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Data Mining Techniques in Monitoring Customers' Sector

An area where enterprises are increasingly looking for the opportunity to gain competitive prevalence is that of acquiring knowledge about enterprise's environment, particularly on the customer's sector. An effective tool in processing and using the knowledge in decision processes is Data Mining Techniques. Wide possibilities of Data Mining Technique based on information resources of Client relation management system are described.

Получение информации о секторе клиентов является для предприятия важным фактором повышения конкурентоспособности. Эффективными средствами при обработке и использовании информации в процессе принятия решений являются методики получения данных. Описаны широкие возможности технологии Data Mining Techniques на основе информационных ресурсов системы Client relation management.

K e y   w o r d s: data mining, customer's sector, CRM, monitoring.

Scanning environment process. Today's turbulent business environment characterised by uncertainty and inability to predict the future is extremely challenging, and thus requires the development of new competences. Companies that are willing to survive in competition must react to the changes quickly. These changes are numerous and challenges to re-engineer or adapt with continuous improvement are numerous, too.

Business environment is the division to macroenvironment and competitive environment [1]. This division makes easier performing observations, research and environment analysis. Macroenvironment includes following segments: economic, political, social, technological, demographic, legislative and international. Competitive environments consist of all economic entities that have co-operative or competitive connections with the company. The distinction between macroenvironment and competitive environment has generally methodological nature and require taking into account its specific elements.

In competitive environment, opposing to macroenvironment the effects of environment influence on the business are more remarkable and can became noticeable in significantly shorter time. From the macroenvironment point of view

some changes can be of low importance but from the point of view of objects that the changes apply to the information are of great importance. Therefore the enterprises should ensure their access to accurate, high quality information about the environment, use modern and efficient analytical tools that allow fast and synