation of development tools, training the users in order to raise their awareness of the errors in spreadsheets, an appropriate organization and implementation of the spreadsheet auditing processes, as well as adopting a clear managerial policy to support standards and controls.

2. Tools

Spreadsheets are generally approached as intuitive tools which are deceptively user-friendly and, although they are widely used in organizations, it often turns out that the information obtained is incorrect. Spreadsheet itself has certain limitations that prevent the development of complex business models, however, the spreadsheet user (creator) himself may lack the necessary skills in developing such a model.

There is undoubtedly a need to define and implement a structured approach in the model design, using the software tools that would serve as guidelines to the spreadsheet creator, so that he should avoid (or prevent) possible error situations, as well as document his activities.

Among the papers presented at the conferences so far there were some that advocate the use of programme languages to "code" the logic of the models and then design the spreadsheet interface in rows and columns together with its in-built logic. One author advocates the implementation of a mathematics area known as the "theory of categories" [13]. The theory of categories, as well as logic, is a tool for studying mathematical and computer concepts and is focuses upon the form rather than upon the contents.

A large number of participants at the conferences insisted on the need to create methods based on the principles of software engineering. They argue that the implementation of these principles of software engineering – which would make spreadsheet engineering – has a potential to improve the performance of spreadsheets programmers, reduce the frequency and gravity of errors in spreadsheets, improve the manipulation with spreadsheets in time.

Rajalingham, Chadwick and Knight [14] propose the application of tools that create Jackson structures to obtain a graphic type of spreadsheets description in the course of

---

[1] **Spreadsheet models can be presented in the form identical to the data structure diagram – Jackson structure which is used in software engineering.**

their development[1]. This allows for an easy check of the logic and a reverse spreadsheet engineering in its "Jackson" structure. Hence every spreadsheet model can be defined by its canonic form that will remain intact even when the spreadsheet form suffers cosmetical changes.

There is a lot of spreadsheet software on the market. The list of the best known software can be seen at the website http://en.wikipedia.org/wiki/List_of_spreadsheet_software. New spreadsheet alternatives have also been proposed at the conferences. The combination of the most recent object technologies with new approaches are indeed genuine alternatives to spreadsheets that are directed towards responding to the so far identified resistance to spreadsheets. For example, the XBRL (Extensible Business Reporting Language) is the language for electronic communication of financial data that revolutionized the financial reporting worldwide. It is used in the preparation, analysis and communication of financial information. The XBRL is an application of XML for business information and uses the structure to describe the data, make them instantly operable, interactive and intelligent.

As regards the spreadsheet documentation, the proper documentation:

- Describes the substance and method of model implementation in that it allows the others to implement the model, but is useful in reactivating the model after a period of time it was idle.
- Reduces the risk of discontinuing the use of the model because only one man or a limited number of people know how to use it and have trust in it.
- Reduces the number of irritating stoppages to the person responsible for further development of the model.

The documentation should include the facts such as: what the model serves for, what it can do, how it does what it does, which premises are included in its design, which constants are used and where they lie, who developed the model and when, who modified the model after it was put to use, and when he did it, the presence of macros and their purpose.

The systematis implementation of Excel comments may be viewed as an efficient method of spreadsheets documentation.

3. Education

In order to design and implement an efficient spreadsheet solution, it is important that one should know how to do the work so that the data may be turned into useful information. The knowledge of this know-how is al-

ready present in the organization. The knowledge of technique is achieved through training. If the technical knowledge does not take the knowledge of how to work into account, the solutions will not be optimal.

A most efficient spreadsheet system management in an organization is the result of the training based on working out the solutions to concrete problems (task-based management). Using one and only approach the user is being trained how to solve a concrete problem using the spreadsheet tools, contrary to the approach where the spreadsheet tools and techniques are studied independently of any concrete problem.

The trainers that favour the "task-based" approach are experienced as to the manner in which the spreadsheets are actually used in real situations. They combine their experience with the client's knowledge of the business environment. This is a better way compared to dry and boring theorizing on how the spreadsheets should be used.

At the end of the training the attendant:

- ✓ Completed his task
- ✓ Set the system for future tasks
- ✓ Learned about the solutions to some of his problems
- ✓ Worked on an actual spreadsheet

The attendant learned the task-related mechanic techniques, as well as the rationale of implementing these individual techniques in task situations.

The "task-based" training is neither the only type of training, nor is it the most popular one. A largely widespread type of training is the general training where the trainees are introduced to the spreadsheet programme package, since the attendants are usually people who already use spreadsheets for various purposes.

The third type of the "training" is most common and includes the users that have never had any formal training concerning spreadsheets. They learned how to use spreadsheets at work, from their predecessors or colleagues, or are entirely self-taught.

A quality training in using spreadsheets is offered at the Faculty of Organizational Sciences in Belgrade and at a number of other faculties. The training in how to work with spreadsheets, however, displays a rather poor approach to spreadsheets:

- Spreadsheets are presented as simple expressions of likewise simple accounting models
- Spreadsheets are easy to learn and their intellectual contents are limited

Students became familiar with spreadsheets even before they enter university and thus acquired wrong habits that are difficult to correct at university.

Lectures ↕ **Research** ↘↗ **Students learn**

The greatest problem, however, may be how to convince the lecturers that the training for work in spreadsheets requires an entirely different approach which is not based only on the changes in the teaching contents, but in the teaching methods, too. A solution may be to encourage them to use the feedback loop RESEARCH ● LECTURE ● STUDENTS LEARN.

4. Audit

The types of testing are numerous and the majority of them cannot reduce the errors to the point at which there are no singnificant errors in the spreadsheet. Here we mention some of the test types:

1. **Testing along spreadsheet development** – Testing applications, unit (module) testing, integral testing.
2. **Spreadsheet observation** – Review of tables in spreadsheet in order to get the impression of logic.
3. **Error scanning software** – Software that browses the spreadsheet searching for errors on the basis of the built-in detection rules in the software. The automatic error scanning tools are similar to spell-checkers and grammar-checkers in the text processing programmes. Excell has the built-in tools for error detection under the commands Tools, Error Checking. These tools are rather simple, but limited. There are several commercial tools available in spreadsheet auditing: SpACE (Spreadsheet Audit for Customs & Excise), OAK (Operis Analysis Kit), Spreadsheet Detective and Spreadsheet Professional, and others. Much more sophisticated scanners are now available on the market. The web site containing the list of such products is http://www.sysmod.com/sslinks.htm#auditing.
4. **Auditing** – The option that is in Excell activated by the Tools, Formula Auditing commands. Such commands allow us to select the links of the formula with the previous cells the result of the formula depends on, that is, with all the cells to which the value of the formula observed serves as input data. One problem with the real auditing is the question on which section of spreadsheet is audited. The most obvious candidate for auditing is the "most risky section" which includes complex formulas and links among the worksheets of the work ledger. While the errors are more likely to occur in this type of formulae in comparison with the ordinary formulae, by the law of probability, there is probably a larger number of errors in ordinary formulae than in the complex ones (the ordinary ones are more numerous) will occur. Very complex, but also very expensive automated auditing softwares for spreadsheets are now available on the market.

5. **Testing through performance** – The tester tests a number of sets of input values to find out whether the spreadsheet produces (or does not produce) correct results. Here, typical and extreme values (paranoid testing) can be used. The problem here is how we can know whether the values obtained are accurate and correct. In the best case, there are possibilities to compare the resulting values to the already known values. A mathematical model would be welcome that can yield values which could be expected as a result in the spreadsheet, too. Without such values for comparison, testing through performance is meaningless.

6. **Logic inspection** – The inspector examines all the cells with formulae, searching for errors. For practical reasons, we recommend the team inspection: an individual usually manages to detect fewer than half the number of all the errors present. In this case the reduction of all the errors cannot be requested, since this is impossible to do. Therefore a reasonable limit is set, in accordance with the importance of spreadsheet in business decision making.

The inspection process should consist of seven steps:
1. Planning. Provision of materials, getting the peer and working out the meetings schedule.
2. Discussing the meeting agenda. Presenting software, role delegation, process description.
3. Preparation. Inspectors check the spreadsheet individually. The aim is not to detect errors, but to understand software modules. Many inspection methods, however, detect errors as early as this phase.
4. Inspectors' meeting. The task is to detect and explain errors. Nothing else is discussed. The meeting has to be reasonably short, so that concentration should not weaken.
5. Improving the process. Inspection has to produce a feed-back information to the guide process inspection of the firm. Each inspection must generate a statistics on the time consumed, errors detected and the gravity of error.
6. Processing. The remedy to /repair of the software is effected after the meeting.
7. Monitoring. Ensuring that the change is correctly made.

5. Management

There are many, some argue too many, issues related to spreadsheet management which should be taken into

consideratin by the organizational policy. There are the issues of choice and of adopting a set of controls that should be analysed over a reasonable time interval. These may be the spreadsheet version controls, the insight and self-auditing during the spreadsheet creation, team review and "close inspection" of spreadsheets models, the documentation policy, the use of "proven" models as templates, as well as recording usual errors and their storage at set sites such as corporate knowledge bases.

In order that only a small number of these requirements be met it is necessary to ensure the support of the firm top management and create a strategy to establish good practice based on the reasonable selection of standards.

Such a standard can be found in the CobiT (Control Objectives for Information and Related Technology) approach. The CobiT is a set of tools that helps business managers to understand and manage the risk related to introducing new technology. It also demonstrates to the interested parties or stakeholders how well the job was done. The CobiT is based on the best international practice of IT management.

The CobiT ensures a generic framework for all the main IT processes. It does not necessarily specify spreadsheets. However, this generic framework can be applied to all IT development solutions, from the entire ERP system to a relatively simple spreadsheet.

For example, the "Provision and Maintenance of Software" control is described as follows:

The control of the IT processes of provision and maintenance of software that satisfies the business requirements of function automation for the purpose of an efficient support to business processes is ensured by the definitions of functional and operational requirements and the phase implementation with clearly set performance and takes into account:

- Functional testing and adopting
- Application controls and security requirements
- Documentation requirements
- Software application life cycle
- Company infromation structure
- Methodology of development system life cycle
- User-machine interface
- Package adjustment

This is backed up by 17 detailed goals of control, covering:

- Design methods
- Principal changes in the existing system

- Project approval
- Defining and documenting necessary files
- Programme specification
- Source data collection project
- Defining input requirements and documentation
- Defining interfaces
- User-machine interface
- Defining necessary processes and documentation
- Defining necessary outputs and documentation
- Opportunity of control
- Accessibility as key factor of design
- Measures of IT integrity in software programme application
- Software application testing
- User manuals and other logistic material
- Re-evaluation of system project

The CobiT approach is based on the "Maturity" model of the software development possibilities, defined by the Software Engineering Institute. The Maturity model offers a method for a quantitative expression of the level of IT control procedures on the 0 (non-existent) to 5 (optimized) scale. The management used the "Maturity" model to map the current status of:

- o Their own organization
- o Best practices or an overall state of practice in their industry
- o International standards

and to determine where the organization desires to be as regards those levels.

Figure 1: CoBIT Maturity Model

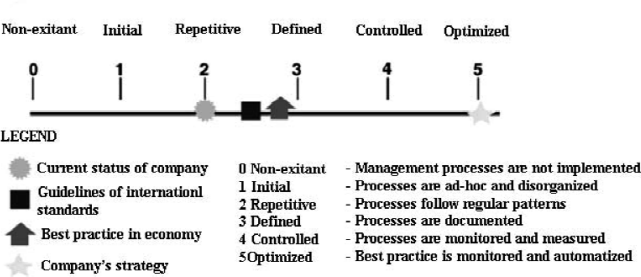The development and maintenance processes control of spreadsheet models and applications that satisfy the business needs to obtain accurate business models and error-free analyses in order to efficiently support business processes is provided by defining the specific features of functional and operational requirements as well as by a phase implementation with clear performance and takes into account:

- design methods
- protection and data storage requirements
- testing and adopting
- documentation requirements.

6. Conclusion

In order that an appropriate spreadsheet information system be provided in an organization, it is necessary to improve four areas of intellectual activity:

TOOLS – adopt the methodology of the structural description of the data and their connexity as a basis of the business model description which is further developed in the spreadsheet; select an adequate software for the spreadsheet; ensure the spreadsheet documentation;

EDUCATION – select the most suitable user (creator) training and establish an appropriate system of permanent education together with research;

AUDITING – establish a spreadsheet audit system implementing most recent auditing tools (software);

MANAGEMENT – adopt standards and controls related to the management of versions, storage, usage of templates, spreadsheet systems performance measurement and continual improvement.

REFERENCE

[1] Panko R Spreadsheet Errors: What We Know. What We Think We Can Do.
Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000,
Greenwich, UK, July 2000.
http://arxiv.org/abs/0802.3457

[2] Rajalingham K, Chadwick D, Knight B: Classification of Spreadsheet Errors
Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000. http://arxiv.org/abs/0805.4224

[3] Hawker A: Building Financial Accuracy into Spreadsheets, Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000.
http://arxiv.org/abs/0805.4219

[4] Ayalew Y, Clermont M, Mittermeir R: Detecting Errors in Spreadsheets, Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000.
http://arxiv.org/abs/0805.1740

[5] Rajalingham K, Chadwick D, Knight B; A Structured Methodology for Spreadsheet Modelling. Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000.
http://arxiv.org/abs/0805.4218

[6] Butler R Risk Assessment for Spreadsheet Developments (HM Customs and Excise) Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000. http://arxiv.org/abs/0805.4236

[7] Chan H Q Chen Y: Visual Checking Of Spreadsheets Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, July 2000.
http://arxiv.org/abs/0805.2189

[8] Cleary P M: How Important Are Spreadsheets To Organisations?
Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, UK, July 2000.

[9] Chadwick D Stop the Subversive Spreadsheet. Proceedings of 1st International Symposium on Spreadsheet Risks, EUSPRIG2000, Greenwich, July 2000. http://arxiv.org/abs/0712.2594

[10] Chadwick D., Sue R.: Teaching Spreadsheet Development Using Peer Audit and Self-Audit Methods for Reducing Errors, Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001.
http://arxiv.org/abs/0801.1514

[11] Butler R J: Applying the Cobit® Control Framework to Spreadsheet Developments Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001.
http://arxiv.org/abs/0801.0609

[12] O'Beirne P: Euro Conversion in Spreadsheets Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001

[13] Paine J: Safer Spreadsheets With Model Master Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001. http://arxiv.org/abs/0801.3690

[14] Rajalingham K, Chadwick D, Knight B: An Evaluation of the Quality of a Structured Spreadsheet Development Methodology Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001.
http://arxiv.org/abs/0801.1516

[15] Raffensperger J: New Guidelines for Writing spreadsheets Proceedings of 2nd International Symposium on Spreadsheet Risks, EU-SPRIG2001, Amsterdam, Holland, July 2001.

[16] Ettema H, Janssen P, de Swart J: Assurance By Control Around Is A Visible Alternative To The Traditional Approach Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001. http://arxiv.org/abs/0801.4775

[17] Knight D,: A Real alternative to spreadsheets Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001

[18] Nixon D, O'Hara M: Spreadsheet Auditing Proceedings of 2nd International Symposium on Spreadsheet Risks, EUSPRIG2001, Amsterdam, Holland, July 2001

[19] Chadwick D: Training Gamble Leads To Corporate Grumble Proceedings of 3rd International Symposium on Spreadsheet Risks –the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002

[20] Banks D., Monday A.: Interpretation as a Factor in Understanding Flawed Spreadsheets Proceedings of 3rd International Symposium on Spreadsheet Risks -the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002. http://arxiv.org/abs/0801.1856

[21] Grossman T.: Spreadsheet Engineering: A Research Framework Proceedings of 3rd International Symposium on Spreadsheet Risks - the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002. http://arxiv.org/abs/0711.0538

[22] Clermont M., Hanin C., Mittermeir R.: A Spreadsheet Auditing Tool Evaluated In An Industrial Context Proceedings of 3d International Symposium on Spreadsheet Risks - the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002. http://arxiv.org/abs/0805.1741

[23] Chadwick D., Knight B.: The Subversive Spreadsheet Proceedings of 3d International Symposium on Spreadsheet Risks – the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002.

[24] Butler R.: Losing At Spreadsheet Roulette Proceedings of 3rd International Symposium on Spreadsheet Risks - the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002

[25] Croll G.: A Typical Spreadsheet Audit Approach Proceedings of 3d International Symposium on Spreadsheet Risks - the Hidden Corporate Gamble, EUSPRIG 2002, Cardiff, Wales, UK, July 2002. http://arxiv.org/abs/0712.2591

Human Resources in the Drive Towards Creativity and Organisational Innovation

Dr Isabel Martins[1] , Dr Orlando Petiz[2], Dr Ana Martins[3]
[1] *HRM/OB Division, University of Glamorgan, Wales in UK*
[2] *School of Economics and Management, Department of Economics, University of Minho in Portugal*
[3] *Learning and Professional Development Division, University of Glamorgan, Wales in UK*

Innovation is the cornerstone of competitive advantage. For this, it is necessary to adopt the practices of a range of measures which lead to entrepreneurial re-structuring. This emphasizes the measures of change within the different components of the organisation, as well as implementing an innovative culture based on quality which will be broad ranging and affect all aspects of the organisation. In this way, entrepreneurial flexibility has to be based on the creative individual and views that intelligence is the major ingredient of bringing about flexibility. With these new attitudes, policies and practices the innovative organisation neutralizes obsolete processes and products focusing instead on its potential. Therefore, in this quest for excellence, new core competencies have to be sought after. These must take into account all employees and not only those whose technical or conceptual competencies are more visible. However, due to the constant and abrupt economic, social, technical and technological changes seen in the entrepreneurial contexts, it is vital to question what type of flexibility is more easily adaptable to the systems of constant change. Therefore, there are some pillars which are vital for these foundations, namely, commitment, tolerance, involvement willingness to take risk, all of which will ensure these organisations are more complex and less bureaucratic.

1. Introduction

Economic globalisation as well as the dissemination of new technologies has created a direct and indirect impact on both the life cycle and dynamism of organisations. Nowadays, this impact is much more unpredictable, turbulent and buoyant. Within this context, organisations will need to adopt a new lifestyle philosophy. In order to identify new sources of competitive advantage most organisations need to revisit their mission and objectives, at both strategic and operational levels.

Organisations require to redefine their behaviour in order to fight obsolescence of their competitive advantage within this constant evolution of both contextual and transactional environments. This behaviour should be more decisive and pro active, in so far as listening to the client and the competitor as well as in conceptualising and adopting new management paradigms. In this way, client satisfaction, scanning the competitive environment, revisiting its ethical values and implementing an innovative culture from within the organisation, are all sources of inspiration and sustainable creativity of organisational innovation.

Nowadays dynamism and company longevity are threatened by the contextual and transactional environments which, as the economic globalisation evolves, become ever more buoyant, turbulent and unpredictable. However, this process can be slowed down or stopped by the adoption of entrepreneurial behaviour which is more decisive, namely, listening carefully to the client as well as to the competitor. Such listening is in turn linked to innovative behaviour. Nevertheless, on the whole companies tend to ignore the importance of listening and fail to see its economic and social value.

This paper will reflect upon organisational behaviour, culture and values so as to compare the traditional organisational paradigm with the new paradigm, i.e. of dynamic vocation, evolutionary and transforming just as the new organisation theory professes it to be. The aim of this paper is to highlight the importance of entrepreneurial dynamism which fosters innovation as a way of being and sees the intangible resources as the new source of creating sustainable value. Three organisations located in the North of Portugal will be analysed.

This paper is essentially concerned with new technical trends adopted by successful companies. Therefore, the paper will begin by contextualising various concepts related to organisational culture and innovation. Thereafter, a reflection will be made upon the reality of three Portuguese organisations located in the northern region of Portugal based on this theory.

2. Knowledge management

There is a need to adopt a new management paradigm, i.e. "knowledge management paradigm". Knowledge management, according to Carter and Scarbrough (2001) is related to the frailties and vulnerabilities inherent in the

organisational competitive advantages. In the recent past, organisations failed to have sustainable characteristics absence of knowledge management paradigm. In this way, knowledge management is a practice (Halawi, Aronson and McCarthy, 2005: 75) and can be defined as " the way in which knowledge is created, shared, distributed and utilised in order to attain organisational objectives" (Serrano and Fialho, 2005: 4). However, it is not simple to offer a definition of knowledge management. In addition to the complexities of the issues involved therein, it has also been the target of various interpretations**.** However, knowledge management also allowed for catapulting different elements within the organisation, namely, at structural, social and human levels (Seemann, cited in Halawi, Aronson and McCarthy, 2005).

Knowledge management strategies entail two approaches, i.e. codification and personalization. In codification, databases store codified knowledge allowing for easy company access and use (Hansen et al., 1999: 107, cited in Carter and Scarbrough, 2001). Personalization reveals that knowledge is inherently linked to the person who developed and shared it. Unlike the economies of the past, current organisations are more exposed to international competition. In this way, the need arose to identify and privilege other sources of competitive advantage. Consequently, according to Serrano and Fialho (2005: 4), knowledge management can be seen as the convergence between the bureaucratic organisational culture and information technologies which it uses. Due to this mutation of cultures as well as the behaviour of organisations, the notions of knowledge employee, learning organisations, and organisational learning all gain much more consistency and more relevance in the everyday occurrences within an organisation. Furthermore, Carter and Scarbrough (2001) corroborate that knowledge management may take various forms, namely, (i) intellectual capital; (ii) knowledge assets as well as (iii) workplace and organisational learning . Indeed, knowledge is considered the only meaningful economic resource in the knowledge society rather than capital or labour. Senge (1990) maintains that organisations cannot function as knowledge-based organisations because they suffer from learning disabilities. Therefore, it is believed that companies must innovate or else they will perish. Furthermore, Rowley (1999) posits that the core competency enabling organisations to survive, resides in their ability to adapt, learn and change. For Yang (2003:242), knowledge and learning are attributed a new conceptual framework in that "(h)olistic theory defines knowledge as a social construct with three distinctive and interrelated facets—explicit, implicit, and emancipatory knowledge." Emancipatory knowledge is based on motivational levels, feelings and emotions towards the external circumstances surround-

ing the individual. Implicit knowledge is based on the individual's experiences, actions and behaviour. Explicit knowledge is codified knowledge which arises from the individual's interpretation of the event. These three facets are holistic in that they are both contradictory and complementary to each other.

Client satisfaction is a permanent source of inspiration for entrepreneurial innovation. Both the client and/or consumer are a touching stone in the innovation process. In this way the new economy based on knowledge has also taken this fact into account. Even though in this respect innovation depends more on the market comparatively speaking to any other type of innovation (Drucker, 1998).

3. Entrepreneurial organisational culture and innovation

Within the economic globalisation context, the process of constructing competitive advantage, is turbulent, unpredictable and rapidly changing, thus demanding that organisational senility be eradicated. This perspective leads to the transformation of entrepreneurial organisations, which according to Santos (1997a:6), can in turn be lighter, more flexible, cooperative and sensitive to organisational culture and "the values of an organisation are essential to the creation of organisational identity through a sharing culture" (Santos, 1998:244). The adoption and sharing of these values and trends are at the root of the eradication of organisational senility and can also be regarded as the seed for innovation. In view of this, the production and management of this entrepreneurial organisational culture fosters a feeling of identity. This creates distinctive organisational characteristics. This culture creates homogenized behaviour patterns which arise from different group elements and thus produces strong interactions and interdependencies (Schein, 1997a, 1997b, 1997c and Daft, 1999). Furthermore, Schein (1997a) proposes an integrated model to relate different variables, among which learning and organisational culture are viewed as the base for organisational success.

It is within this change perspective based on intangibles that Stata (1989) sets forth the idea that the only sustainable source of all competitive advantages is rate of organisational learning. Although, Haas and Hansen (2005) insist upon the use of coded and personal knowledge as these view the existence of a direct relationship between knowledge, gains and competitive advantages (Handzic and Chaimungkalanont, 2004).

The business world currently accepts that business quality depends on the quality and characteristics of

its employees which, in turn, leads to business excellence. Competition is rife and, is often, disloyal arising from instability in market conditions, namely at the level of surplus capacity of world production. Such a situation, and parallel to that market, provokes deep alterations at the behavioural level, both for the producer and the consumer.

Various issues which warrant reflection have arisen in the literature and these are linked to the structure of those pre-requisites which lead to organisational success. In this regard, the debate revolves around intensive goods within knowledge which result from innovation, but which also lead to new innovation processes. This perception considers innovation as a guarantee to business success, although, despite the application, production and diffusion of knowledge, the alteration characteristics of demand and investment patterns are strategic for both the implementation and success of innovation processes. In this way, organisational success and longevity include the capacity of offering the client a product adequate to the clients' needs. In this regard, Peters and Austin (1988:159) highlight that competition is seen as "the continuous engine for innovation" although Freire (1995) regards competition as engine for development. In these perspectives two non-coincidental, although complimentary parts, can be identified converging towards organisational development processes. Furthermore, it is understood that competition is indeed important when implementing innovation policies.

Within a different perspective, Hamel (1998b) is fully aware of the importance inherent in both quality and globalization; he emphasizes the turnover of those variables and highlights a different one which is related to the 'revolution' in the fundamental changes within the context of a new business paradigm. Hamel further corroborates that one has to bet on differences seeing that "in this unstable world, the main challenge is not to achieve productive efficiency in capital intensive industries but instead to free innovation power in creative intensive industries" (Hamel, 1998a:47). In this way Hamel (1998b) corroborates that visionaries are worthy of analysis. The contemporary world does not adhere to fortuitous situations and that innovation does not result from isolated geniuses but instead from activists inherent in organisations. In order for these to be genuinely different, innovation needs to be regarded as an added value and also as a source of value. The classical paradigm, i.e. the top-down approach is considered as planned change. This approach has mostly revealed to be unsuccessful as lower-level managers were not included in the change process. The bottom-up approach to change, also known as "systems/quantum paradigm"

(Druhl, 2001:382) is centered on the living-systems approach. This approach is based on the individual learning and social interactions prevalent in organisations. Furthermore, in this systems/quantum paradigm organisational change strategies nurture the individual's ability for self-discovery, enhance communication and encourage teamwork.

Schein (1997a and 1997b) emphasises the importance of cultural change and believes that the sharing of pre-established "suppositions" in organisations may lead to such objectives and may thus create cascades of innovation. Mejía (2000) concurs with this set of ideas and further highlights that organisational culture is a way of cultivating human knowledge from which one can establish the capacity to mould individual behaviour in favour of a common goal through sharing of the same technology, language, rules, knowledge, sanctions and compensations. Within this line of thought, Barros (2003) postulates that organisational culture is a source which controls and conditions human behaviour. Thus, Barros focuses on the concept of organisational behaviour, viewing it as an activity that studies the way people behave, including how to predict, understand and monitor their behavior. We believe that this reality leads to an imposed conditioning on group elements. Rego and Cunha (2003) further corroborate that organisational culture is a strong factor influencing both employees' behaviour and motivating them to be creative and innovative.

Notwithstanding the importance of the abovementioned viewpoints, it seems that competitiveness is based on productive gains. Thus, industrial policies have been object of various analyses and it is assumed that "doing by knowing" alone does not guarantee business success. In this way, sustained competitiveness is based on dynamic factors which, Maximiniano Martins (1998:165 and 1997:69) regards as "not directly productive, such as design, quality, energy, environment, research and development, strategic marketing, internal organisation, health and safety, human capital, innovation, technological context, product differentiation". This author further highlights that the industrial policy, in its aim to modernize the business sector, should be proactive. Thus, there is a need to aid the construction of infrastructures to support industrial development, namely at the level of human resource development, creation of technological schools, diverse support services to industry and the creation of various entities offering scientific-technological support. Thus, taking into account the devaluation of "knowing-doing", Maximiniano Martins (1998: 165,6) is in favour of an interdependence between productive and societal systems, through "its increasing immaterial and knowledge

intensive strategic base" and is in also favour of an "economic intelligence" as a form of responding to structural vulnerability. Although Oliveira Martins (1998:230) corroborates with opinion of Maximiniano Martins, the former believes education and industry to be two fundamental variables to re launch competitiveness in Portugal. In this way, Oliveira Martins further believes that to "educate is to awaken autonomy and responsibility, but it also leads to actively respond to the creative social needs". Thus, taking into account the economic changes which are occurring in the labour market, investment in education needs to be strategic and should be followed by quality parameters, motivation factors and mobilization, factors which are conducive to economic and social cohesion.

4. The primary data analisis and discussion of findings

In order to integrate and relate the organisational context to its competitors, organisations necessarily are required to aim at satisfying the client; in so doing, the focus should on the drive towards achieving innovative behaviour.

This article will reflect on the findings gathered from three Portuguese organisations which are part of the traditional transformation sector. These organisations have different dimensions but are still considered Small and Medium Enterprises (SMEs). The organisations in this analysis are referred to as "Case A", "Case B" and "Case C". Case A belongs to the traditional textile sector, whilst Cases B and C belong to production and sales of spares in the Motorcar Industry. Their dimension is two hundred and sixty (260) employees, forty-two (42) employees, fifty-one (51) employees respectively. The sample incorporated all employees. The response rate of valid questionnaires can be broken down into 74%, 66,6% and 43% respectively.

In the abovementioned organisations, the sample entailed all the employees as the objective was to carry out of the cross section analysis thereby assessing the perceptions thereof. Thus, after gaining permission from these organisations, the authors placed the questionnaires personally at these organisations and in turn a employee from each organisation was responsible to distribute the questionnaires accordingly. However, the response rates obtained (valid questionnaires can be broken down into 74%, 66,6% and 43%, "Cases" A, B and C respectively), not all employees completed the questionnaires distributed. Moreover, despite this response rate, the wider collaboration efforts on the part of the administration employees

demonstrated their involvement and responded to our needs. The data gathered and included in this paper, were analysed using SPSS.

One of the questions asked was related to identifying the organisation's empoyees, according to the age group, with the objective of ascertaining how many employees were part of the Design, the R&D and also the Sales/Marketing. The responses are summarized in the following table:

Table 1: Employee Roles in the organisations (May 2006)

EMPLOYEE ROLES	Case A (%)	Case B (%)	Case C (%)
Top management employees	0,00	14,29	9,09
R&D/Design/Research	1.08	0,00	0,00
Middle management	1.61	7,14	4,55
Administrative employees	3.22	10,71	18,18
Commercial/Marketing employees	1.08	3,57	54,55
Manufacturing employees	93.01	64,29	13,64
Low skilled employees	0,00	0,00	0,00
Total	**100,00**	**100,00**	**100,00**

Reflecting on the table above, we ascertain that Case A organisation merely allocates 1,08% of its total employees to Commercial and Marketing and R&D/Design/Research. On the other hand the other organisations which are smaller, allocate 0% to R&D/Design/Research, whereas they allocate 3,57% e 54,55%, to the Commercial and Marketing employees, these percentages are higher than those within the same scale, in Case A.

If we exclude the organisation in Case C which is concerned with both producing as well as marketing its products, hence the high percentage of people allocated to Commercial/Marketing sectors; all the other organisations exhibit low figures. On the other hand, Case A

demonstrates 1,08% for R&D/ Design/Research, whereas the other organisations totally neglect these figures. Such behaviour seems to be totally out of line seeing that nowadays competition is ferocious and organisations need to improve their performance in the realm of Marketing, R&D as well as Design. In this way, implementing change and creating an organisational culture which lends itself to knowledge management which induces the diffusion of technologies and feeds innovation seems to be simple. However, if we compare the concern organisations have regarding their number of employees in top management, middle and administrative functions, larger organisations (Case A) are less concerned with this issue than the smaller organisations. The opposite occurs for the low skilled and manufacturing employees who are greatly valued by their large organisation, the opposite happens for the others.

In reflecting upon the figures obtained, Case A is part of the textile industry and relies heavily on intensive labour. The other organisations are concerned with the production and selling of automobile spare parts. Despite the fact that these also rely heavily on intensive labour, they have both different behaviour and needs when it comes to management and administration as well as different policies of focussing on their internal and external clients. These policies seem to be in opposition to the new principles of the new management paradigms, namely the "knowledge management paradigm". Seeing companies are exposed to international competition and towards the proliferation of new technologies which, in turn, shorten products' life cycles, their competitive advantage may not be sustainable. In this way, given the fact that companies insist on following strategies that are not related to knowledge economy, their survival seem to be difficult as it can be shown in the financial results.

In view of such assertions encountered, there are great contradictions between the theoretical postulations and the everyday reality of companies. This organisational feeling may be the result of a less flexible organisational culture, one that is more autistic to ethical values, and not aligned with a culture of learning, where tacit knowledge is the pivotal element in the usage and energising the production factors. This paradigm impedes change of organisational perceptions and thereby not allowing the intangibles to be seen as a new organisational force as well and as new core value sources of sustainable wealth. Turbulences, vulnerability and unpredictability of the market competitors do not adhere to rigid organisational guidelines. The strategy of intensive labour and low salary costs is in direct contradiction to the current market demands because they do not create a consistent base for organisations and thus condition their longevity. However, the lower the internal dynamism which can be considered as one of the organisational frailties, cannot be held accountable by the older employees, as these are still considered to be young, and which are within the age group between 22 – 35 years. Moreover, the employees in the organisation - Case B, are all the same young age group or below. In turn, Case C has 8,6% of young employees whilst 32% of the employees are in the age group of 35 – 55 years old.

5. Conclusion

Currently, the intangible values are the pillars of the organisational competitive advantages and are positively related to the performance of employees. This performance is however, dependent on the democratic organisational culture, the ethical principles and the implementation of the new cultural values of the organisation. Nevertheless, the main and essential input fostering competitive advantages resides in the brains of individuals whose cognition capacity needs to be exercised through continuous learning and transversal knowledge as these are the main ingredients for creative sustainability. However, the majority of economic agents continue to overvalue information technologies material investment. On a daily basis these agents also display some ignorance about the real dynamic competitive factors, which reside within the intangibles. Thus, these agents are incapable of recognizing that personal knowledge, associated to organisational knowledge, is an additive for both its performance and competitiveness. This seems to also be applied to the organisations in this analysis. Consequently, a change in the organisational paradigm is hampered; it is also difficult to perceive the strategic value knowledge has both in its usage and in its diffusion. Consequently, the innovation climate and a more entrepreneurial spirit of both employers and employees is not cultivated; the leap that organisations need to take in their search for strategic knowledge domain, namely at the individual level, continues to be postponed which thus blocks the organisation's sustainability because it underutilizes its existing resources, namely at the level of intellectual capacity of employees. Therefore, it seems there is a need for attach greater importance to the intangible values in the organisation and harmonizing these with the tangibles in view of their capacity to expand, project and to form the foundations of organisational performance. This is achieved through synergies which are being created. When variables such as competition, client and the business innovative spirit are appropriately blended, they are considered the foundations for organisational longevity. However, the organisational cultural heritage is thwarting the paradigm change and dependency on the old paradigm is jeopardising the organisations' longevity.

REFERENCES

[1] Barros, R. - Influência da Cultura Organizacional no PMO, http://www.Kebconsultoria.com.br/arquivos/cultura pmo.ppt, 2003

[2] Carter, C. and Scarbrough, H. - Towards a second generation of KM? *Education, Training* Vol. 43, No. 4/5, pp. 215-224, 2001

[3] Daft, R. - *Teoria e projecto das organizações*, 6th Edition, Rio de Janeiro, LTC Editora, 1999

[4] Drucker, P. - The Discipline of Innovation, *Harvard Business Review*, November-December 1998, pp. 149-157, 1998

[5] Druhl, K., Langstaff, J. and Monson, N. - Towards a Synthesis of the Classical and Quantum Paradigms Vedic Science as a Holistic Approach to Organizational Change , Journal of Organisational Change Management, Vol. 14 No. 4, pp. 379-407, 2001

[5] Freire, A. - *Gestão Empresarial Japonesa*, Lisboa, Verbo Editora, 1995

[6] Haas, M. R. and Hansen, M. T. - When Using Knowledge can Hurt Performance: The Value of Organisational capabilities in a Management, Consulting Company, *Strategic Management Journal*, Vol. 26, Issue 1, pp. 01-24, 2005.

[7] Halawi, L, Aronson, J. E. and McCarthy, R. V. - Resources-Based View of Knowledge Management for Competitive Advantage, *The Electronic Journal of knowledge Management*, Vol. 3, Issue 2, pp. 75-86, available online at www.ejkm.com, 2005

[8] Hamel, G. - Faça você mesmo uma Revolução, *Executive Digest*, Ano 4, n 49, Novembro de 1998, Lisboa, pp. 46-52, 1998a

[9] Hamel, G. - Uma lufada de ar fresco na estratégia, *Executive Digest*, Número 50, Dezembro de 1998, Lisboa, pp. 80-81, 1998b

[10] Handzic, M. and Chaimungkalanont, M. - Enhancing Organisational Creativity Through Socialisation, *The Electronic Journal of Knowledge Management*, Volume 2, Issue 1, 57-64, available online at www.ejkm.com, 2004

[11] Maximiniano, M. - Apoios à indústria portuguesa, *Anuário da Economia Portuguesa 1997*, Lisboa, Associação Portuguesa de Economistas, pp. 67-71, 1997

[12] Maximiniano, M. - Política Industrial, *Anuário da Economia Portuguesa 1998*, Lisboa, Ordem dos Economistas, pp. 164-167, 1998

[13] Mejía, Ramírez F.- El desarrollo de una cultura organizacional de compartición del conocimiento,http://dois.mimas.ac.uk/DoIS/data/Articles/juljuljiky.2000:v:4:p:4088.html, 2000

[14] Oliveira Martins, G. - A aposta na educação, *Anuário da Economia Portuguesa 1998*, Lisboa, Ordem dos Economistas, pp. 229-232, 1998

[15] Peters, T.and Austin, N. - *A Paixão pela Excelência*, Lisboa, Pensamento Editorial Livreiros, Ld , 1988

[16] Rowley, J. - What is knowledge management? Library Management, Volume 20, Number 8, 416-419, 1999

[17] Rego, Arménio, Cunha, Miguel Pina - *A essência da liderança*, Lisboa, Editora RH, 2003

[18] Santos, Francisco Lopes dos - O papel da motivação do empresário no planeamento estratégico das PME's, *Anuário da Economia Portuguesa 1998*, Lisboa, Ordem dos Economistas, pp. 241-244, 1998

[19] Schein, Edgar - *Organisational Culture and Leadership*, 2 ed. California, Jossey-Bass, 1997a

[20] Schein, Edgar - *Organisational Learning: What is New*?, MIT Sloan School of Management, 1997b

[21] Schein, Edgar - Three Cultures of Management: The Key to Organisational Learning in the 21 Century, MIT Sloan School of Management, 1997c

[22] Serrano, A. and Fialho, C. - Gestão do Conhecimento: O novo paradigma das organizações, 2 Edição Aumentada, Lisboa, FCA-Editora de Informática, 2005

[23] Stata, R. - Organisational Learning: the key to management innovation, *Sloan Management Review*, Spring: 63-74, 1989

[24] Yang, B. - Holistic Learning Theory and Implications for Human Resource Development, *Advances in Developing Human Resources*; Vol 6; No. 2, 241-262, 2003

Internationalization of Retail

UDC: 339.94:658.87

Iva N. Joksimović
Delta sport, Belgrade

The focus of the paper is on the development and positioning of the brands, based on international retail chains practice. The key terms in relation to branding aspect represent the starting point in the paper, as well as the identification of main values for successful brand positioning. Planning and implementation of marketing communication and analysis of brand performance have been discussed in the paper. Special attention has been paid to the analysis of the retail environment through the development of the model that defines the retail location, competition, customer and product aspects. The research focusing on the development of international retail chains and key elements for successful brand positioning and brand profitability has been presented. Building profitable retail brand is largely linked to the strategy that is chosen for the development and brand positioning.

1. Introduction

Retail internationalization is a complex process, increasingly widespread in recent years. This internalization process has an increasing impact upon corporate strategies as well as upon the development of the retail sector. The size, form and the function of the process have completely changed. The retail internationalization model has to include the process that permeats the whole retail firm, affects the activities of competition and changes the environment in which the firm and its competition do business. Viewed as a process, internationalization allows for the firm to exploit innovation, and hence to grow and develop.

The process framework can be hypothetically presented in such a way that it consists of numeric values. These values (dimensions) can refer to:[1]
- The process content;
- The process outcomes; and
- The process framework.

The **process content** is characterised by three dimensions:
- The form of the internationalization process;
- Temporary phases or the order the process follows;
- Resources transformation and technology transfers within the process.

The dimension or value containing the **process outcomes** is:
- The process outcomes.

Three dimensions that can be discussed, and refer to the **process framework**, are:
- The value system on which the managerial decisions are based;
- The process scope;
- The prevailing environmental conditions and the situational circumstances.

---

[1] **[1] Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.**

These seven suggested dimensions of the process interact; however, it will be useful to take each into consideration and thus characterise the process better.

2. Dimensions of retail internationalization process contents

Form of retail internationalization process

There are four broad forms of international retail activities processes: functional, territorial, temporal and structural.

The functional form of the process refers to the functions affected by the internationalization activity. The dominant functional form of the process is the business operations of retail facilities – shops in the country which is not the country of origin of the firm (extrafirm, abroad). The other functional forms of the internationalization process include the use of other resources, provided by another country. Such resources are usually resale products, which may include items, services and labour employed in a retail firm. The search for the source of supply for the resale items at an international level has long been established and includes increasing volumes of goods, as international trade expands. The search for the sources of items supply the firm needs at an international level includes, for example, the computer equipment, the logistics equipment, packaging materials, vehicles, consulting services, etc. The use of internationally mobile labour force and of international capital are examples of other input resources representing different functional forms of the internationalization process.

The territorial form of the process includes the manner in which information flows across the geographical space, the nature of decisions as related to the territory, the expansion of knowledge across the territory, and the

manner in which information is distributed across that territory. The examples are: "the method" in which the network of retail facilities is created so as to expand the retailer's market power, "the method" to spread information across the customer entity on "export" markets as well as "the method" of creating geographical networks of supply through regional distribution centres for a retail network. On the global level, this form of the process can be observed in the way the IKEA established its shops in 32 countries, in that it opened each shop through direct investments.

The temporal form of the process refers to its activity period, the speed at which the business is done and the scope to which it is cyclic, phase or repetitive in time. Some retailers go international for a long time (for example, C&A in Europe). Others have started working at an international level only recently, although the retailer has been active for already a long period (for example, "Marks & Spencer" went through a market research process for a period a little longer than 20 years). The corporate learning activities (running-in) related to retail firms abroad are characterised by a clear time dimension with the firms that learn faster than others. "Carrefour", for example, entered several markets and promptly learned whether a market had potential for future development; if that was not the case, they made a relatively fast withdrawal, as they did in the USA, in Great Britain, in Germany and in Japan. Within the firm, therefore, different time lines of development in different countries are charted, so a complex time form for the process is created.

The structural form of the process refers to the structure of the firm and its markets as well as to the changes related to the internationalization process. The structure is in this context the link between the relations among the the firm and its market defining variables. Hence the cost structure, the management process structure, the relations with the suppliers, the competition in the sector, etc. together make up the total structure. The changes in this structure are caused by the internationalization. An example of such a form of the process is the change in the relations with suppliers caused by "Promodes" entering the Greek food-processing sector. "Promodes" requires their Greek suppliers to grant them longer payment periods and lower prices; after they managed to obtain these, the Greek retailers themselves demanded similar conditions from the suppliers. All four aspects of the process contents exist simultaneously, they interact and hence help define a specific nature of a generic process which is connected with certain internationalization events.

Phases of retail networks internationalization process

The retail internationalization process can be hypothetically presented as a several phase process. The passage from one phase to another is characterized by a certain group of activities. One type of activators or catalysts will probably mark the movement of one phase into another. The key phases are the following:[2]

- Pre-entry
- Entry
- Post-entry development
- Assimilation
- Exit

The amount of time for each of the phases changes from one firm to another. Managerial activity also varies greatly in each phase. There is a lot of research on the aspects prior to entry and on being embedded into the market, especially on varied entry mechanisms, on the advantages and disadvantages of each of them. Such studies are useful, however, they show just one part of the ovarall internationalization process. The assimilation and the exit phases efficiently mark the different final phases of the internationalization process. Assimilation comes when the firm changes from an international into a national firm. The exit can be of many types, from a complete withdrawal, to the firm reducing its activities.

PROCESS FORM				
	Functional	Territorial	Temporal	Structural
Pre entry	Survey of knowledge, Market research	Local market research	Scope of previous experience	Strategy evaluation
Entry	Formula project	Market selection	Entry timing	Method of entry, supplier relations
Post-entry development	Retail brand development, Knowledge transfer to head office	Network development	Speed of expansion	Cost structure management, Competition ctivities
Assimilation	Firm's social intelligence	-	Driver in creation of independent firm	Subsidiary creation
Exit	-	Closing sales facilities	-	Sales of business to another retailer

Figure 1. The process form

² **Burt S, Mellahi K, Jackson P, Sparks L: "Retail Internationalization and Retail Failure", International Review of Retail, Vol. 12, 2002.**

Resource transformation and knowledge transfer within the retail network internationalization process

The internationalization process causes the resource transformation within a firm as the firm does business in export market. This transformation process often includes a certain form of knowledge transfer within the firm and from the firm which goes international on the export market.

The transformation occurs through various economic and social mechanisms that operate in an international context, as related to the national one. The examples of such mechanisms are the following:[3]

- Economies of scale, scope and imitation differ in speed and intensity from country to country. The economies of scale in purchasing refer to the size of the market and the supply sector structure, both of which vary significantly in every country.
- Social mechanisms of communication and decision-making in the firm vary from one country to another. The scope of local control varies both in the firm and from country to country within the firm. For example, "Lidl", the retailer granting a discount for food produce, has a highly centralised managerial control, while "DM", the retailer offering a discount for medical products, has a decentralized decision-making structure.
- The differences in transaction costs related to the decisions on alternative organizational structures, e.g., on franchising, subsidiaries or daughter firms in full ownership or mergers. In honouring different transaction costs, "Marks & Spencer" implemented different organizational structures in different countries.
- Variations, within one country, in the social mechanisms of power relations that control the interaction with the customer environment, public policy agencies and firms. The Western retailers entering China encountered difficulties in adapting to the different nature of both social relations and power relations, even to the extent that some of them, especially "Ahold" and "Obbies", withdrew from the market.
- The differences in the managerial skills of a relevant capacity to do business in another country and to transfer organizational skills to the whole markets. The scope of the firm's international perspective and international culture will precondition the nature of the perception of various countries and hence affect the mechanisms of managerial knowledge development and transfer that we know in practice. In this respect we can compare the "IKEA " and the "Boots ". The "IKEA" is strongly oriented towards internationalization, while the capacities are transferred internationally, regardless of the mutual qualities of the range of items in the shops. The "Boots" have for years had a history of an unsuccessful international expansion due to their obvious incapability of doing business in other countries, and to an insufficient attention paid to export business.

This dimension of resources transformation is especially important as it deals with the nature of the retailer's "product" on an export market. The retailer will be experienced and will have the knowledge of the work format adjusted to the country he comes from; hence it will be his so-called "shop formula". This is then transferred to a new market; the firm will have its own formula and will adjust it to the market to a certain extent. The formula will be further adjusted as the firm gains experience in the export markets.

The knowledge transfer will differ when the retailer sets up individual retail facilities, from which the retailer acquires the existing firm. This can be illustrated by the international business of the "Tesco" hypermarkets. The "Tesco" set their own hypermarket formula in Poland, in that they transferred the knowledge learned in Great Britain to the Polish market, as well as to the markets of other Central-European markets where they do business. Besides, "Tesco" bought the "HIT" hypermarket chain in 2002. In the acquisition of these "HIT shops" and their change to the "Tesco" formula, there is the knowledge transfer again, but affected by the formula devised by the previous owner.

The aspects to this resource transformation and knowledge transfer are various:[4]

- Transfers in the firm necessary in establishing a new formula on a new market – in individually developed as well as in acquired shops;
- Transfer of knowledge within the firm, gained from the experience on a new market;
- Transfers to other firms and from other firms that do business on the same market.

In terms of operational aspects of the firm, these three aspects of resources transformation and technology transfer operate on two levels:
The level of key or basic format and the relations that

---

[3] [5] Dawson J: "Strategy and Opportunism in European Retail Internationalozation, British Journal of Management, 12 (4), 2001.
[4] [9] Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.

define it, as well as its development, for example, the hypermarket, the shops offering facilities to customers, etc. Changes in format the firm effects in order to make it a formula of the firm on a given market.

3. Outcomes dimensions of retail networr internationalization process

In addition to the issues of internal importance for the firm and certain decision activities within the firm, there is a number of issues to be dealt with in the internationalization process model in trade (retail activities), related to the process outcomes in its various phases. In analysing the internationalization impact, it is necessary to identify:[5]

- Impact types
- Impact processes and
- Impact intensity level.

4. Scope dimensions of retail network internationalization process

The factors of the retail internationalization process framework can be hypothetically shown as intermediary impacts that shape the process. These frame dimensions are present outside the internationalization process as well, however, they affect both the contents and the outcomes.

Managerial value systems

The internationalization process operation in retail business is affected by managerial cultures of both the country and the firm. Managerial styles differ as the response to historical and and cultural factors which support the social value systems. This is especially the case in the retail business, where, as we pointed out above, the relationship between the managerial culture and the cus-

Innovation affecting the sales channel structure New relations in the sales chain Behavioral changes within chain New functions introduced into the channel			Innovation in competition activity Additional investment Improved productivity of assets Sectoral restructuring catalyst New competitive behaviours	
Changes in demand chain efficiency			**Change in sectoral competitiveness**	
Loss of old values Culture transfer	**Changes in socio-cultural values**	<u>Impacts of retail internationalization</u>	**Reaction of public policy to National and international agencies**	Constraints as regards ownership Barrier to entry Constraints in corporate behaviour
	Firm performance		**Increased literacy of customers**	
New market profitability Cost function variable Profit is sent to head office New managerial knowledge Increase in business scope HRM opportunities for development (personnel) Status impacts			Customers' broader knowledge of product Better understanding of marketing New customer concepts Respect for cultural differences and diversities	

Figure 2. Internationalization impacts

Each of these impact types has its allied processes; thus, for example, the trade management processes and the retail management are important in identifying the competition impacts, whereas the critical processes of the sales channels management and logistic, technology flow management and suppliers management are important for the changes in the demand chain efficiency. We have clear interactions between these outcomes and the internal aspects of the internationalization process, especially resource transformation and the knowledge transfer within the firm.

tomer culture is important. The context of national retail business is characterised by at least four main, but different managerial styles: North-American, European, Asian and Islamic.

These styles of managerial culture make a broad overgeneralization of subtle effects of the culture upon managerial methods, while some cultural approaces in each of the styles differ significantly. Within the area of the European managerial culture it is, therefore, possible to identify the differences in both the managerial and the customer cultures. For example, different styles can be adequately differentiated in the firms on the macrore-

---

[5] [9] **Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.**

gional basis: the Mediterranean, the Scandinavian, the French and the Anglo-Saxon. Some experts argue that, for example, there is a French style hypermarket symbolised by "Carrefour", or the Anglo-Saxon style represented by "Tesco". This "game" between the customer-market culture and the firm culture is a complex one.

As regards the retail internationalization, a relatively small number of European retailers can boast of being successful in business in North America, these being the retailers who adopted the American management style. The European retailers were more successful in their international business within Europe. Few American retailers proved to be successful in Europe if they remained consistent to their American managerial style. Americal retailers preferred the Canadian market. The Asian retailers, with only few exemptions, remained within the Asian region.

The managerial style is manifest in numerous areas of trade, including the business formula creation, the customer relations, interactions with clients, knowledge management and knowledge transfer, technology reactivity and the nature of innovation. The retail internationalization process is largely affected by the cultural style of the firm that goes international and the cultural values of the managerial structures.

Scope of the retail networks internationalization

Every retail internationalization process has to adapt to the scope factor. The firm's size, the size of a retail facility and the size of the market, all affect the manner in which the process is conducted.

The international movement of firms inevitably reduce their income, however, larger firms are more capable of adapting to such reductions. The transfer of scarce managerial resources from home business to export business is easier in large companies. It is also more likely that the location acquisition process for smaller units on export market is easier and less expensive compared to the location acquisition for large shops. The size of the market, among other factors, affects the commitment level the firm may have on a new market as well as the level of resources it is willing to allocate on this market.

Prevailing environmental and situational conditions

The final relevant impact factor refers to the prevailing environmental conditions in new countries and in the country of origin. These affect the speed at which the process phase goes, the process outcomes, the response to managerial style, the process form as well as the resource transformation and knowledge transfer mechanisms.

The level of customer wealth can be a significant factor in this respect. The wealth is not evenly allocated, therefore the territorial model or pattern of international retailer development will be conditioned by the differences in wealth and in consumer power by the territory. In the movement of Western European retailers to Central Europe in the nineties, the firms first came to capitals/major cities with the greatest concentration of consumers' purchasing power. Several other aspects of consumer environment affect the internationalization process, for example, the household structure and family relationships, permanent and house ownership, availability of individual and personal living space, etc. A number of other aspects of the prevailing environment are also relevant. For example, the basic national culture will probably go through a long and deep internationalization process. Other environmental factors may be shorter-termed, for example, the logistic problems for foreign retailers on a given market. What is, however, important in all these cases, is the managerial perception of these aspects as they are. This managerial perception will be influenced by the firm's managerial style.

5. Conclusion

In the last two decades of the twentieth century the retail chains internationalization has become an everyday affair, and an international aspect of retailers is evident in its many elements: the methods in which the shops work, the employment of labour force from other countries, the adoption and implementation of foreign ideas and the exploitation of foreign capital.

We have shown that the most evident proof of retail internationalization is the presence of forein shops (brands) in a country and argued that the retail chains internationalization is a much broader concept. We have also studied the temporal and territorial aspects as essential in different cultures and environments and shown that they are the starting points of the analysis of an overall aspect of the retail internationalization.

REFERENCE

[1] Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.
[2] Burt S, Mellahi K, Jackson P, Sparks L: "Retail Internationalization and Retail Failure", International Review of Retail, Vol. 12, 2002.

[3] Mellahi K, Jackson P, Sparks L: "An Exploratory Study into Failure in Successful organizations", British Journal of Management, Vol. 13, 2002.

[4] Currah A, Wrigley N: "Networks of Organizational Learning and Adoptation in Retail TNCs", Global Networks, 4 (1), 2004.

[5] Dawson J: "Strategy and Opportunism in European Retail Internationalozation, British Journal of Management, 12 (4), 2001.

[6] Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.

[7]Wrigley N, Coe N.M, Currah A: ''Globalizing Retail: Conseptualizing the Distribution-based Transnational Corporation (TNC), Progess in Human Geography, 29 (4), 2005.

[8] Florida R, Kenny M: "Transfer and Replication of Organizational Capabilities", Oxford University Press, 2002.

[9] Dawson J, Larke R, Mukoyama M: "Strategic Issues in International Retailing", Routledge, London, 2006.

[10] Nisbett R. E: "The Geography of Thought", Free Press, New York, 2003.

[11] Ducroq C: "La nouvelle distribution", Dunod, Paris, 2003.

[12] Bennett R: "International Marketing", Kogan Page, London, 2005.

[13] Burt S, Mellahi K, Jackson P, Sparks L: "Retail Internationalization and Retail Failure", International Review of Retail, Vol. 12, 2002.

[14] Fill C: ''Marketing communication", FT Prentice Hill, Harlow, 2005.

[15] Filipović V, Kostić - Stanković M: "Marketing menadžment", FON- Menadžment, Beograd, 2007.

[16] Hollensen S: "Global Marketing - A Decision-oriented approach", Prentice Hall, London, 2007.

[17] McGoldrick P: ''Retail Marketing", The McGraw-Hill Companies, London, 2002.

[18] Pahalad C.K, Ramaswamy V: "The Future of Competition: Co-creating Unique Value with Customers", Harvard Business School Press, Boston, 2004.

[19] Petkovic G: "Modeli za donošenje odluka u trgovini", Ekonomski fakultet Beograd, 1998.

[20] Podnar K, Golob U: "CSR expecations: the focus of corporate marketing, Corporate Communications", International Journal, 2007.

[20] Rakita B: "Međunarodni marketing", Ekonomski fakultet, Beograd, 2005.

[21] Walters D, Hanrahan J: "Retail Strategy, Planning and Control", Macmillan Business, 2000.

[22] Wrigley N, Coe N.M, Currah A: ''Globalizing Retail: Conseptualizing the Distribution-based Transnational Corporation (TNC), Progess in Human Geography, 29 (4), 2005.

The Role of Conjoint Analysis in the New Product Price Sensibility Research

UDC: 658.8.031 ; 338.516.49

Marija Kuzmanović, Tijana Obradović
Faculty of Organizational Sciences

It is very important that in the new product development process we should be able to predict its sales price. The pricing strategy is largely responsible for whether the prospective customers will accept the new product as well as for the income to be earned from its sale. In defining the pricing strategy it is necessary that, besides the price elasticity, we pay attention to the customer demand elasticity, in terms of customer preferences, their perception of value and the very situation in which the product is purchased. Many methods are at our disposal when it comes to obtaining a thorough insight into customers' demands, and, in view of the presumptions on which they are based, they yield different levels of useful information. This paper presents the model of individual elasticity of demand and a review of methods most commonly implemented in pricing research with special emphasis on the conjoint analysis. The conclusion that is drawn is that the traditional conjoint analysis and the choice based conjoint analysis are the methods that yield best results in pricing research conducted both in the early phases of the new product development and throughout their launching and the entire life cycle.

1. Introduction

It is important that in each phase of the new product development the customers' response to the product characteristics, aspecially its price be predicted. The price sensitivity analysis is a very popular research technique because it is relatively simple to conduct, it can be quantified, and it yields the results which are a good basis for decision making. The errors related to the price sensitivity estimate may, however, mislead the managers to draw wrong conclusions, or to disregard other components of individual price elasticity, such as the customers' system of values and situational factors. The knowledge of the customers' perception of the appropriate, or fair price of the product is not enough to predict a probability that the customer will buy the product. A more complete picture of individual price sensibility requires a model that consists of price sensibility and the factors motivating the customer to purchase.

In the early phases of the new product development it is possible to define a large number of product concepts, however, each of them has to have a defined price. Hence the pricing strategy largely defines the acceptance of a new product by the prospective customers and the income to be gained from its sale. Vithala Rao claims that "the price is the only element of the marketing mix that generates income; all the other elements create costs" [11]. Therefore the price should be observed in each phase of the new product development. In the analysis of different concepts the price may prove to be a barrier for further development. In the process of product development the price is the input data related to making decisions as to the production costs. In launching the product, the price is the basic element of the income maximization strategy, the income to be earned throughout the life cycle of the product. The identification of the individual elasticity of demand can, therefore, prove to be a useful way of developing marketing mix and pricing strategy and of identifying the key segments of the market.

New products are introduced to the markets that have little or no information on the comparable prices for the product. The crucial problem related to new products is the customers' uncertainty of the value the product will have for them. Hence one of the most important functions of marketing is to help prospective buyer to develop his/her own subjective measure of the product's value, which will be a function of his perception of his needs. The research may help define the customers' value systems, so that the product should be created as related to these systems and positioned on the market in relation to these attributes.

On the other hand, in launching the product on the market that already has the products of the same purpose (substitutes), it is necessary that the impact of competitive products upon the demand elasticity of the new product should be examined too.

Pricing research can use a number of methods, varying in accordance to their capability of providing quality information on the customer preferences, which in turn affect price elasticity. The direct observation, the van Westendorp method, the traditional conjoint analysis, the discrete choice modelling are only some of the methods that allow for getting an insight into the customer behaviour.

2. Demand elasticity, price sensitivity and customer value

The price elasticity of demand is a concept traditionally related to markets and market segments, rather than to individuals and is a measure in which the market demand for a certain product change due to the change of its price. Formally, price elasticity is a ratio between the percentage change of the quantity of the product demanded and the percentage change in price, and can be expressed as follows:

$$E = \frac{\%\Delta q}{\%\Delta p} = \frac{\Delta q / q}{\Delta p / p} = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q},$$

where q and p are the quantity and price of the product, respectively. When the elasticity coefficient exceeds 1, the demand is elastic, that is, the demand is sensitive to the change in price. When this coefficient is lower than 1, we deal with an inelastic demend, one that is not sensitive to changes in price.

Price elasticity is a measure of an individual or of market segments response to changes in price. Poor price elasticity means that an individual is willing to tolerate high price to obtain the product. The individuals that display a high price sensibility will consequently avoid high-price products.

The price elasticity measure, however, does not yield enough information to predict demand, hence the data obtained solely on the basis of the reaction to price are not enough to define the elasticity of market demand. It is also necessary to analyse other impacts, such as the brand reputation, advertising level, delivery promptness, etc.

Price sensibility cannot be isolated from the stimuli that cause it, nor from the situation in which it exists, as the data obtained at that moment are useless. The research that include the data on customer preferences can be used for market segmentation, product improvement and sale, by affecting the preferences that reduce the demand sensitivity.

A useful measure of individual elasticity of demand is the probability that an individual will buy the product at a given price, in a given situation. This can be extended to the distribution of probability of purchasing at different prices, which can be further applied to market segments in order to get the demand elasticity of a given segment.

Basically, there are two components of the demand elasticity measure: price elasticity and customer values that also include situational factors. Since the customer value factors can be in correlation with the intention to purchase, the customer values and the price sensitivity to-

gether make a good model of individual demand elasticity. The prospective customer may find the product price to be rather acceptable, however, he still does not intend to buy the product. A vegetarian may be aware of the price of beef, however, the translation of his price awareness into the demand measure without taking into consideration his eating habits is meaningless. In their research, Jamieson and Bass [4] use five factors to describe purchasing intentions. These are the product awareness, the product attractiveness, the prospective buyer's financial solvency/capability, the buyer's tendency to consult somebody on the purchase and the product availability. Other researchers propose similar sets of variables that affect price sensibility, common to all of them, however, being that the model includes the variables related to the situation, the product itself and the customer. One of the best models is that proposed by Harmon and Laird [3], presented in Figure 1. This model, together with the data obtained in the research, makes a good basis for marketing decision making.
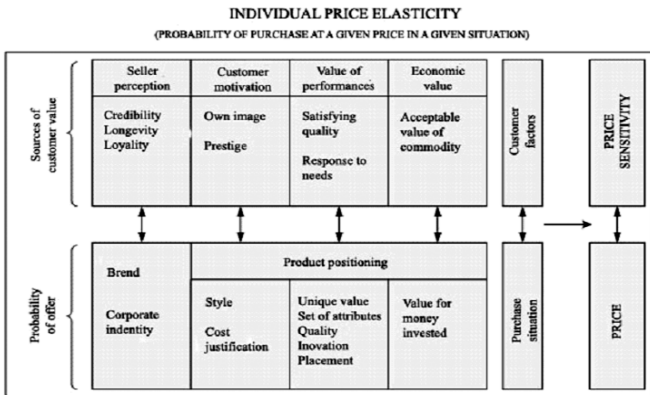

Figure 1: *Demand elasticity factors [4]*

The model in Figure 1 presents the sources of price elasticity, as well as the manner in which the value of the demand, including the product concept, the situation and the price, affects these factors so that they should result into a potential purchase. In the purchase situation, the value of the offer has to answer the sources of customer values in every category – the product must satisfy the customer needs. The situation has to be such that it satisfies the stimuli – the product has to be available, the buyer has to be aware of it, the location has to be appropriate and the transaction has to be possible. Finally, the price has to be reasonable, acceptable and fair.

3. Price sensitivity research methods

The practice knows a number of methods used in defining price sensitivity. One group of methods is based on direct observation to obtain an explicit measure of price sensitivity, whereas the other group of methods is based on indirect reasearch, i.e., price sensitivity is a derived value. The method that belongs to the former group and is most com-

monly implemented in practice is the van Westendorp method, while the latter includes the methods used to measure customer preferences, the Traditional conjoint analysis and the Choice based conjoint analysis.

3.1. Direct observation research

One question marketers most often ask in market research is "How much are you willing to pay for ...?" the data gathered in this way, however, may lead to wrong conclusions for several reasons. Firstly, one and the same question combines the price and the purchase intention. The respondent may believe that the product is worth an amount of money, however, he does not need the product. The measure of the perceived price of the product and the intention to buy it should, therefore, be analysed separately. Secondly, the respondent's answer will often be conditioned by the situation he is in. The respondents may enter discussion or debate on prices, thus hindering the research, or they may tend to satisfy the researcher attaching to the price much more importance than necessary. Some customers link the price of the product with its quality, or they are not really familiar with "reference" prices of similar products on a stready market, especially if the product is new.
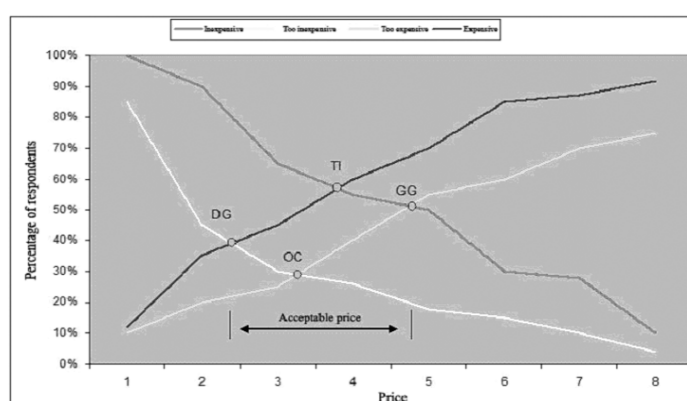
3.2. Van Westendorp method (VWSM)

In 1970's, Peter H. van Westendorp, a Dutch economist, proposed a method for measuring customer perception as regards price. The method is based on the premise that there is a scope of prices whose boundaries are, on one hand, the maximum price the customer is willing to pay, and, on the other, the minimum price below which the quality of the product is doubtful.

This method is also known as the *Price Sensitivity Measurement* (PSM) and is a relatively simple and inexpensive method using a graphic presentation to find an acceptable price scope. The model is based on the research in which the respondent is asked four questions for each described product:

1.) Which price do you find low for a given product? (inexpensive)
2.) Which price do you find high for a given product? (expensive)
3.) Which price would be low enough to make the quality of the product disputable? (too inexpensive)
4.) Which price would be high enough to make you abandon the idea of buying the product? (too expensive)

On the basis of the responses, each of the questions is assigned a cummulative distribution of frequencies which are entered into the graph, where the *x*-axis denotes the

price, and the *y*-axis shows the number of respondents. The point of intersection of the curves obtained on the basis of the answers to the first two questions is the "indifference point" – (IP). It represents the price which an equal number of respondents find to be either high or low. The intersection of the other two curves, obtained from the answers to the third and the fourth questions is the "optimum price" – (OP) and represents the price which an equal number of respondents find to be too low or too high (Figure 2). The point in which a the number of respondents who regard the price to be high is equal to the number of those who regard it to be too low is the "lower limit for price" – (LL), whereas the point in which the number of respondents who find the product to be too expensive equals the number of those who find it in-

expensive is called the "upper limit for price" – (UL).
Figure 2: *Van Westendorp method*

The original van Westendorp model assumes that the acceptable price of the product ranges between the lower and the upper limits, the "Indifference point" is the commonest price of the product or the price of the product – market leader, whereas the point of the "optimum price" actually represents the ideal price.

Van Westendorp, however, argues that a number of products on the already established markets (the existing markets) have the prices that are not within the given range of acceptable prices.

3.3. Traditional Conjoint Analysis

The Conjoint Analysis is a research technique based on the multivariation analysis, used to define optimal characteristics of a product or a service, to measure individual preferences, to understand and anticipate the customer behaviour in new situations. This is a decomposite method which assumes that the product/service can be "decomposed" to its attributive components and which implies measuring cumulative effects of a larger number of the product/service attributes on the customer preferences.

The name of the method comes from its very nature, namely, the product attributes are CONsidered JOINTly. One reason for this is that the customer does not make a decision on purchase on the basis of just one characteristic, but takes into consideration all the characteristics of the product simultaneously.

The basic premise of the decomposite approach is that the customers evaluate the total *utility* of the product/service in that they combine individual *partial utilities* of the attribute levels describing the given product, where the partial utilities of the attribute are defined as numeric values reflecting the extent to which different product characteristics are desirable.

Using one set of both quantitative and qualitative attributes, including the price, the researchers in the conjoint analysis define a set of alternative products, i.e., profiles (Figure 3) which may be realistic or hypothetical. They then eliminate from the set any impossible combinations such as a high quality product at low price.
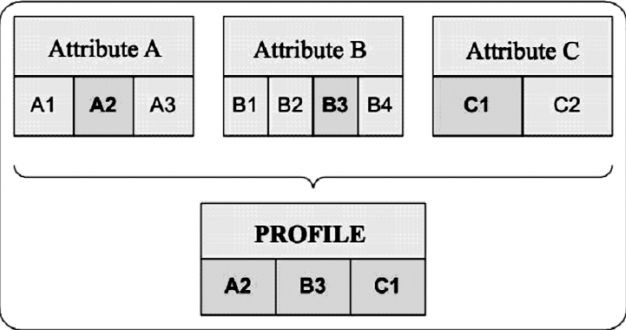

Figure 3. *Relations between the profile, the attribute and the attribute level*

Products are described by a set of attributes that take different values, from lowest to highest, therefore, to establish an overall attitude towards the product, the customers evaluate the total utility of all the attribute values simultaneously, through ranking or assessing each of the combinations (Figure 4).

Figure 4. *Profile assessment*

On the basis of the total of customer attitudes it is possible to estimate partial utilities for certain attribute levels, using some of the composition rules. These rules serve to explain the structure of individual preferences of the customers. They help explain the manner in which the respondent combines part-worth utilities of each of the attribute levels into the total utility of the product (Figure 5).
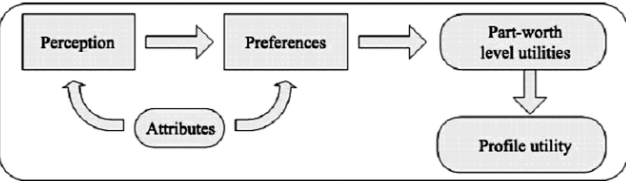

Figure 5. *Utility calculation process*

The total utility of the product j for the i – respondent can be expressed as follows:

$$U_{ij} = \sum_{k=1}^{K} \sum_{l=1}^{L_k} \beta_{ikl} \, x_{jkl}$$

where K is the total number of attributes, $k = 1, ..., K$, L_k is the number of k-attribute levels, $l = 1, ..., L_k$, and β_{ikl} is the utility of the l- level of k- attribute for the i-respondent (i- segment). The variable x_{jkl} takes the value l if the l-level of k-attribute is presented in the j profile, otherwise, it takes the value of 0.

In calculating the part-worth utilities the traditional conjoint analysis commonly uses the least square method and the monotonic regression (analysis).

The conjoint data can be used in determining the price sensitivity, but also all the other attributes included in the research. The part-worth utilities of each of the price levels offer a unique measure of the market or a market-segment sensibility to the change in price. When interactions between price and other attributes are calculated, it is possible to determine whether and in which manner the price sensitivity varies in relation to brand and other attributes. The price sensitivity of a brand with a strong image is usually lesser compared to that of an unknown brand.

The part-worth utilities can further be used to obtain a range of useful information on customer preferences, such as the attribute relative importance, the customer utility functions, the preference shares, as well as to define a model to simulate the customer choice behaviour for the predicting purposes.

$$R = \beta_{ikl} - \beta_{ikl*},$$

A relative attribute importance is a measure to which the attribute impacts the customer's choice and equals the difference between the greatest and the least utilities of the level of a given attribute, namely:

where *l* is the level with the highest utility value, and *l** is the level of the lowest value for the utility within the *k*-attribute. The higher the value, the more important the attribute for the respondent or a group of respondents. In practice, the relative attribute importance is commonly used in market segmentation based on customer preferences.

The utility function helps determine the individual sensitivities of the attribute value perceived to the change in its values. These functions are unique for any individual customer. The flatter the function, the lesser the attribute sensitivity.

Hence the attribute sensitivity can vary for different ranges of attribute value, and it is the utility function that helps getting an insight into this (Figure 6). For example, we can see in Figure 6 that all the attributes are highly sensitive to the level change. As regards the "price" attribute, for example, we can see that the rise in price from € 200 to € 250 reduces the utility to a small degree, whereas the rise from € 250 to € 400 reduces the utility, and consequently the respondents' preferencies, to a considerable extent.
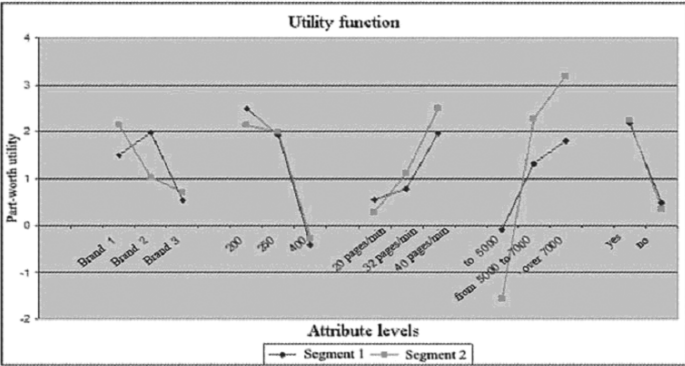

Figure 6. *Individual utility functions*

The utility functions, however, yield information only on the sensitivity of the attribute level utility, not on the demand sensitivity in general. To measure the demand sensitivity it is necessary that, using these data, the preference share and then a potential market share be determined.

To determine the product preference share the Logit model is most commonly implemented. This model does not assume that the respondents always decide in favour of purchasing the product with the greatest total utility. This is because, in making their decisions, the customers do not conduct detailed calculations. Instead, they base their assessment on a less precise notation of utility.

The Logit model employs the exponential transformation to translate the product utilities into the *preference shares*. The transformation has the following form:

$$P_{ij} = \frac{e^{bU_{ij}}}{\sum_{j=1}^{m} e^{bU_{ij}}}$$

where P_{ij} is the preference share of the *j*- profile for the *i*- respondent, while U_{ij} is the utility of the *j*- profile for the *i*- respondent. By definition, the "exponent" *b* has the value *l* and is used to fine-tune the results, so that they reflect the current customer behaviour on the market more accurately.

The preference share of a product, however, does not always represent its market share. It represents the share the product could have if there were no external variables to influence the customer's choice. This is because the awareness and the availability of the product often limit the prospect of purchasing the product. Namely, in case preference shares of two products are equal, the one that is characterised by higher awareness and distribution will have a larger market share.

The most commonly implemented method for the regulation of external variable impact upon conjoint data is weighting the preference share of each product by its *visibility*. The product visibility is a measure of its chances to be in the shop. This visibility is a combination of the awareness of the product and the value of distribution. For example, if a product is available in 50% of shops, it can achieve 50% of awareness in these shops and therefore achieve a 25% visibility (50%*50%). Another product may be available in 75% of shops and have a 67% awareness in these shops, achieving a visibility of 50% (75%*67%). The ratio between the preference shares of these two products after the transformation caused by the external variables impact can change drastically. Namely, the product with a larger preference share may have a smaller market share if its visibility on the market is smaller than the other product's visibility.
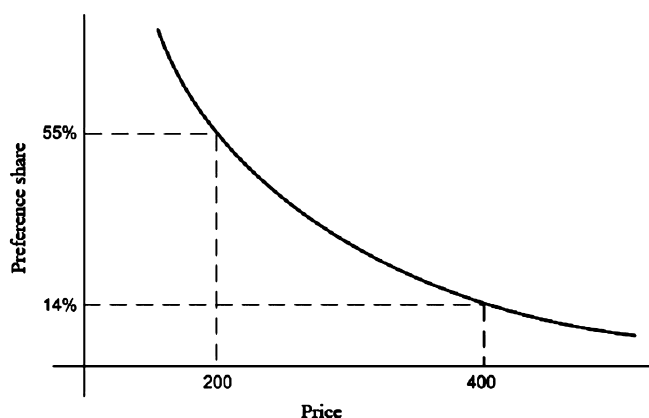
Figure 7. *Conjoint simulation and price sensitivity*

The conjoint analysis allows for conducting a simulation of the market reaction to different price levels in order to estimate the consequences this change may cause (Figure 7) in competitive conditions. However, when the product is entirely new on the market and has no direct competition, the simulation, i.e., the definition of price sensitivity can be conducted as regards the option that the customers will not buy the given product.

3.4. The Choice Based Conjoint Analysis

The Choice Based Conjoint Analysis (CBC), or, as literature also calls it the Discrete Choice Modelling (DCM), is one of the conjoint methods. Contrary to the approach based of preferences (the traditional conjoint analysis) that stems from the marketing practice and is predominantly focused upon apprehending customer preferences, the choice based approach comes from the economics discipline and is implemented in assessing a wide scope of products and services [9].

Similar to the traditional conjoint analysis, the choice based conjoint analysis is one from the set of decomposite methods, however, it differs from the traditional one by the manner in which it presents the questions to the respondents.

There is a range of types of discrete choice models. Common to all of them is the choice scenario with a description of manifold sets of products whose prices range within a certain interval. The scenarios may vary from respondent to respondent, with different sets of tasks or with different prices for the target product presented in scenarios as well as in different aggregate data obtained. The choice task may be viewed as a set of alternative products, where the respondent is expected to choose the best (Figure 8). The choice itself turns the attention from evaluation of alternatives and estimate of the differences among them, which is characteristic of the traditional conjoint analysis, to the choice of the best

product from the set of the ones on offer. In this way evaluation is by far more simplified. In fact, the respondents do not evaluate each product separately, but look for the dominant product, and if they do not find it, they try to eliminate the one whose attributes are least important. It is in this way that they find the best of the alternatives offered and they make their choice.

Figure 8. *The task of making choice from a set of alternatives offered*

The method became popular in the early 1990s due to its similarity to real situations in which the customers make decisions on purchasing one product or another. One important advantage of this method is that it can include the answers such as "none offered", or multiple answers. This characteristic is very important as regards the fact that in reality each decision-making process ends up in the customer buying the product. By choosing the option "none offered" the respondent contributes the information on the change in demand caused by too high prices of the products on offer, or by the products becoming inattractive for any other reasons.

By its structure, the information obtained by the CBC is very similar to that yielded by the traditional conjoint analysis, the only difference being that in the CBS the preferences are calculated on the aggregate level, applying the Logit model. The choice based conjoint analysis, too, offers a possibility of simulation to determine the sensitivity of preference and demand to the change in price or other attributes covered by the research.

4. Comparative review of methods

Table 1 presents a comparative review of four research methods described in the chapter above. The characteristics of the methods presented in the table are largely simplified; in practice, the value of each of the methods depends on the extent to which the reasearch is planned and conducted and to which the findings are well used.

Much pricing research is based on the assumptions that the decisions on purchasing are motivated by economic

value, with preferences often being neglected. What makes a difference between the useful research from those whose findings are misleading is the significance of difference between the assumptions on which the model is based and the real situations in which the customers actually make decisions.

The van Westendorp method of price sensitivity measurement (VWPSM) does not provide the insight into the customer values that encourage decision-making on purchasing. Since this type of research combines the intention factors with price sensitivity, the research findings may be misleading.

Presented options	One product for all respondents	One product	Sets of product characteristics (attrributes) Real and hypothetical products.	Set of products described by price and characteristics.
Questions put to respondents	How much are you willing to pay for...?	The highest and the lowest price levels percieved	Product evaluation and ranking	Which of the products offered would you buy? (choice from the set of offered products, with the possibility of choosing the option *none*)
Assumptions	Respondents know how much they are willing to pay.	The range of acceptable prices is known for each respondent.	Respondents are aware of the attributes they prefer.	Models realistic purchase conditions.
Focus	Intention to purchase a product at one price	Price	Attributes, Price	Products, Price
Information obtained	One price	Optimum or fair price as well as acceptable range of price	Optimum combination of attributes Part-worth utilities of attributes, including the price Attribute sensitivity in competitive conditions and a potential market share	Optimum product Prospective market share.

Table 1: Comparative review of price sensitivity reasearch methods

The Conjoint analysis is both a technique appropriate for defining the new product prices and a good tool to gather data on preferences for the potential products attributes in the early phases of a new product development, but throughout its life cycle as well. By balancing between the characteristics and the price it is possible to decompose the precieved utility of the product as a whole into part-worth utilities the customers assign to each of the characteristics. These part-worth utilities may be useful in determining price sensitivity, but also all the other attributes covered by the research. An especially important advantage of the Conjoint analysis in pricing research is that it takes into account the compe-

tition interactions and the potential impact of substitutes upon the demand for a given product.

The Discrete choice modelling has a number of advantages in pricing research concerned with the new and the existing products. It is a model that is much more similar to realistic purchase situations, however, the hypotetical situational variables may be included into the research if necessary, to simulate the purchase situation. While the traditional conjoint analysis can identify the importance of the product attributes, the findings of the choice based conjoint analysis can determine the preceived value of the product as regards the competitive products.

5. Conclusion

In the early phases of the new product development the analysis of customer value has an important impact upon decision making. Very important, too, is the opportunity to use the market research in the new product definition phase in order to identify both the attributes that enhance purchasing, and their best combinations in the product. In the subsequent phases the most favourable characteristics of the products are improved, by influencing the unique customer value factors and reducing the product price sensitivity. Even when the product has all the characteristics the customers expect, it is necessary that data on customer preferences be collected, in order that the product should be positioned on the market as favourably as possible, since, in any case, the price sensitivity of a product may vary in dependance of its positioning and the perception the customer has of it.

The paper presents a review of four pricing research methods. The comparison of these methods is conducted on the basis of their capabilities to yield data on customer preferences and the price sensitivity required to form a full insight into individual demand. Here, the traditional conjoint analysis and the choice based conjoint analysis have proved to be the best methods for an early market research of new products, since they include all the essential data on customer prefarences.

REFERENCE

[1] Duke, C.R., "Matching Appropriate Pricing Strategy with Markets and Objectives", *Journal of Product and Brand Management*, 3 (2) (1994) 15-27.

[2] Green, P.E., Krieger, A.M., "What's Right with Conjoint Analysis?", *Marketing Research*, 14(1) (2002).

[3] Harmon, R.R., and Laird, G.L., "Linking Marketing Strategy to Customer Value: Implications for Technology Marketers," Kocaoglu, et al. (Eds), Innovation in Technology Management: The Key to Global Leadership, PICMET, July 1997, 896-900.

[4] Jamieson, L.F., Bass, F.M., "Adjusting Stated Intention Measures to Predict Trial Purchase of New Products: A Comparison of Models and Methods", *Journal of Marketing Research*, 26 (1989) 336-45.

[5] Kuzmanović, M., "Primena Conjoint analize u definisanju marketing strategije", Menadžment, FON, 2005, 28-35

[6] Kuzmanović, M., *Kvantitativne metode u upravljanju marketingom: Primena conjoint analize*, Društvo operacionih istraživača, 2006.

[7] Kuzmanović, M., "To the Optimal Marketing Strategy Using Conjoint Simulation", SEEMAR06, 2006.

[8] Kuzmanović, M., "The Nonstandard Algorithm for Constructing Efficient Conjoint Experimental Designs", *Yugoslav Journal of Operations Research*, 18(1) (2008).

[9] Louviere, J., "Analyzing Decision Making: Metric Conjoint Analysis", Sage University Papers Series on Quantitative Applications in the Social Sciences, No 67, Newbury Park, California, 1988.

[10] Mahajan, V., Muller, E., Bass F., "New Product Diffusion Models in Marketing: A Review and Directions for Research," *Journal of Marketing*, 54 (1990).

[11] Rao, V.R., "Pricing Research in Marketing: The State of the Art", *Journal of Business*, 57 (1) (1984).

[12] Sullivan, P., "Comparing Price Sensitivity Research Models for New Products", Portland State University, August 2003.

Developing a System of Indicators for Local Community Results from the Developmental Planning Point of View

UDC: 005.92

Jože Benčina[1], Srečko Devjak[2]
[1]*University of Ljubljana, Faculty of Administration*
[2]*University of Ljubljana, Faculty of Administration*

This article discusses the issue of strategic planning support within local communities. The preparation and implementation of a strategy is a task that demands a high level of motivation and knowledge from all the participants. An environment for transmitting theoretical knowledge and exchanging experience, or some sort of development advisory center, must be provided. This kind of a center requires appropriate IT-support in order to function properly. The issue must therefore be resolved at both the organizational level and the IT level. The article thus suggests a comprehensive multi-level resolution of the issue and gives a detailed view of the IT support model that has been developed at the Faculty of Administration. This model comprises the budget indicator information and selection, as well as a software application that uses a fuzzy aggregation tree to establish an indicator structure and calculate and display the results. The article concludes with a discussion on the experience gained in two case studies in which this software is used, that are currently underway in two local communities in Slovenia.

Introduction

Developmental planning and hence formulation and ensuring the prosperity of communities (local communities, regions, states) is one of the central topics in regional development considerations. The desired outcomes should be planned (strategically, tactically), and the achievements should be controlled. The strategic planning approaches and models require that the planning methods be implemented jointly. The strategy formulation process starts with the assessment of current results, the analysis of the organizational current efficiency and ends with evaluation and control (Figure 1: Strategy formulation and implementation).

A thorough insight into the strategic planning structure is based on the balanced scorecard implementation [10], where the structure development goes from mission, to basic values, to personal goals, while the performance measurement goes from an individual in the organizational hierarchy to the final results the organization achieved as a whole.

Strategy development calls for a fully managerial approach, where as many as possible participants should be included. The task is a complex one and the organizations, and especially top management, do their best to develop and implement the strategy. In the local community, which has to observe the interests of numerous members, these being of various kinds and priorities, the task is even more complex. This is the reason that in the numerous strategies of the Slovenian municipalities we practically cannot find any integral strategic documents that would contain all the elements necessary for a successfil implementation of strategies and timely reactions in case they might be departed from for any reasons. In order that this situation be resolved, it is necessary that the approach be consolidated, that the selected objectives be clearly defined and that the tools for data gathering
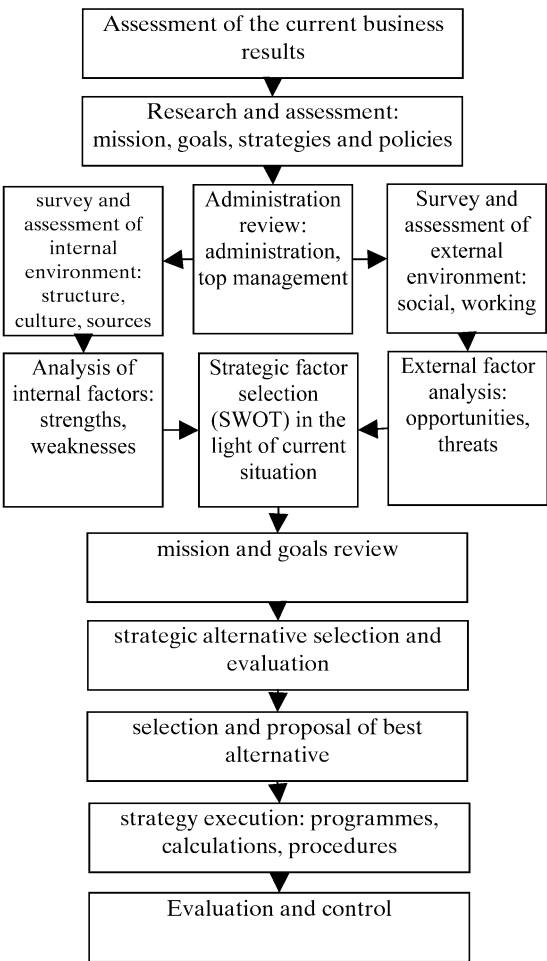

Figure 1: *Strategy formulation and implementation [20]*

and processing, as well as for the reporting of out-comes, be provided. It is in this way that we can achieve comparability and ensure that the results of more local communities be consolidated into collective results (for the regions and on the state level).

The core of each strategic approach is a qualitative planning and monitoring of the results. It is necessary that a system of indicators be established to represent the objectives we set and to report on how successfully these objectives are being achieved. An integral insight into how the local community functions brings forth a large number of all types of goals measured by an equally large number of various indicators which can be made clearer to local communities only with the aid of IT support. This must act on two levels:

- set of indicators
  - ensures access to appropriate indicators,
  - ensures the maintenance of the set of indicators (setting new ones, adjustment of the existing and leaving out the unnecessary ones),
  - ensures access to data sources for the indicator value calculation,
- indicator structure
  - allows for the building of a hierarchical organizational structure and the hierarchical indicator structure,
  - supports (completing) structures with data,
  - aggregates values by structure,
  - presents the results on all the defined levels of the structure.

The problem will be dealt with in the following chapter, on both levels. First, we present an analysis of certain examples of indicator models on the basis of which we will be able to set up a framework for a system solution to provide the set of indicators for local communities. The local community indicators are rather fragmentary at the points of their origin, the goals of various subjects in local communities may vary considerably. In order to understand and resolve the problems of indicator structuring we, therefore, need an adequate methodological approach. For that purpose we have chosen a successful example of indicator modelling by using a balanced scorecard. We conclude the chapter with a short presentation of the approach to aggregation of hierarchically structured values of indicators. The third chapter is devoted to the discussion of the solutions to problems and the presentation of the logistic IT solution. We conclude the paper with a discussion on the problems emerging in the field of establishing a system for measuring the local communities performance and the preliminary findings of case studies that were being conducted at the time this paper was prepared.

Locaj communities performance measuring methods

In searching for the solution to the problem we conducted an analysis of certain indicator models, tested the method of the balanced scorecard implementation in the local communities and built a model for the indicator hierarchical structure aggregation. In so doing, we provided the necessary elements for creating the solution model which is the basis for building a system for results evaluation system and the comparison between the local communities.

Examples of indicators for local community performance evaluation

Our starting point in analysing the problem is a number of examples of indicators which will further prove to be a basis for contemplations on an adequate approach to measuring and evaluation of the municipality, or the local community performance. The survey begins with four examples of indicators from Slovenia, the index of developmental threats to Slovenian municipalities [17], the index of development potential of Slovenian municipalities [13], and the financial indicators of the municipality [5]. This set of examples is completed with the national indicators for local authorities and partnerships in the United Kingdom [15], indicators for regional development monitoring in the Alps [19], and the system of strategic assets of the cities [16]. We use these examples to give a detailed review of good practice and the core of the problem of IT logistics for a performance indicator system of a local community.

The index of developmental threats, together with the Law on municipality financing [21] is taken as a measure for co-financing investments by the state.

Table 1: *Development threats index calculation indicators [17]*

1.	Development level:
a.	GNP per inhabitant (2001–2003)
b.	Gross tax base on income per inhabitant (2001–2003)
c.	GNV econom.soc/employee (2002–2004)
d.	formal (registered) employment rate(2002–2004)
2.	Developmental threats:
e.	registered unemployment rate (2002–2004)
f.	population age index (2002–2004)
g.	number of population supplied with sewerage system (census 2002)
3.	Development opportunities:
h.	Average number of years of education (census 2002)
i.	number of work places per work active population in the region (2002–2004)
j.	share of the area of the Natura region 2000 (status 2004)
k.	population density of the region (census 2002)

The key advantages of the model are that the number of indicators can be controlled and that the data are available. Certain indicators are only occasionally measured, therefore they are less adequate in monitoring the dynamics of local communities development. The data sources are the databases of the Statistical Institute of the Republic of Slovenia which, unfortunately, do not allow for creating a single chart with arbitrary data, but rather the indicators have to be integrated into the chart by hand. Besides, the data on the GNP per inhabitant and the number of years of education for the population are available only on the statistical region level. The data processing algorythms are defined, however, there are no tools to perform the data calculation. The algorythms are not included into the context of the problem as a whole, the possible cause-effect relation of the given indicators with other findings is not defined. As regards its basic purpose (classification of municipalities and regions in order to determine the share of investment projects co-financing) it would be interesting to see how the value of individual indicators affect the orientation of investing and the selection of projects to be co-financed.

The set of indicators is the result of the project named The Number of Tools for Defining and Monitoring the Regional Development Policy [11] and stems from a broader set of indicators used in evaluation of the sustainability of the regions.

The Development potential scale of the Slovenian municipalities stems from the models developed by the Institute of Robert Hugging Associates on which the World knowledge scale of regions [9] and the European competitiveness scale of regions are based [8]. In making a choice of indicators, the data availability and the excellence model principles were employed.

Table 2: *Slovenian municipalities development potential index structure [13]*

ECONOMIC INDICATORS	
IndiCators, or indicator groups	%
Infrastructure (points in total)	5
New apartments in m²·1000	5
Economic performance (points in total)	47.5
Income tax for citizens	17.5
Gross returns of companies population.	10
Number of employees·1000	10
Number of s.p.·1000	5
Number of farmers·1000 (neg. cor.)	5
Development investment (points in total)	7.5
Building leases for non-residential objects m²·1000 inhab.	7.5
TOTAL: ECONOMIC INDICATORS	60

HUMAN FACTOR	
Individual indicator	%
Demographic potential (points in total)	20
Natural population growth	4
Number of children in kindergarten ·1000 inhab.	4
Number of elementary school children·1000 inhab.	4
Number of weddings·1000	4
Weddings·divorces ratio	4
Education (points in total)	20
Number of pupils·1000 inhab.	5
Number of students·1000 inhab.	5
Graduated from levels 4 and 5 ·1000 inhab.	5
Graduated from levels 6, 7 and higher·1000 inhab.	5
TOTAL HUMAN FACTOR INDICATORS	40
Corrective factor: 5 points as regards the sum of all the ranks are taken into consideration by the above calculation	

In its contents the model is rather similar to the developmental threat index; the indicators measure similar properties; however, in the former case the focus is on observing the threatened local communities, while in the latter, it is on observing the local communities with the strongest developmental potential. Contrary to the developmental threat index, all indicators are measurable on the municipality level. Our intention was not to provide a detailed analysis of individual indicator examples, hence we compared the findings in general terms and found that a number of municipalities are classified in a similar way, according to both indicators, however, there are numerous examples where these models yield practically adverse results.

A short survey of two examples of indicators in the Slovenian environment already reveals a range of problems we encounter in the models of measuring performance and classification of local communities:

- content analysis of issues is missing, as is the cause-effect analysis, the relationships between initiatives and/or measures for improving performance,
- there is no guarrantee of consistency, seemingly similar approaches may result in different findings, there is no consistent context of indicators from which consistent subsets of indicators could be chosen,
- data are gathered from different sources, there is no mechanism which could make the input data gathering simple and prompt,
- indicator aggregating algorythms are different, there are no aggregating tools, that is, they are available only to the indicator creators.

At the Faculty of Administration we have developed a model of financial indicators for each municipality and implemented it in the system presented on the web-site and thus available to all the interested users.

The model includes five aggregate indicators computed from the basic data for calculation. The system has a database which is annually updated from the data provided by the Statistical Institute of the Republic of Slovenia as well as a program module for data calculation and transfer to the users' computers (Figure 2). It offers the full IT support for the provision and implementation of indicators, the necessary data and aggregation mechanisms for computing aggregate indicators. The solution does not allow for the set of indicators to be extended, nor does it allow for data aggregation in any other ways, however, each user can manage processing of this kind using the table processing program.
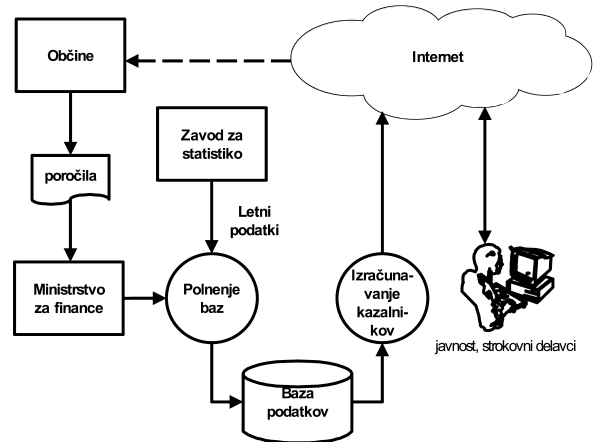

Figure 2: *Chart of indicator calculation systems for municipalities in RS [18]*

The given examples of indicators are, similarly to the European competitiveness index [8], performance oriented and are in no way attached to development potentials and factors. They tell the community in which areas it lags, but do not explain what steps should be undertaken so that performance be better.

A similar approach can be perceived in the single set of 198 national indicators which make up the framework for measuring the performance of local authorities and local partnerships in the United Knigdom [15]. Here we deal with a planned approach to building a consistent system of indicators, however, not even these numerous indicators can cover the overall activities of local communities, but only the portion directly controlled by the government. Such an approach certainly helps solve a large number of issues related to measuring the performance of territorial communities, especially when fully supported by the data sources.

So far, the examples we mentioned are designed as measuring instruments, therefore they are not emplyed in performance interpretation.

The following two cases of indicators are presented as two more approaches that try to highlight the contents as well as to assign the content value to the performance.

The system for monitoring the regional development in the Alps, DIAMONT [19], builds on the basic approach to the indicator study by defining the phenomena (issues) they relate to. Thus it introduces a dynamic observation of indicators and allows for linking the indicators to problem solving, limitations and goals. Such a system is problem solving oriented and allows for the linkage of the performance in the permanent development evaluation by the performance improvement measures.

Table 3: *Communities capital and strategic issues concerning their growth [16])*

Assets	Regions
Intellectual assets	• human, organizational (social, innovational, procedural)
Democratic assets	• insisting on a higher level of publicity • optimization of democratic participation • establishing new types of partnerships
Cultural assets	
Environmental assets	• cleanliness • safety • attractive appearance
Technical assets	• organizational • IT IS e-administration • infrastructure (energy, transport, buildings premises)
Financial assets	• public private partnership • addressing other parties privatization • financial discipline

In defining the expectations for results we are, by a rule, oriented towards the end-values of indicators that express the desired objectives. Territorial communities are complex systems where numerous factors affecting the expected results should be taken into consideration. The administrative system of the territorial units, in the majority of activity areas, allows for / does not allow for, supports / impedes, enhances / hinders the development and result achievement. On the other hand, the measurable changes in the end results are often visible only after a period of time and at the moment we register difficulties, it is usually too late to undertake any steps towards resolving the problems efficiently. It is for this reason that the system of strategic assets – city, or region assets, is the approach that surpasses numerous limitations related to measuring the efficiency and performance of a territorial community [16] (Table 3). The growth of capital is related to the crucial strategic issues that make the

starting point for both the strategic planning of a community and the creation of the system of indicators for monitoring the achievement of the set objectives.

The analysis of various models of performance measuring indicators displayed two crusial flaws. The analysis of territorial communities on different levels (local, the association of local communities, region, association of regions, state, association of states) is not consolidated. The ultimate objectives, "good life" of a community member (citizen, local) is often poorly presented in the sets of indicators, therefore it is not clear in which way the good performance within the model really affect the improvement of the quality of living in the local community. The essential problem, however, is not the different approaches, nor poor understanding, but the fact that, the problems of the territorial communities fail to be solved, due to the orientation towards satisfying specific, expert requirements within the tasks and the projects.

The implementation of the principles registered in the above mentioned cases, however, clearly leads to an applicable model. It is necessary that we start from the uniform offer of indicators. The local communities must be offered a uniform set of indicators made up of an adequate number of compulsory indicators, and of other, optional indicators that the community implements on the basis of its own estimate. They must be content structured, each must be accompanied with an explanation of meaning, instructions for use and the data source. The set of indicators must be permanently controlled, adjusted and harmonized.

The Balanced Scorecard System for Public Sector (BSC)

The planning system has to link the planning steps into the activity, validation and adjustment cycles. The balanced scorecard system includes strategic planning focusing upon strategy implementation. It focuses upon measuring performance, hence it is quite appropriate in resolving a given problem. It observes the varied aspects of organizational business operations. The original version has four perspectives. The end performance is measured by the financial perspective, the operation flow is defined by the customer perspective and the perspective of internal processes. The development orientation and developmental opportunities are measured by the perspective of growth and learning [10]. The public sector can be treated in a similar way, only the end performance is by a rule measured by the customer value, therefore the customer perspective becomes the end performance measure [14].

Before we continue discussing the balanced scorecard, we would like to point out that this system is complementary with the excellence models (EFQM, CAF, [6]), where the excellence models are oriented towards quality provision and achievement, while the balanced scorecard is oriented towards strategy formulating and implementation (Figure 3) [4], [12]. Both approaches intersect in the area of performance measurement.

As we will see, the issue of choice of the value of pooling (perspectives) basically depends on the circumstances, and the basic logic in goal monitoring certainly remains the driving force of every BSC. The ultimate objectives of a territorial community are related to the community members' quality of living (Figure 4).
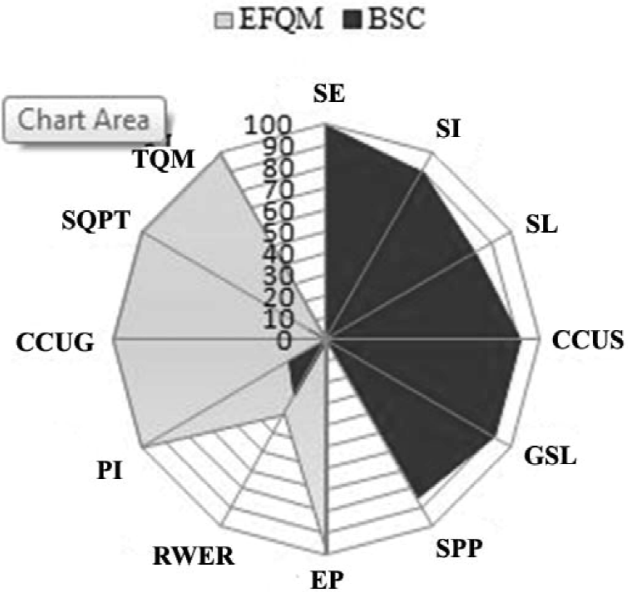
Explanation	
SE	strategy execution
SI	strategy implementation
SL	strategic learning
CCUS	creating common understanding of strategy
GSL	great strategic leaps
SPP	strategic project prioritizing
EP	excellence of performance
RWER	reasoning within extending relations
PI	permanent improvements
CCUQ	creating common understanding of quality
SQPT	sensitivity to quality in participating together
TQM	total quality management

Figure 3: *EFQM and BSC as analogous, complementary models [4]*

The above mentioned perspectives for strategy formulation may be too generalized, and the additional problem is that the standard BSC form is already rather widespread, therefore the features of the standard model came to be taken as the standard form of treating the issue. Hence the author of the above chart proposes that
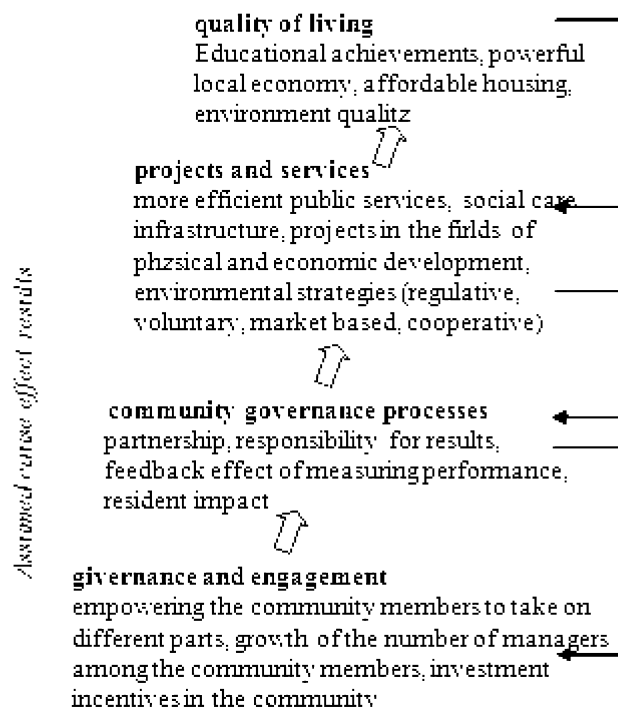
quality of living
Educational achievements, powerful local economy, affordable housing, environment qualitz

projects and services
more efficient public services, social care infrastructure, projects in the firlds of phzsical and economic development, environmental strategies (regulative, voluntary, market based, cooperative)

community governance processes
partnership, responsibility for results, feedback effect of measuring performance, resident impact

givernance and engagement
empowering the community members to take on different parts, growth of the number of managers among the community members, investment incentives in the community

Figure 4: *Cause-effect relations in viewing BSC territorial community [7]*

PROSPERITY
community priorities
achieve desired results

EFFICIENCY
community realization
task and project accomplishment

COMPETENCE
finances
financial capital

COMPETENCE
assets
intellectual, democratic, cultural, environmental, technical

Figure 5: *BSC territorial units charts*

The balanced scorecard for a territorial community shows three levels of activity:

- planning the performance – deciding in favour of successful performance,
- accomplishing tasks and projects towards achieving planned results,
- developing competences – provision of finances and growth of other types of assets.

The members (subjects) of the territorial community are the creators and the consumers of its performances. Each unit monitors its goals which contribute to the mutual objectives. The individual (subject) can be a creator of the end objectives and thus directly contribute to the end performance. His end goal is simultaneously the end objective of the community. Numerous subjects contribute to the growth of competences or support the task, or project, accomplishments. They contribute to the end objective indirectly, and their end goals are oriented towards ensuring efficiency or competence.

The objectives and the performance are then integrated upwards, in accordance with the community structure; namely, a number of local communities follows mutual regional objectives, a number of regions follow the state objectives ... the structure of units and their goals (indicators) may be rather complex and branching, hence such an approach can be introduced into a community only accompanied by an appropriate IT support.

Fuzzy Aggregation Tree

In analysing the hierarchical structures created using the balanced scorecard, we have at our disposal a number of IT solutions, each with certain limitations. In exploring the possibility to implement the fuzzy logic to aggregate the tree structures [1] and [2] we came to the model so-

the perspectives be renamed and makes the link with the original BSC perspectives:

- governance and engagement ←→ learning community / learning and growth,
- community governance processes ←→ community performance (task and project accomplishment) / processes,
- processes and strategies ←→ community ecconomy /finances,
- quality of living ←→ community priorities (desired outputs) / parties.

In implementing the BSC in the public sector different perspectives are used, their structure varying from one example to another. The analysis of examples and conditions in the Slovenian municipalities has shown that the quoted set of perspectives of the Slovenian local community would, in fact, be adequate, although the aspect of finances had better be classed within the community competences (assets – Table 3). Thus there would be three, instead of four perspectives – competence, efficiency and performance. Even though the financial capital in the local community is considered to be a middle-term category (bigger changes in a shorter period of time are an exemption), we have formulated the BSC on the basis of the already presented starting points (Figure 5) which is more intelligible in comparison with the case of its predecessors, at least according to the first reactions in the studies. A key advantage appears to be that the perspectives are rather generalized, but are much easier to understand in practice.
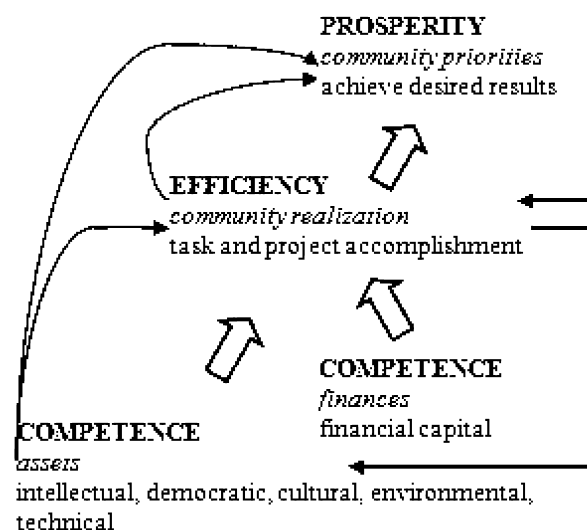
lution to aggregating tree structure with arbitrary variables on the leaves (children) and in the nodes of the fuzzy aggregation tree [3]. The theoretical model was then applied within the IT solution that allowed for creating an organizational tree structure as well as the tree structure of the balances scorecard system for each organizational unit.

As we now do not intend to conduct a detailed discussion on the theoretical foundations of the model (a curious reader can learn more about the issue in [3]), we will primarily present here the applicable properties of the model and the IT solutions. The basic idea of the fuzzy aggregation tree model is the implementation of the fuzzy logic theory in the tree structure. The variables in the leaves and in the nodes are noted in three forms (real value, fuzzy set, or fuzzy number and linguistic value). The input value of the variable can be any of the three mentioned. Transformations among the types of notations are defined within the model. With each change in the value the input value is reflected into the other forms of notation. All the variables in the tree can be expressed in three equivalent ways. The model defines the methods of aggregation, which are in their simplest varieties expressed as the calculation of the weighted arithmetical mean. We aggregate fuzzy numbers. At each node of the tree we calculate the sprouts (children) from this point, therefore the model can be implemented without any limitations as regards the number of levels in the tree, or the number of nodes, or the number of children on individual nodes. In the presentation we commonly employ linguistic values, the power of the noun segment of the set of values of the linguistic variable; the number of nouns is arbitrary, and we usually use the 3, 5 or 7-noun sets. Thus we come to an intelligible presentation of performance, where at the moment of defining the variables we can choose the value granulation arbitrarily.

The targrt values are determined using the definition of transformation among values, while the granulation and the acceptable deviations of linguistic values are determined by the definition of noun values for the linguistic variable.

The model was implemented in the web IT solution[1]; to acces the system it is necessary to provide a user name and a password, which a curious reader can do on the web adress at the bottom.

Local community scorecard solution model

In order that a quality planning be ensured in the local communities it is necessary that an appropriate support should be provided. The crucial elements of this activity are the motivation and the knowledge transfer. In this paper, we primarily focus upon the IT support perspective that can be defined on two levels. On the general level, meant for all the system users, it must ensure the creation of the consistent system of indicators for the local communities as well as an access to the data sources. For individuals who wish to create a balanced scorecard it has to provide the tools for defining the hierarchical organizational structure of the system under consideration and the BSC tree structures for each organizational unit. The activity of an individual is organized for each case of performance separately, while for the support to the whole system it is necessary to provide an appropriate form of activity on the level of the local community associations or within a respective state agency (in Slovenia, it is the RS Government Agency for Regional Development). For a quality system to be established and functional, an appropriate level of knowledge is required, and the system will have to include a permanent surveillance and the test of the indicator set consistency.

The Local Community Indicator System Model

On the operational level, the local community indicator system model includes the functions presented in the example of the financial indicators for the municipality (Figure 3), as follows:
- indicator definition (meaning, calculation method, data source);
- database for indicator calculation;
- indicator value calculation tools;
- methods and tools for consistency validation and the set of indicators rationalization.

In this case we deal with a fixed set of indicators. The system model assumes a dynamic generation of the indicator systems, which means that the existing solution should be upgraded by the the indicator system dynamic definition module, within which the life cycle of the indicator will flow, from the moment the indicator is proposed, to a detailed definition of the indicator and its allocation into the set of indicators, to an indicator adjustment and its discarding if necessary. The solutions must contain the built-in methods for system consistency assessment which will ensure that the set of indicators be optimal, without being burdened with ambiguous or redundant definitions.

Also, the entire indicator structure should be consolidated, starting from the general definition of the balanced scorecard for local communities (Fifure 7). Significant differences among local communities do make it impossible to consolidate the system entirely, however, it is

necessary that a comparison be possible among the communities with similar characteristics.

IT Solution for Organizational Tree and for Balanced Bcorecard Tree

Each organizational or a local community unit contributes to the system with its own organizational structure and the chosen indicator structure. All the units are integrated by the organizational structure into a unique system. Hence the IT solution includes two tree structures, the organizational tree and the balanced scorecard tree. In the former, we define the structure of the organizational system we observe. On the local community level, these are all the subjects that participate in achieving the set objectives. We can further integrate the local communities themselves into higher organizational structures (regions, states, ...). In the latter, we define the structure of the balanced scorecard for each node of the organizational tree. The input indicators (the BSC leaves) are transferred upward by the organizational structure, in which process the equal indicators of subordinate units integrate into an aggregate indicator of an assumed unit. The performance of each organizational unit integrates the performances of all the subordinate units and the performance of the unit under consideration itself.

The connectivity of input indicators with data sources is not yet implemented, since it depends on the system in which the indicators are defined. The integration of both systems is not anticipated; the approach to the set of indicators would be a special application, since the proposed balanced scorecard approach in the organizational structure is only one possible solution. For specific purposes, different, purpose-specific approaches will certainly be implemented in individual content areas.

The levels of IT support for the indicator system are planned separately, their development and implementation are performed separately. They overlap in the methodology area, since, presumably, the same methodological starting points should be used in either of the sub-systems.

Discussion and conclusion

The solution model is developed from organizational orientations, sets of methods and the already implemented IT solutions. Much is still left to be desired until its full implementation, however, at this level of development it already defines the organizational and methodological starting premises that allow for a goal oriented system development. The model is the result of the research conducted so far and includes two applicable solutions,

financial indicators of Slovenian municipalities that allow for the benchmarking of local communities from the budgeting point of view, and the web-program solution to creating the balanced scorecard system. The former have been in use for some some now and municipalities may implement them in the performance analysis and planning. The web program solution is still in the testing phase, and the balanced scorecard system is being established in two municipalities in Slovenia.

In introducing the solutions to the balanced scorecard system we were happy to find that the employees in the municipal administration were only too willing to participate in the project, however, we did encounter some problems in the execution of the project. One is the understanding of the role of the municipality and the municipal administration in the local community. The municipal administration somehow do not consider themselves responsible for the end performance, since the general opinion was that the task and project executors were either public agencies or contracted partners. Hence it was necessary that we first analyse the roles in the system. The result of the investigation into the problem was the definition of the perspectives of the balanced scorecard system (Figure 7). We crossed the basic barrier by introducing the notions of competence, efficiency and excellence. The municipal administration officials took on the roles of the citizens, consumers of services, or performance and thus gained a broader view on the community and the understanding of the role of the municipal administration itself. Not all the barriers were lifted, though, since it was difficult to find concrete, quantitatively oriented indicators. The participants expected to be offered a set of indicators from which they would choose those they consider to be most adequate for their purposes. The problem highlighted the need for a full solution model to be defined. The full knowledge of the local communities activities and of measuring performance requires to be formalized and the access should be granted to whoever is interested. At the time this paper was being prepared we were engaged in making an inventory and defining the indicators. In addition to the issue of defining the set of indicators, the issue of defining the end goals emerged. Of great help in solving this problem was the presentation of performance with linguistic values that we determined for all those results that do not have any specific requirements and that still take the mean value to be the one from the previous periods, marked as "good". A general conclusion is that in the project planning we have underestimated the elements affecting the scope of work and the duration of the project, and to a large extent.

In the work in this field, the research work overlaps with the applicative development of the solution. In the field

of reasearch we contributed the structure of the perspectives of the balanced scorecards systems for local communities and the solution to aggregating the values to the tree structure of the organizations and the indicators. In the former case, we will continue our research and search for the balanced scorecard solutions to individual areas of the communal activities, while in the latter case we will introduce and test new methods for indicator aggregation and the presentation of performance.

The applicative development of a full solution will require much work and funding. The provision of sources for the development would certainly be much easier if cooperation among institutions from various countries were established. Hence, in conclusion, we invite all the researchers engaged in similar matter and planning similar projects to collaborate. The environment we offer for an exchange of knowledge and experience is the forum on the balanced scorecards solutions[2].

REFERENCE

[1]   Benčina, J., "The use of fuzzy logic in coordinating investment projects in the public sector", Proceedings of Rijeka School of Economics: Journal of Economics and Business, Rijeka, 25/1 (2007) 113-136.

[2]   Benčina, J., "Web-based decision support system for the public sector comprising linguistic variables", *Informatica*, Ljubljana, 31/3 (2007) 311-323.

[3]   Benčina, J., "Fuzzy trees in group decision support systems", *Yugoslav journal of operations research*, Beograd, (2009).

[4]   Brinker, D., *Das Modell der European Foundation of Quality Management (EFQM) und die Balanced Scorecards (BCS) abgestimmt einsetzen*, 2007, <http://www.dbc-consult.de/downloads/EFQM%20und%20BSC.pdf>, accessed 10.08.2008.

[5]   Devjak, S., Peček, B., "Koncepcija i razvojni program sistema pokazatelja budžetskog poslovanja u slovenačkim opštinama". *Management, Beograd*, 7/32, (2003) 58-65.

[6]   The EFQM Excellence Model, 2008, <http://www.efqm.org>, accessed 10.08.2008.

[7]   Epstein, P., Wray, L.: *Community Balanced Scorecard and Effective Community Governance*, Community Indicators Consortium Conference, Jacksonville, Florida, 2007, <www.resultsthatmatter.net/site/model/CommBalScd_CIC_Mar07-rev2_web.ppt>, dostop 07.08.2008.

[8]   Huggins, R., Davies, W.: *European Competitiveness Index 2006,* Robert Huggins Associates Ltd, Pontypridd, 2006, <http://www.cforic.org/downloads.php>, accessed 11.08.2008

[9]   Huggins, R., Izushi, H., Davies, W., Shougui, L., *World Knowledge Competitiveness Index*, Cardiff, Centre for International Competitiveness, Cardiff School of Management, University of Wales Institute, 2008, <http://www.cforic.org/downloads.php>, accessed 11.08.2008.

[10] Kaplan, R.S., Norton, D.P., *The strategy-focused organization : how balanced scorecard companies thrive in the new business environment*, Harvard Business School Press, Boston, 2001.

[11] Kavaš, D., et. al., *Razvoj orodij za oblikovanje in spremljanje politike regionalnega razvoja: raziskovalni projekt*, Ljubljana, Inštitut za ekonomska raziskovanja: Center za mednarodno konkurenčnost: Urbanistični inštitut Republike Slovenije, 2005.

[12] Kovač, P., "Integracija modela odličnosti EFQM in sistema uravnoteženih kazalnikov BSC v javni upravi", *Uprava*, Ljubljana, 6/1 (2008) 57-76.

[13] Modri trak, *Razvojni potencial slovenskih občin*, Županska akademija, 2008, <http://www.zupanska-akademija.si/index.php?m=4&x=izpisi>, accessed 05.08.2008.

[14] Niven, Paul R.: *Balanced scorecard step-by-step for government and nonprofit agencies*, Hoboken, Wiley, 2003.

[15] *New Performance Framework for Local Authorities & Local Authority Partnerships: Single Set of National Indicators*, Department for Communities and Local Government, London, 2007, <http://www.communities.gov.uk/publications/local-government/nationalindicator>, accessed 06.08.2008.

[16] *Cities of the future, global competition, local leadership*, PriceWaterhouse Coopers, 2005, <http://www.pwc.com/extweb/pwcpublications.nsf/docid/6d6e19f6db793518ca25712d002a2e4a> accessed 06.08.2008.

[17] Pečar, J., Kavaš, D., *Metodologija izračuna indeksa razvojne ogroženosti za obdobje od 2007 do 2013*, Delovni zvezek 6, UMAR, Ljubljana, 2006.

[18] Peček Bojan, *Diskretne simulacije upravnih postopkov*, Doktorska disertacija, Ekonomska fakulteta, Ljubljana, 2008.

[19] Schönthaler, K., Andrian-Werburg, S., *Spremljanje regionalnega razvoja v Alpah s pomočjo kazalnikov*, DIAMONT, Projekt Interreg IIIB, Program Območje Alp, 2006, <http://www.uibk.ac.at/diamont/downloads/workpackages/folder_wp7_slovene.pdf>, accessed 05.08.2008

[20] Wheelen, T.L., Hunger, J.D., *Strategic management and business policy: entering 21st century global society*, 6th ed., Addison-Wesley, Reading, 1998.

[21] *Zakon o spremembah in doplnitvah zakona o financiranju občin*, Uradni list RS, št. 57/2008, 24. člen, 2008.

---

[2]**http://www.sqrbrowse.com/scorecards_beta/**

IS Development Issues Understanding - a Condition and an Object of Social Responsibility for IS in Serbia
UDC: 007:004

Mila Mitić
Mihajlo Pupin Institute, Belgrade

The issue of social responsibility for information systems (IS) becomes more and more important. However, it is not easy to determine what a socially responsible IS development is and which responsibilities for IS should be delegated and to whom. Different views on IS nature and on their roles in organizations and society are the basis for different delegation of responsibility for IS. Besides,a permanent improvement of information technology, permanent changes in organizations and society and an increasing IS connectivity make IS development and the problem of ascription of social responsibility for IS ever harder. Understanding of IS development issues can be seen as a condition and as an object of social responsibility for IS. This paper points out that aa socially responsible IS development requires an understanding of IS development issues and delegation of responsibility for building that understanding. The issues of a socialyz responsible IS development are illustrated on the case of the water information system (WIS) development in Serbia. The paper is a contribution to an understanding of IS and information society development issues in Serbia and in that way it is a contribution to a socially responsible development of IS and information society.

1. Demand for social Responsibility for IS in serbia

Information systems bring changes to both an individual, an organization and a society. Their development gives rise to numerous ethical issues as well. The number and the critical importance of the ethical issues in the information technologies (IT) development, which is the basis of modern IS have led to establishing a specific research area - computer ethics. The computer ethics issues are frequently approached with a presumption that IT are ethically neutral tools and that ethical problems result solely from a wrong use or a misuse of IT. There are, however, arguments that IT are not ethically neutral, that they include the implicit rules of the profession of their creators, the industries that sell, install and support them ([1], [2]). Moreover, the lack of coordination between the presumptions implicitly built into the IT and the IS and those of their users are usually taken to be the causes of numrous failures of IS implementation projects in the developing countries.

There are also arguments, that integrating IT with the systems of human activities is the basic problem in the IT area and that the real cause of a high percentage of failed IS is the neglect of "human environment", that is, of the entire social context ([13]). The direct IS users are usually left out of a decision making process concerning IS development. The information system, apart from having an impact upon its direct users, frequently affects other interested parties (stakeholders), whose interests, however, often fail to be taken into consideration in the IS development process.

There is evidence that the errors related to the IS development tend to be repeated and that many seem to have learned how not to succeed with IS. One reason that the IS fail in a large number of cases is peoples' unwillingness to learn from the errors and take on the responsibility for the failure. To eliminate this irresponsible and unethical behaviour that harms both the society in general and its individual members, it is necassary that a mechanism of social responsibility for IS should be established.

Since in Serbia, despite all the attempts, the IS important for the functioning of the country and its citizens, supposed to be part of the national information infrastructure, i.e., the basics of information society, and recognized as such a decade back, have not yet been developed, it is of critical importance that social responsibility for IS in Serbia should be established.

2. The meaning of social Responsibility for IS - points At issue

For purposes of an easier understanding of the paper, in the following section we offer a short survey of concepts related to responsibility, as well as of problems of responsibility assigning ([Greška: izvor podataka nije nađen], [4], [5], [6]).

2.1. The concept of "responsibility"

In a most general sense, responsibility means the relationship between two parties. By its acting or its failing to act, one party affects the welfare of the other party and hence has to (should) answer for its conduct. Social

responsibility means the responsibility towards the society. It is not an objective in itself, but a means to change the behaviour of people in order that a desired condition of the society be established - a "good life" for all.

There are various dimensions and conditions of responsibility. The dimensions of responsibility are: the subject, the object and the authority of responsibility. The subject of responsibility denotes the one who is responsible, whereas the object denotes what is the subject responsible for. In other words, the responsibility for an object of responsibility is delegated to the subject of responsibility. The objective of delegating responsibility cannot be achieved without the authority of responsibility - an individual or an institution in charge of the rules and the validity of delegating a certain responsibility, nor can it be achieved without the support provided to a socially responsible behaviour.

Responsibility can be delegated only if certain conditions are fulfilled - if there is a causality as well as the awareness of the causality, the freedom of will and choice, the power to act and certain personal qualities of the subject. In order that responsibility be delegated to the subject, there must exist a cause-effect relation between the subject and the object of responsibility. The subject has to be aware that his behaviour may have an effect upon the object of responsibility. The subject of responsibility, furthermore, has to be capable of behaving in a responsible manner -he/she/it must have the freedom of will, the freedom of choice and the opportunity to act, as well as the power of controlling what he is responsible for. The greater the subject's power, the greater his/its responsibility.

The subject can be responsible only if he/it has certain qualities. Emotions are an important precondition of responsibility, since a person without feelings for others and without self-respect cannot be a responsible member of a society. Also important in delegating responsibility are the nature of the subject's intention and the extent of that intention, as well as the subject's knowledge of how to anticipate the outcomes of his own behaviour. Hence a socially responsible subject should be capable of learning. He has to observe the events and behaviours in his environment, learn from errors and change his behaviour in accordance with the understanding he achieved.

2.2. The problems in responsibility delegation

The problems in responsibility delegating are those related to identifying the subjct and the object of responsibility. The problems of identifying the subject of responsi-

bility arise mainly due to the subject's failure to fulfill the conditions of responsibility. Earlier, the responsibility used to be delegated to an individual, as it was thought that only man, as an ethical being, feels he has to answer for his behaviour. Due to the conditions of an increasing complexity and interrelations, the individual has no knowledge of the cause-effect chain between himself and the object of responsibility, nor does he have the power to control the flow of events in this chain.

In recent years, the social responsibility of organizations has been increasingly debated. In many cases the organizations fulfill their responsibilities more efficiently compared to the individuals. Compared to an individual, the organization has generally more power, it can develop a greater capability of perception, of learning and of making relevant decisions. Besides, organization generally lives longer than an individual. The organizational acceptance of responsibility, that is, group responsibility raised the issue of the opportunity for the responsibility of other, not so well-organized groups.

The basic points of issue of group responsibility are the group member's responsibility (whether it is only the group that is responsible or its member, too) and the relationship between the member's responsibility and the responsibility of the group (whether the group responsibility is greater than the sum of responsibilities of its members). Besides, a serious problem of group responsibility is delegating responsibility for an activity with cumulative effects (effects evolving from a longer period of duration of the activity) since it is very difficult, if not impossible, to specify causality relations for such an activity.

Another problem of specifying the subject of responsibility is the problem of indirect responsibility. The subject is indirectly responsible if he has an indirect impact upon the object of responsibility, e.g., if he tries to change the behaviour of other subjects of responsibility in order to avoid or diminish the undesirable outcome of their actions. For example, indirectly responsible is the consultant who did not inform the decision makers on the possible adverse consequences of their decision.

The points of issue in defining the subject of responsibility are the following: which type of behaviour and which types of outcomes of the subject's behaviour the responsibility should be delegated for. Responsibility is usually delegated for actions, however, there are some who claim that responsibility should be delegated for failing to act as well. Responsibility is usually delegated for planned outcomes. A point of issue, though, is whether the object of responsibility includes the consequences that were not planned, and under which condi-

tions this can be done. Similarly, a point of issue is whether cumulative effects can be taken as the object of responsibility.

The object of responsibility can also be the ability to be the subject of responsibility. Given that education plays a vitally important role in ensuring the development of responsible subjects of a society, raising a responsible subject can be viewed as the object of group responsibility, even the responsibility of the society as a whole. Besides, the very subject of a certain responsibility can be deemed responsible for the development of his own capabilities as the subject of responsibility, e.g., for permanent training in order that should be capable of accomplishing the tasks delegated to him by the society.

The problems related to the authority of responsibility are also numerous. The authority of responsibility should accept to take care of responsibility. He has to have the power of improving responsibility. In the process of improvement of the socially responsible behaviour he is in charge of, the authority of responsibility is faced with the problem of acceptability of universal rules of a socially responsible behaviour. One problem of authority is also the problem of the validity of the estimate of responsibility. Responsibility depends on the extent to which the conditions for responsibility are fulfilled, which is interpreted by this authority. The interpretation of the authority, as an external observer, may differ from the feeling of the subject of responsibility. For example, if the authority perceives a larger number of possible actions compared to the subject, his estimate of the freedom of choice will be higher compared to the freedom of choice the subject really felt. On the other hand, the subject may feel free to choose the actions, while the authority, who finds it easy to predict his actions, assumes that he has no freedom of choice.

2.3. Responsibility for IS

The problems in delegating responsibility in general are present in the case of delegating responsibility for IS, too. Due to a continual development of IT, the permanent organizational and social change and increasing interrelations between IS, the development of the IS and the problem of delegating responsibility for IS become ever more difficult.

The responsibility for IS is most often delegated to the IS designer/developer, despite the fact that such approach is wrong. The director of the organization, who is often found responsible for the work of the organization, cannot be delegated responsibility for IS since he does not fulfill all the conditions of responsibility - he

has no necessary knowledge of IS. Other individuals, participants in its development, e.g., programmers, hardware experts, system analysts, individuals from the IS user organization that define the requirements for IS can also be deemed responsible for IS. An individual, however, cannot understand all the relations between IS and other systems, be knowledgeable of all the consequences of his decisions, nor does he have the power to control all the events vital in the IS development and operation. Furthermore, the individual, in the organization in which he is employed, is not always free to take the action he finds desirable. The individual's freedom of choice and power of action are even smaller when he develops IS for the organization he is not employed in, since the rules of work in the organization and the expectations of its members mean an additional limitation to his activities.

Given that technology is often understood as the application of science, the responsibility for IS can be delegated primarily to researchers, and then to the experts in the IT and IS areas. Due to the fact, however, that human knowledge is limited, the researches cannot be responsible for all the results of their work either. Moreover, practice is usually ahead of theory in the IS area - experts invent and develop new practical possibilities, without waiting for the results of respective research.

In other words, having in mind the nature of modern IS, no individual can fulfill all the conditions of responsibility for the entire IS. The individual can be deemed responsible for only certain aspects of IS. For example, a software engineer can be responsible for the quality of software, not for the entire IS.

Organizational responsibility for IS can be delegated to the organizations engaged in certain activities in the IS area, e.g., in the delivery of services or in software or hardware supply. They certainly do have an impact upon the events on the market, can develop an understanding of the IS development and operation on the basis of the acumulated experience, as well as understand the importance and relevance of new IT. The prospective candidates for the subjects of group responsibility for IS can be various user groups or professional groups interested in IS since they can have an impact upon some aspects of IS. The organization for which an IS is developed can also be deemed responsible for IS.

In order that the problem of delegating responsibility for IS be overcome, a reflective responsibility for IS, e.g., a responsible process of delegating responsibility for IS is proposed. The reflective responsibility assumes that the process of delegating responsibility it-

self is open to change, that is, that all the stakeholders should be involved, as well as that problems should be discussed freely and the existing decisions on assigned responsibilities can be changed if necessary. In other words, reflective responsibility for IS means permanent negotiations of all interested in IS. In practice, it looks like a discourse on the current state of affairs and the norms implemented, in which all the interested parties are in a position to express their standpoint. The discourse starts the moment the responsibility problem is perceived. The goal of the discourse is the development of a common understanding of cause-effect chains of responsibility and an explicit delegation of responsibility on the basis of so developed understanding, agreed upon by all the parties interested in IS. In case new knowledge gained by those interested in IS endanger the agreement reached, a new discourse begins.

3. Understanding of IS Development issues - condition of responsibility for IS

The common understanding of reality is an element of a universal basis of responsibility for IS ([2]). Since knowledge is one condition of responsiblity, the common understanding of the IS development issues shared by all the IS stakeholders can be regarded as a universal condition of responsibility for IS.

The IS area is a new scientific discipline with a plethora of problems to solve. We have various attitudes as to the nature of IS, the role they play in both the organization and the society, the approach to their development, the roles of individual participants in their development, the factors of their success. In dependance of these attitudes, the responsibility for IS is delegated in different ways.

Information systems are generally regarded as technical systems. At times they are equalled to IT. The problems in the use of IS made researchers conclude that IS are technical systems with social consequences. The attitude that is increasingly prevailing is, however, that IS are not technical, but social systems. An information system is viewed as a concrete sample of IT in an organization or a society, as a system evolving out of the interactions between IT and the organization, that is, in the interactions among the social, the technical and the knowledge systems. IS are not merely a tool of a modern organization; they are an information infrastructure, that is, the organization itself ([3], [7], [8]).

The modern IS cannot be imagined without IT, however, to understand the issues of IS development and discuss a responsible development of IS, it is necessary that those definitions should be analysed that do not assume that IS is based on IT. These definitions point to certain elements which are usually neglected, due to our infatuation with what modern IT can do. For example, according to one definition, the key IS element is an individual who, in order to solve the problems in an organizational context, needs the files to be presented in the way that corresponds to his/her psychological type ([9]).

Different attitudes of the nature of IS brought forth the development of different paradigms and approaches to the IS development. The majority of conventional approaches to the development of IS do not include the tools and the knowledge for working with social processes. The majority of technologies highlights only thechnical and rational issues. The use of the paradigm of natural sciences often results in neglecting the key elements, that is, man and his life. Man is regarded as a machine, as one of operative components of the system that needs to be tuned, adjusted to IT, not as a human being with a purpose, a will, one to whom IS should serve instead of him being adjusted (serving) to them. The designer often develops an IS that corresponds to his own psychological type, not to the psychological type of the IS users. Such approaches prevent us from understanding the phenomenon of the encounter between the technology and the organization; i.e., understanding that the organization, a host, and the IT, a guest, enter the process of mutual formation ([3], [9], [10], [11], [12]).

Neglect of the lack of understanding of the human environment, that is, the full social context of IS which includes the organizational, social, political and ethical aspects important in accepting and implementation of IT, is considered to be an important cause of IS failure ([3]). The coventional, non-system approaches recognize neither contradicting interests, information policies that result from the behaviour of the members of the organization for the purpose of maintaining their own power, nor the emergence of unpredicted events and consequences.

The IS development method often defines the role, the liabilities and the responsibilities of the participants in the IS development. For example, according to the method that assumes that there is an objective reality characterised by order, the designer is an expert that analyses the problem, finds the proper answer and offers a solution, namely, he is responsible for IS. The methods that deal with human environment and understand IS as organizational intervention, assume the role of the designer in a different way - for example, together with the

future users of IS, he tests the needs and and possibilities to improve the organization by IT implementation. A socially responsible IS expert abandons the insignia of "the priest of high technology" as well as an unintelligible technical vocabulary. He digs into the users business operations and his needs for the purpose of building mutual/common understanding of the situation and finding out what kind of IS is required and which changes it can bring. Such approaches, however, require a non-engineering view of the world and a change in behaviour. These changes are by no means easy to achieve. It is necessary that the designers and the users work together as partners, not as providers and clients for the technology. These relations of mutual partnership are built in time. This, of course, requires that the role of the users change and that they should be largely engaged in cultivating the human environment ([3],[11]) .

4. Understanding of IS Development issues - object Of responsibility for IS

Knowledge for life and work is becoming increasingly important, hence knowledge is considered to be a must, the object of social responsibility ([13]). Therefore, knowledge of the IS development issues, as a precondition of a socially responsible IS development, should be the object of social responsibility. It is necessary to determine who is responsible and which responsibilities he has in building the understanding of the IS development issues. Since knowledge is achieved through formal education, through research processes and through permanent learning, it is necessary that responsibilities for these processes be delegated.

The formal education for IS often offers only technical knowledge which does not meet all the needs of an IS expert ([14]). In his practice, the socially responsible IS expert encounters the questions the answers to which are not always known, therefore it is necessary that the education system should develop a competence in an individual to find answers to such questions and to be able to ask similar questions himself ([15]).

To meet the criteria for getting higher degrees and titles in the field of research and science, many IS researchers often choose to deal with simple issues, even in cases when they are aware that it is necessary to conduct more difficult and more complex research ([16]). The consequence is that the society is left not only without proper solutions to real problems, but is often quite unaware that these problems are present.

Fast changes in IT demand that the IS experts continually upgrade their technical knowledge. When they realize that mere technical knowledge is not a qualification enough to work in the field, they resist to acquiring other necessary knowledge for fear they will lose their technological competence ([3]).

Understanding of IS issues, therefore, is an important object of social competence.

5. Wis development in serbia and social responsibility

Social responsibility is, by a rule, delegated in advance. The responsibility for the consequences of the actions or the consequences of failing to take action may, however, be discussed backwards, in order to clarify the current situations and improve the effects of future actions ([2]). This paper deals with the social responsibility aspects of the development of water supply information system (WIS) in Serbia, for the purpose of clarifying the IS development issues.

The Water power resources management of Serbia does not have an IS established, although much has been done on its development. This paper presents a short review of the WIS development. The review is more detailed for more recent activities in which the author partisipated in person (which allowed for a more profound understanding of the gravity of the problems in WIS development). Each group of activities described is followed by the issues of IS development viewed form the aspect of socially responsible behaviour (related to achieving goals, dimensions and/or conditions of social responsibility for IS) for the purpose of encouraging speculations which, according to the author, are necessary in building the awareness of the problems in WIS (and other IS) development as well as for a more responsible approach to IS development in Serbia.

5.1. Software for hydrological modelling

The software for hydrological modelling was introduced by the 1990's, in accordance with the best practices in the U.S.A. Numerous modules were developed, however, only one was used in Serbia. Its only direct user, a trainee engineer at the time of its introduction, has used it for years to base the forecasts for the needs of the electric power supplies of Serbia.

The basic idea of the technology transfer and the knoWldege built into it is the creation of a "better life" using the technology that has already been successful-

ly used elsewhere. Failing to implement the software for hydrological modelling in Serbia (with the exemption of one case only), however, poses a large number of questions: Is the understanding of a better life universal - do both people in the U.S.A. and people in Serbia equally feel that hydrological modelling contributes to a better life? Are there only one or more ideas of a better life in one country? Can one and the same idea of a better life be created in the same way and by the same software in different social environments? Are there any obstacles, which are they and how can they be overcome?

Why was there only one young engineer who thought that the software offers a better life and that there are no obstacles that this "proven" better life be achieved? Did he, compared to other potential users of the software, have a greater freedom of choice, more knowledge and/or was he more willing to build his own responsibility?

Implementing the software daily, this engineer appreciated its role in his work, found out in which cases he can rely on the software generated forecasts. His work has an impact upon the quality of forecast-based decision making. When making decisions, indirect software users consult the forecast and will find it difficult to decide in the absense of the forecaster. The question is: why is there only one software user and does the lack of a decision to change this state of affairs affect the quality of managing hydro- and electrical power potential? Is thare anybody (and who) in charge of such issues?

5.2. Studies and general designs

The studies and general designs of the development of WIS (Vojvodina, Serbia) and the Hydro-meteorological information system of the basin of the river Drina (HISD) were made in the 1990's. The review of the General design of WIS Vojvodina has shown that it was well done, but that it was devised on the basis of a poorly set project task, which cannot be taken as the designer's responsibility. This triggers a number of questions: Did the vision of good life of those who formulated the project task differ from that of the reviewers? Should the reviewers have been included into the IS development in an earlier stage? In which way would the participants with different visions of a better life create a mutual vision? Would such a vision have changed from the moment the task was set to the moment the task was accomplished? Who was in charge of the IS boundaries and their potential change?

The main point of issue the people responsible for the management in the basin had in the HISD review was in which republic of the former Yugoslavia the head information centre would be located. Does it mean that the location of the centre on one's own territory was considered to be a quality of a better life? Which are the causes of such a desire (power, perhaps?) and which are the ways to fight them? How can IS be developed in such adverse conditions, how can its functioning be ensures and how can the resistance of those whose life will be deprived of the quality they favour be prevented?

5.3. The Modules

The studies and modules mentioned above were not further developed. Some moduled were developed without any coordination. Others, revised, accepted and highly assessed by the users, were never employed, while others still where not as much as installed. One module was not used because the input data could not be entered (in a way specified by the Water Act). Another was developed in collaboration with a university professor who was interested in the field covered by the module. As long as his interest lasted, the values of the data were supplied and the module database was kept updated. In the later review of the chances that the module could be re-employed, the potential user assessed the module as very functional, however, he requested that a new module be developed using more modern IT. One implemented module had only one user, while potential, even highly interested users had no idea it even existed ([17],[18]).

Whether the developed modules are or are not implemented, a number of questions remains: Is anyone granted the power not to act properly (not to install the software, not to supply the necessary resources) and by (not) doing this deprive somebody else of a better life? Why should he be granted that power and what is his right to behave so? Does the developer have to check all the presumptions, especially those which are supposed to have been fulfilled, such as observing the law? What knowledge should he have, in which way can he achieve it, if he can achieve it at all? Whose knowledge can he or should he rely on? How are the responsibilities determined in this network of relationships?

Is everybody ready to participate to make his life better? Does better life require most recent IT, or the prospective "better life" is not wanted at all, which is then concealed and justified by the need for most recent IT? Which are the reasons that force one to publicly accept something one does not seek for? Who is to be in charge of such issues, and in which way can he do it?

5.4. System approach to WIS development

In 2001, the development of WIS was approached in a systemic manner. The need for a change in the approach was understood on the project of integral IS development for the environment. The traditional approach to IS development was impossible to be implemented in this project - an important future user, who ordered the project, was of the opinion that the IS development was the responsibility of the developer and was unwilling to participate in setting the requirements for IS ([19]). On the basis of the results obtained in this project, a Planning basis of the WIS development in Serbia. This document maintains that WIS should be in the function of a system of integral management of water resources (IMWR) and has to be developed simultaneously with the IMWR. The new approach adopted marked the change in the fundamental presumptions on the reality, on the organization needs, on the method of decision making, people/human resources, responsibility, and on the development process. A system approach to IS development was adopted, the need was recognized that IS should be developed in the process of permanent learning, with all the stakeholders of WIS participating ([20]).

Putting this document into practice started with the creation of a strategic plan of the development of WIS in Vojvodina. In the process, however, the project started was found to be rather too difficult. Hence the project was discontinued, and, for the purpose of creating conditions for the project to be resumed, a decision was made that an IS be designed for the needs of drainage system implementing the system approach. Problems appeared with this IS, too. The basic causes were a resistance to change and a lack of understanding of the adopted planning basis and the set project tasks ([21]).

Although the basic presumptions were often repeated along the work, the participants were not willing to accept them because they were unfamiliar, different from expected and usual ones, adopted in the course of education. They expected that the state would stipulate the necessary changes in the water resources management, independently from them. Besides, they pointed out a plethora of operational problems due to which the IMWR concept could not be paid the attention it deserved. On the other hand, probably for the reasons of justifying the previous decisions on the WIS development, the proposition made by the designer and some other participants from the organization itself, that the project scope should temporarily be altered and adjusted to the identified organizational needs, was rejected.

The work in the WIS development work group meant an additional obligation, without any reward granted for performance. In such a situation, some participants expected the designer to provide the solution and considered him responsible, others insisted on the necessity of the solution to be worked out and were ready to actively take part (which never happened). Some participants wanted the designer to be their partner in search of a better life for the organization.

It was difficult to explain to the engineers that the WIS development process could not be fully planned ahead, that it had to be iterative. The planning problem appeared even in the process of gathering the requirements for the development of the technical characteristics module for the drainage system, that is, when it was agreed that the requirements were known, and that they could be easily and promptly defined. In 1990's, however, the water resources experts changed their attitudes to these systems, in an attempt to preserve both the drainage systems and themselves. This required that, prior to the development of an appropriate IT solution, a thorough work should be done in building a mutual understanding of the importance of drainage systems as well as in defining the types of data for which values could be gathered. Due to the presence of a large number of values for technical data, often collected for a single occasion, i.e., for one single case, their validity had to be proven.

The system approach to WIS development brings forth new questions in the issue of IS development: What knowledge, which freedom of choice and which power of action were used in proposing and adopting the IS development plans? Why do people adopt the propositions they do not understand, they do not know the consequences of or which do not meet the needs of the organization according to some future IS users? How can the set objectives be achieved at all when the participants are not introduced to them and when some managers even claim that the set objectives are inappropriate to the organization?

How can the inborn attitudes of men be changed? What should be done to convert the observers of the change into the supporters of them? How can they be freed from fear of being blamed, how can the conditions be created in which there is readiness to learn from one's errors, to correct wrong decisions?

How difficult is it to work on the IS development if one's beliefs differ from those of the majority of experts? To what extent do those beliefs limit the participants' freedom? How much effort does it need that the approach

itself be explained to both the participants in the development and the external observers. How risky and demanding is that approach given that there is a high probability that the external observers, knowledgeable of only traditional IS approaches, decide that it is not expertly enough?

Does the lack of accurate values for the data mean that the prospective IS users do not make decisions on the basis of facts? What type of IS do they need? In which way will IS meet the needs of different psychological types of users?

Who is responsible for failing to ensure the conditions for a steady, continual work of all the participants in the IS development? Who is responsible for cumulative effects of a legitimate absence of a future IS user in the development of the system?

Who is to be in charge of these difficult, but important issues? How can he do it?

5.5. New HISD development project

Simultaneously with the attempt to implement a different approach to the WIS development, efforts were made to develop a new HISD. The two projects were not related. The HISD approach did not correspond to the new approach to the WIS development. Furthermore, the HISD development was commenced without taking into account that a project under the same title had already been developed once, that the planned software was already developed, but was not implemented, although it was highly appreciated by the prospective users, on occasions of its presentations.

The HISD development commenced with the development of the simulation model for the purposes of management in the river Drina basin, although one such model is already in use in the basin (the only model out of many developed that has for years been in use in the basin - see 5.1.). Nobody bothered to enter into analysis as to why there is a need for a new model, nor which are the flaws of the old one, nor whether conditions allow for the implementation of that new one.

Despite an evident conflict of interests of various institutions, the software for the management logistics in the river Drina basin was developed. The development of the planned software was continued even when the key institutions from the Republic of Srpska and Montenegro waived participation. Besides, the prospective user from Serbia claimed that they had no need for the newly-developed software.

In the review of the project, the key decision makers were in a dilemma about wahat was being done on the project and why. They, however, were not willing to start a debate on serious problems highlighted in the preliminary statement of the organization-participant in the project execution ([18]). In spite of all these, the project was continued.

The problems mentioned above point to serious problems in the approach to IS development: Can the goals of the development projects of related IS be achieved through uncoordinated work? What are the reasons to forget the past, to not even mention it? Why is there no desire to learn from one's own errors? Is there an awareness that such unwillingness only hinders achievement of the desired goals? Is the existing knowledge an obstacle for openess to other knowledge and different opinions?

Who is to take care of these problems, and how is it to be accomplished, if experts have no power to solve them, and the authorities do not care to learn their opinions?

5.6. European Union aid programmes

The European Union aid programme was initiated for the purpose of introducing WIS in Serbia. The first project documents stressed the system approach and building success on errors as fundamental parts of WIS designing. In his offer, the contractor stated that several unseccessful attempts to introduce WIS in Serbia so far were caused by organizational problems. The proposed approach to WIS development in Serbia insisted that sustainable and appropriate approaches should be used from the very beginning of the project as well as that local knowledge and expertese and the representatives of all the stakeholders should be involved too.

On the other hand, the project was conducted in accordance to the project task that was not considered appropriate by either the contractor or some members of the project monitoring Board, however, the European Development Agency representative was firmly against any changes in the project task. The opening activities on the project were not carried out in the way that the contractor considered the key factor of the project success - the system approach was not implemented, the organizational issues were not analysed, the local knowledge was not involved, nor were the representatives of stakeholders. In other words, the approach that was devised as appropriate was not properly implemented from the beginning of the project. Likewise, the local experts' experience in WIS development was not used

at all, regardless of an expressly stated opinion that it is rather extensive and highly valuable. Moreover, the local experts, after they had expressed their doubts as regards the project success, were excluded from further activities by simply not being appointed into the groups in which their engagement was planned.

The above quoted problems were the indications of a great risk for the success of the project ([22]). The decision makers on the project, however, did not care to hear anything about this, a case similar to the one of the HISD. They seemed not to be willing to learn from the errors made, to use the acumulated experience. They seemed to feel it was easier to wait for the others to provide solutions, to "absolve" themselves by claiming that they are not acquainted with what IS is, to require "all" data, and to exclude those who do not agree with them from the process.

However, does the decision maker in the WIS have the right to do so? Isn't it his knowledge, his openness to different standpoints, his willingness to start a discourse on problems and responsibilities, that make the precondition for the WIS success? Does he have the right and authority to change the social reality by not taking into consideration the needs and the interests of all the stakeholders?

Could the project with a poorly set project task bring a better life to the water resources of Serbia? Did the European Union really aid Serbia in developing WIS in the appropriate manner?

Is it really so difficult to look back, to recognize and analyse the errors we have made and thus try to create a better life instead of only talking about it?

6. Concluding remarks

This paper is an author's attempt to, so far as it is possible, contribute to the responsible IS development in Serbia by liberating the IS experts and reasearchers from the limited and limitating understanding of IS.

The paper highlights the issues of responsibility for IS and lists problems to be thought about in order to understand the IS developmet issues. Due to the complexity of the problem and due to the limited human competences, the answers to these problems should be sought in the discourse among all the stakeholders in the IS development - the users, the investors, and the experts. In finding the answers which will be subject to further changes, conditions could be created for both understanding and delegating social responsibility.

In order that a realistic vision of a better life for all the parties interested in IS be created, the discourse should include the researchers, the teachers, and those who are responsible for generating knowledge required for a socially responsible IS development.

Since the development of information society, and hence IS as part of the national information infrastructure is the care of the Ministry of Telecommunications and Information Society, the success Serbia will achieve in creating information society will depend on the willingness of the Ministry to analyse and discuss the socially responsible IS development and to take care of that social responsibility. A significant role in this work certainly belongs to professional associations, as well as all the organizations engaged in the development of information systems.

REFERENCE

[1] Avgerou, C. Information Systems and Global Diversity, Oxford University Press, Oxford, 2002

[2] Stahl, B. C. Responsibility and Information Systems in the Developing World: Is Responsibility a Universal Concept Generally Applicable to IS or Do We Need Different Standards for Different Places?, 4th BITWorld Conference, Cairo, 2001

[3] du Plooy, N. F. The Social Responsibility of Information Systems Developers, in S. Clarke, E. Coakes, M.G. Hunter and A. Wenn (eds.), Socio-Technical and Human Cognition Elements of Information Systems, IGI Publishing, Hershey, 2002

[4] Stahl, B. C., Responsible Management of Information Systems, Idea Group Publishing, Hershey, 2004

[5] Stahl, B. C. Accountability and Reflective Responsibility in Information Systems, in C. Zielinski, P. Duquenoy and K. Kimppa (eds.), The Information Society: Emerging Landscapes, Proceedings of a Conference on Landscapes of ICT and Social Accountability, 2005, Springer, New York, 2006

[6] Stahl, B. C. Ontology, Life-world, and Responsibility in IS, in R. Sharman, R. Kishore and R. Ramesh (eds.), Ontologies: A Handbok of Principles, Concepts and Applications in Information Systems, Springer, 2007

[7] Lee, A.S. Thinking about Social Theory and Philosophy for Information Systems, in J. Mingers and L. Willcocks (eds.), Social Theory and Philosophy for Information Systems, John Wiley & Sons, Chichester, 2004

[8] Hanseth, O. and E. Monteiro, Understanding Information Infrastructure, Manuscript for book, 1998

[9] Mason, R. O. and I.I. Mitroff, A Program for Research on Management Information Systems, Management Science, Vol. 19, No. 5, pp 475 487, 1973

[10] Bostrom, R. P. and J. S. Heinen, MIS Problems an Failures: A Socio-Technical Perspective - Part I: The Causes, MIS Quarterly, Vol. 1, No. 3, pp 17 32, 1977

[11] Hirschheim, R., and H.K. Klein, Four Paradigms of Information Systems Development, Communication of the ACM, Vol. 32, No. 10, pp 1199-1216, 1989

[12] Ciborra, C. Encountering information systems as a phenomenon, in C. Avgerou, C. Ciborra and F. Land (eds), The Social Study of Information and Communication Technology: Innovation, Actors, and Contexts, Oxford University Press, Oxford, 2004

[13] Magnani, L. The Ethical Significance of the Interest in Information and Knowledge, The Second Asia-Pacific Computing and Philosophy Conference: Computer Ethics in Asia-Pacific, Chulalongkorn University, Bangkok, Thailand, 2005

[14] Checkland, P. and S. Holwell, Information, Systems and Information Systems: Making Sense of the Field, John Wiley & Sons, New York, 1997

[15] von Foerster, H. Responsibilities of Competence, in H. von Foerster, Understanding Understanding: Essays on Cybernetics and Cognition, Springer, New York, 2002

[16] Carola, L. Development and Status of the Information Systems / Wirtschaftsinformatik Discipline - An Interpretive Evaluation of Interviews with Renowned Researchers: Part II - Results Information Systems Discipline, ICB - Research Reports, No. 3, University Duisburg-Essen, Institute for Computer Science and Business Information Systems, 2005

[17] Mitic, M. Strateški plan razvoja Vodoprivrednog informacionog sistema VPC "Dunav": Analiza intervjua - prikaz, Institut Mihajlo Pupin, Centar za sistemske analize, Beograd, 2002

[18] Andelic, M., M. Mitic i B. Ivancevic-Pejovic, Mišljenje o recenziji Studije Hidro-informacioni sistem Drina - Simulacioni model II faza, mišljenje uradeno za Republicku direkciju za vode Ministarstva poljoprivrede, šumarstva i vodoprivrede Republike Srbije, Institut Mihajlo Pupin, Centar za sistemske analize, Beograd, 2006

[19] Andelic, M. i M. Mitic, Idejni projekat integralnog informacionog sistema za životnu sredinu Savezne Republike Jugoslavije, projekat raden za Savezno ministarstvo za razvoj, nauku i životnu sredinu, Institut Mihajlo Pupin, Centar za sistemske analize, Beograd, 2000

[20] Javno vodoprivredno preduzece "Srbijavode", Planska osnova razvoja Vodoprivrednog informacionog sistema, Beograd, 2001

[21] Mitic, M. Razvoj informacionog sistema za potrebe odvodnjavanja - šta i kako dalje?, prezentacija radena za JVP "Vode Vojvodine", Institut Mihajlo Pupin, Centar za sistemske analize, Beograd, 2005

[22] Mitic, M., Uvodenje Vodoprivrednog informacionog sistema u Republici Srbiji - Analiza uspešnosti projekta sa stanovišta korisnika rezultata projekta, analiza uradena za Republicku direkciju za vode Ministarstva poljoprivrede, šumarstva i vodoprivrede Republike Srbije, Institut Mihajlo Pupin, Centar za sistemske analize, Beograd, 2007

Management of Market and Life Environment Protection

Ružica Milovanović
Faculty of Economics, Kragujevac

Modern business conditions demand a new kind of approach in process management areas and development of competition. Changes in market area produce a direct impact upon the way of thinking that is related to the company management so that generation and conservation of advantageous position over competition must be a result of a constant periodic process. The basic elements of advantage over competition are the dominance in expertise and in assets. A continual improvement of efficiency of knowledge and work efficiency is a basic imperative of modern economy and the most significant factor in the competitive activity of a company in world market, where the key players are Corporations. This knowledge needs to be built in business policy of every business organization. Assets dominion is a tangible advantage that is acieved by investing into automated processes, computerized and robotized production means, trade marks, and production quantity. By recognition of its values and by investing in these items, the company takes a new position as regards the consumers. Technological sciences, as multi disciplinary scientific areas, have to develop new kinds of knowledge in designing new products and processes, including complex systems and methods for protection of living environment. Ecology, technology and environment protection, with successful interaction, should point toward a possibility of further improvement of living quality.

1. Introduction

In international economic relationships, quality is recognized as a basis for removing technical-technological and many other obstacles that emerge in trading in goods and services. The company's competitive position, similarly, is based on a higher quality product, a higher safety in use, as well as upon a higher extent to which the needs are met, which further stresses the interrelation between the competitive advantage and technological innovations. The background for these processes is an accelerated development of technology where the information technologies (IT) are of paramount importance [1].

The implementation of these gave rise to new rules of competition that lean on the production standards, service standards, technology development and innovations. The processes of an accelerated growth of industry and raw materials leave huge quantities of pollutant waste materials that threaten the man's quality of life. We can even argue that the survival itself is endangered. This has led to undertaking a number of activities whose objective is to solve the existing and prevent the emergence of new ecological problems. The efforts of the majority of countries are focused upon bringing as adequate regulations as possible, as well as upon developing more efficient systems for environment management, in order that stimulative conditions for a successful environmental protection should be created.

2. Market management

A positioned company which fails to produce innovation at the times that demand one is doomed to stag-nate and perish. The management that is unable to manage innovation in that period has not expert enough to accomplish their task [2]. The importance of new products in the technological innovations for a company has long been well known. These are part of the modern company's competitive environment as well as the basis for its survival and growth. The success the company has made in the positioning of its competitiveness and profitability is directly related to the expertese of the management and their competence in bringing the needs and the offer into accord [2]. Creating and maintaining advantage over the competition is a result of a permanent process (Figure 1).
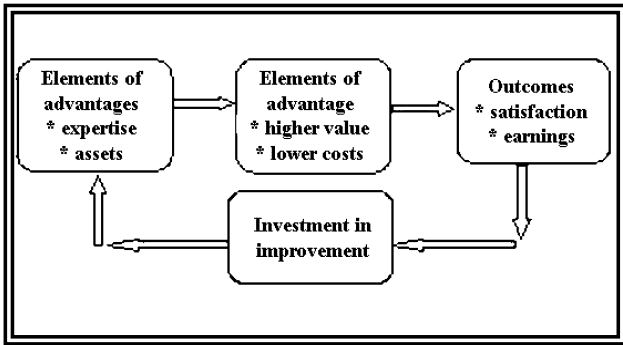

Figure 1: Elements of competitive advantage

When implemented correctly, information technologies can contribute to the adjustment and management processes in different ways. They can encourage ideas for new products and new markets, in the first place. They can also help improve the efficiency of the new product development process, increasing the probability of a future commercial success.

One advantage of the information technologies implementation is less time required for collecting, processing and sharing or distribution of information. A well informed manufacturer will decide in favour of implementing new technological procedures more readily. Information technologies enhance the development of numerous new products, however, they also cause certain products to disappear. It is for this reason that a range of new product management models were proposed.

One of the possible models is the product life cycle analysis [4]. The essence of the product life cycle (PLC)[1] is the awareness that the product is created, it grows, matures, declines and finally disappears from the market. The product life cycle analysis yields the data on the market saturation. In some circumstances, the tendency of demand over a certain time period can be predicted.

By shortening the life cycles of certain products and simultaneously prolonging the cycles of others, information technologies implementation can offer a range of advanced products with new and improved properties. This postpones the process of ageing of the product at minimum costs, while at the same time increases the economy of business operations.

The purpose of information technologies implementation is the capability of surpassing the boundaries developed by the industries, creating new markets or making old markets obsolete. In some cases, new markets are captured/created by identifying and enhancing the needs that have previously failed to be fulfilled or satisfied. Meeting these needs enhances not only the development of new products and services, but also the development of new technologies, whose direct implementation generates new production processes and new ways to meet the customers' elemntary needs.

The efficiency of information technologies is especially evident in the production of health-safe and hygienically pure food, the imperative of the modern man.

The automation of the processes by the digitalization of the parametre values of the product manufacturing and their manipulation by the computer management units becomes increasingly important in this field of production.

In order to meet the customers' needs in a profitable way, the manufacturers use the information technologies to establish and maintain contacts with their suppliers and other agents, among which are not only the sup-

_____

[1] **Product Life Cycle**

pliers of raw materials and semi-finished products, but also the consulting or credit granting firms (Figure 2).
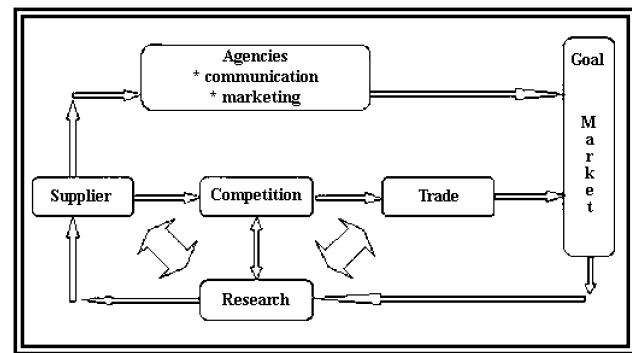

Figure 2: Coordinating system

Such electronic services result into a many-sided communication, a more efficient information flow and, consequently, the introduction of modern production processes. At the same time they help increase competitiveness and ensure conditions for a faster and a more efficient allocation of resources.

The advantages of electronic business (information) are, as potentially high, recognized and adopted in the production of functional food, too[2], so that we can be certain that this is one of the possible new product management models. The computer analysis of the marketing system has shown that the modern man's diet should include not only health-safe food, but also the nutriments that have an additional positive effect upon human health.

Functional food production is most widely used in the flour mill and baking industry, however, it is also partly present in the meat industry. These are the products manufactured from natural ingredients and used in the daily diet. The additives to the nutriments, use dto make them functional food are: probiotics[3], prebiotics[4], antioxidants, vegetable fibres, mineral matter, vitamins.

One potential solution in preventing starvation and death of thousands of people is certainly electronic information, implemented within new technologies.

Fast developing countries, such as Brasil, China and India, are in an increasing demand for food products. A higher standard of living in these countries resulted in an

_____

[2] **Refers to the nutriments that, besides their basic, nutritive, value, produce an additional positive effect upon human health.**
[3] **Fermented sausages, when produced as functional food, contain probiotic bacteria. These are probiotiv organisma, types: _Bifidobacterium Spp._ and some species from the _Lactobacillus_ family.**
[4] **These are indigestible ingredients that stimulate the activity of one or several species of bacteria (diet fibres).**

increased demand for meat, eggs and milk. Only in 2006, four times as much meat was produced compared to 1961, as its consumption worldwide is now twice as high and amounts to 43 kg per inhabitant. In 1985, an average Chinese consumed 20 kilos of meat annually; today, the quantity exceeded 60 kilos.

In 2006, China imported $20,27*10^6$ t of food, 40 percent more compared to the previous year. This is one reason that an increasing portion of world crops is now used in the so-called indirect diet[5].

What concerns us most is the fact that arable land was once used to grow plants used in nutrition. Recently, the production of fuels has developed, using wheat to produce ethanole and diesel fuel. As much as 30% of crops in the U.S.A. is transformed into the fuel of plant origin, which is one of the generators of higher prices of bread wheat, i.e., of famine.

Modern agricultural achievements are not accessible to all the nations at the moment, however, modern genetic technology is possible to implement. By electronic communication it was established that there are approximately 200 genetically modified seeds (resistant to extreme weather conditions) in the laboratories of the poorest countries.

Similarly, the sales of genetically mutated seeds commodity increase, and 43% of fertile soil in the fast growing economies (China, India, Brasil) is sewn with these very seeds.

3. Environmental protection management

The pollution of the environment by the waste of non-biological origin is increasing worldwide, therefore it is necessary that steps are undertaken to sustain the quality of life and ensure the conditions for biological survival. The development of production and consumable raw materials, products and energy is such that it threatens the ballance between the quantities of extracted waste matter and the nature's ability to absorb it.

The ammassement of ecology problem issues brought an increased awareness of its global character in its wake. The majority of countries are engaged in adopt-

ing adequate regulations in environment management and in creating a favourable social climate to ensure stimulative conditions for environmental protection. Besides, an increasing portion of national income is allocated for working out the solutions to the environmental protection issues.

Some serious pollutants are: PET, HDPE, LDPE, PP packagings[6]. It is for this reason that the ecological status of packaging is estimated on the basis of the impact of used and discarded units of packaging upon the environment. The term used in the estimate of the ecological ststus of packaging is the *ecological balance* and includes two groups of criteria:
– technological and economic eligibility of the unit of packaging and
– ecological acceptability of the unit of packaging.

It is important to note that the ecological status can be corrected in each of the phases of the life cycle. To pack a product, such packaging is used whose properties satisfy technological requirements The selected packaging is then assessed from the economic point of view and valuated according to the techno-economic criteria.

Thus valuated packaging is then subjected to the estimate of ecological status. Contrary to the ecological suitability criteria (the impact of used and discarded packaging), the impact of packaging is estimated throughout the life cycle, from the use of raw materials, to the manufacturing process, to the use of packaging, to the procedures of treating the used and discarded packaging.

Empirically obtained data show that the energy consumption in the packaging manufacturing process affects the estimeted ecological status of packaging to a greatest extent. It is for this reason that the term *ecological balance* was introduced, to define the energy consumption in each of the phases of packaging life cycle. The least energy consumption is found to be in producing glass packaging, whereas the greatest consumption is caused in the production of metal, especially aluminium packaging.

The greatest effect in environmental protection, however, can be achieved by the implementation of appropriate procedures with used and discarded packaging.

Various types of packaging are usually a very valuable secondary raw material and the packaging waste phase includes all the procedures of packaging waste treatment for the purpose of getting new products produced. Only the part that is not possible to recycle becomes the packaging waste and is permanently stored in underground storage sites.

---

[5] **More than a half of soya quantity produced is used as livestock feed.**
[6] **Packaging on the basis of: PET – polyethilen-terephthalate (water and beverages bottles), HDPE – high density polyethilene (table oil bottles), LDPE – low density polyethilene (main component of plastic bags), PP – polypropilene (street containers and drinking water supply pipes).**

It is important to note that recycling the used packaging helps reduce the volume and mass of packaging waste to the amounts more than ten times smaller. It simultaneously provides raw materials and /or products that have a certain economic, and overall an ecological value. Thus the cardboard, paper, woodboard packaging are increasingly used in the production of paper, cardboard and other products.

Broken glass packaging is used as a basic raw material in the production of glass. Recycling of metal packaging is also very important in terms of its economic justification.

As regards the recycling of plastic packaging, it is important to disintegrate the packaging into its ingredients, since only these can be recycled. If polymer materials are not possible to disintegrate further (manyfold polymers or combined materials), it is economically and ecologically reasonable to use them as fuels.

Recycling is incresingly spoken about as a profitable business, as well as a way to protect the environment. This is further supported by statistical data that present the total annual waste of $3*10^8$ euros in Serbia, caused by an inappropriate waste management. The value of the annual waste equals the value of 1.1% gross national product of Serbia. It is for this reason that the rate of re-use and recycling of packaging (paper, plastics, metal and glass) should be raised to one foruth of its total quantity.

The packaging industry is a very profitable industry all over the world. The development of technology, an ever-increasing care for the ecological aspect and recycling, as well as the growth of customers' demands make it one of the most advantageous industries. The reason is self-evident – the goods for sale must be packed.

According to the data obtained from the Statistical Institute of Serbia, the Recycling Agency and the independent researchers, the data on the waste materials collected, the recycling, the production, the exports and the imports in Serbia in 2005 were as follows:

Category	collected	recycled	production	exports	imports
Paper	144,944	105,978	523,205	39,593	447
Metal	307,971	337,145	376,319	143,975	173,149
Glass	31,262	12,446	16,371	18,816	0
Copper	22,5	15	17,5	7,5	0
Aluminium	20	60	110	7,5	47,5
Plastics	15	5	15	10	0
Total	541,677	535,389	1058,395	227,384	221,096

Table 1. Scope of secondary materials market in tons

On the basis of the data a conclusion can be drawn that the imports of paper exceeded the exports to a great extent, as is the case of collected and recycled paper, though only a portion of collected paper was recycled. As far as metal is concerned, more metal is recycled than is collected, which is the consequence of large imports, approximate to exports in this case.

Very small quantities of glass are collected and recycled. The exports are negligible, and there were no imports at all. Copper is collected in larger quantities than are recycled. The exports were satisfactory, but there were no imports. Much more aluminium was recycled than was imported, which is the result of too much aluminium imported compared to the exports.

As regards plastics, the quantities recycled are significantly smaller than those collected, the result of satisfactory exports, with no imports of plastics. The production has, apart from the cases of copper and plastics, largely exceeded all the other positions.

An industry accompanying all other sectors, the packaging production cannot stagnate, especially if we know that all the products with a fast consumption rate (food, chemicals and other commodity purchased at mega markets) are consumed daily, therefore there is a demand for new quantities on the market. This is not a problem for packaging manufacturers, as they can always combine the forms and the types of material, and the production technology develops fast. The development of this industry here is a great opportunity for a majority of entrepreneurs.

There are 500 small private businesses in Serbia producing and importing packaging. A smaller number of firms is engaged in manufacturing or importing packaging machinery.

The advantages of our market for this type of business are as follows:
- Strategic positioning on the markets of Europe, Asia and the Near East,
- Duty-free access to the free-trade area in Southeast Europe ($6*10^7$ customers),
- Serbia is not a European Union memeber; greater flexibility and advantages in investing,
- The lowest tax rate on profit in Europe,
- Trained and non-expensive work force,
- Relatively stable economy,

---

[7] **http://www.ekoforum.org**

- Stable monetary policy and prompt implementation of macroeconomic laws,
- Liberal regulations in foreign trade and foreign investments, and
- Relatively simple procedures of setting up a business and starting production, including the non-residents stay regime, firm registration and customs duties.

The packaging and packaging machinery industries also provide opportunities for large corporations with modern technology. Knowledge of ecology and the spread of ecology movements caused radical changes in the packaging industries of the developed countries. The reesearch conducted in a number of countries show that certain international trusts and agencies are deeply concerned with eco-packaging and recycling issues.

The member countries of the International Chamber of Commerce adopted the "Human Environment Quality Protection Code". These regulations urged numerous multinational corporations to adopt similar eco-rules.

The field of recycling in Serbia is regulated by the Waste Management Act of 1996, when the Agency for recycling was established; by the Code on collecting, storage and transport of secondary raw materials of 2001; and by the Environmental Protection Act of 2004. The Agency for recycling reports to the Ministry of science and environment; however, as regards its activities and the type of liabilities, it collaborates with other compatible ministries, such as the ministries of privatization and economy, of power supply, of health care and of finance. The agency is simultaneously engaged in expert work such as monitoring the situation and control of the secondary raw material use, market research for such materials, data on the available and required quantities of secondary raw materials. How much raw material and which materials we have, can they be treated in this country or not, do we have capacities installed, do these need to be revitalized, and, if we do not have them, which are the priorities in their construction[7]?

4. Conclusion

A continual improvement of the knowledge and work productivity is the fundamental imperative of the modern economy as well as the most important factor in the global competition of companies, where the main role is played by large corporations. IT are the basic module in achieving technological advantage and adequate protection of environment.

REFERENCE

[1] Day G. S, Wensley R, Assessing advantage: a framework for diagnosing competitive superiority, Journal of Marketing, 1988.
[2] Drucker P. F, Management: Tasks, responsibilities and practices, Harper & Row, 1973.
[3] Kukrika M, *Formula* za siguran uspeh, Tesla Comerc, Subotica, 2000.
[4] Mann J, Thornton P, Micro electronics, marketing, Industrial Management, *Data Systems*, jul/avgust, 1981.
[5] Petrović N, Ekološka svest kao osnova održivog razvoja, Zbornik radova "Menadžment, tehnologije i inovacije", Beograd, 2006.
[6] Vujković I, Ambalaža, Tehnološki fakultet Novosadskog Univerziteta, Novi Sad, 2002.
[7] International Organisation for Standardization, Standardi: *14001, 14004, 14010, 14011, 14012*, http://www.iso.org

Entrepreneurship, Growth and Public Policy

*Zoltan Acs, David Audretsch, Robert Strom:
Entrepreneurship, Growth and Public Policy, Cambridge
University Press, 2009*

The three basic parts of the book titled *Entrepreneurship, Growth and Public Policy*, brought together eighteen authors around the key theme areas that thoroughly explore the main topic presented in the title. The first part, *The Role of Entrepreneurship in Innovations*, points to a novel and enhancing approach in dealing with the already classical topic of innovations and entrepreneurship, focusing upon entrepreneurship as an indispensable factor in achieving innovation, competitiveness and economic growth. The authors claim that the European Union takes entrepreneurship to be the basis for the generation of growth, employment and competitiveness in the global economy. The U.S.A. is also increasingly in favour of entrepreneurship; in the policies and strategies they adopt they expressly state that it is in the incentive of entrepreneurship that a new driving force of economic growth lies, as well as the key to surpass the crisis.

In the second part of the book, titled Linking Entrepreneurship to Growth, a large number of authors contributed the articles that define all the relevant instruments and mechanisms in entrepreneurship that foster the relationship among the science, the technology and the practice as the crucial paradigms of development and growth. The entrepreneurial efforts primarily

guide the research and development towards those areas in which the best results are achieved and value is created as closely related to the people's needs. Entrepreneurship is responsible for linking all relevant factors in the earliest stages of the idea of products, the services and the processes in order that the innovation process should flow on efficiently and effectively towards the implementation and diffusion of concrete innovation. Entrepreneurship is in the focus of the efforts to achieve efficient commercialisation, create the environment for successful business operations with the acquisition of both tangible and intangible resources required – material, financial and human. This means new employees, new investments, the activities of funds and banks, and consequently a new wave of economic growth and development. In this part entrepreneurship is defined as a driving force and accellerator that does not allow for the "particles" of potential purposeful activity meant to generate new value, to scatter and fall to the bottom of social and economic trends, as a residue, or to drift unemployed on the surfice, as a stagnate water. On the contrary, as an accellerator, entrepreneurship lifts them up, disperses them, connects them and mobilizes them, preventing any staleness, idling or inactivity characteristic of the states of defensiveness and absence of initiative so prevailingly present in the conditions of crisis and depression in the economy as well in the society.

*T*he third part deals with politics and brings articles and reports on linking relevant facts of development on the economic and social levels as well as highlights the specific role entrepreneurship plays in creating entrepreneurial economy. The entrepreneurial economy is defined as the "economy in which the entrepreneurial capital, as well as a physical, human and knowledge capitals represent a significant source of economic growth" (p.8).

The role of Joseph Schumpeter, the leading theoretician in the field of entrepreneurship who set the "theory of creative destruction" as early as 1911, is specific. Schumpeter maintains that the new firms with entrepreneurial charge will replace the old, obsolete and exhausted firms, leading to intensive innovative activities, which will, in turn, result in a higher level of economic growth. According to Schumpeter, what makes the entrepreneurs different from other people engaged in economic activities is the willingness to wrestle with innovations and change. More precisely, Schumpeter argues that "The role of the entrepreneur is to reform or transofrm the stale frames of production in a revolutionary manner, making use of inventiveness, or, better still, the unexploited and untested technological opportunity for manufacturing new goods or producing the old goods in a new way...". Schumpeter also points out all the difficulties accompanying such an effort, giving entrepreneurship special emphasis. He states that entrepreneurship is, in fact, a specific and significant social function, primarily because it deals with the issues outside the routine tasks and familiar relationships known to everybody within the organization, fighting significnt resistance to such activities along its way.

*B*uilding on the works of the classics and the Nobel Prize winners Robert Solow, Edith Penrose, Joseph Schumpeter, Richard Nelson, Milton Friedman, John Maynard Keynes and others, the editors and the authors of this edition deserve to be praized for having recognized and explored the crucial issues of the relationship in individual entrepreneurial efforts, entrepreneurship as a broader context and the social policy and strategy. In the research of the environment, special attention is paid to those elements of public policy that strengthen the pillars of society which support the incentives to a greater stability in the conditions of entrepreneurial operations. Universities are analysed as crucial agents in introducing innovation and in the development of new business endevours. The role of universities is viewed in two key directions, as educational institutions and as the promoters of research and development; hence, in addition to the support they give to a broader entrepreneurship in the society, they themselves are the centres in which a high level of entrepreneurial activity takes place. As regards the high levels of risk and uncertainty accompanying any entrepreneurial activity, the impact of the environment becomes crucial for the support to the sensitive entrepreneurial organism in the development phase.

Dr Maja Levi Jakšić

TITLE OF PAPER IN ENGLISH
(two lines at the most)

Marko Markovic[1], Ivan Ivanovic[2]
[1]Faculty of Organizational Sciences in Belgrade
[2]Faculty of Economics in Belgrade

Abstract - *These are instructions for preparing papers that will be included in the journal. Your papers should be prepared according to the instructions.*

1. INTRODUCTION

Papers have to be written in English. Original papers should be typed one sided A4 format (210x297mm). Use margin 2,5 upper, 2 cm lower, left and right.

Maximal length of paper is 8 pages including tables, text, pictures, literature and other appendices. Pages are numbered with graphite pencil in upper right corner.

Send two copies of the paper (original + one copy) and diskette in format MS Word 6.0.

If the last page of text is not filled up, the columns on the last page should be even, of the same length.
.

2. SUBTITLE (SIMULATION MODEL) (example: SIMULATION MODEL)

In the middle of the first page, after one empty line, insert English title of the paper. Use font Times Roman Bold 14 pt.

The name of authors and the names of their institutions in font Times Roman 10 pt. should be centered as in the model given at the beginning of this instruction..

Other parts type in two columns 0,5 cm in between. Paper is typed normal space and double space between paragraphs. Font Roman 10 pt is recommended. Beginning of the paragraph is typed at the very beginning of the columns.

The title of the paper and names of authors are followed by short abstract in Italic. All subtitles are typed in Bold, capital letters same sized as in the previous text (not smaller than 10 pt).

3. SUBTITLE (example: COMPARATIVE ANALYSES)

$$\sigma^2(r_p) = E(\sum_{i=1}^{n}[r_{p,i} - E(r_p)]^2) \qquad (12)$$

All equations type in one column, numerated at the right side, as illustrated.

4. CONCLUSION

All figures, tables or graphic presentations are adapted to the width of one column. If necessary, when the figures do not fit in one column, use the width of the page, and then continue as previously, in two columns. See the figure below.
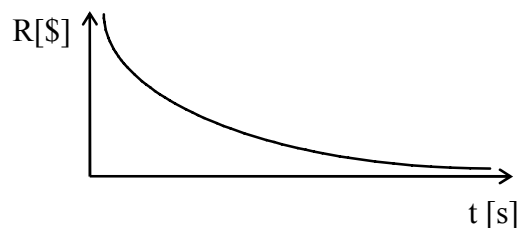

Figure 1. Graphic presentation of results

REFERENCES

Only the literature related to the problems and main ideas presented in paper should be including and ordinal numbers of the references type in angular brackets.

Literature in text has to be quoted in angular brackets to the order of their quotation . For example in [5] it is shown that. The example of literature is shown below.

[1] Banks, J. and S.J. Carson., Discete - Event System Simulation Prentice - Hall, New - Jersey, 1984.
[2] Bodily, S., "Speadsheet Modeling as a Stepping Stone", Interfaces, vol. 16, No.5, pp 34-52 1986.
[3] Protic D., Simulation of work on Airport Belgrade. Proceedings of work, SINFF-N, page 75 -81. Zlatibor 19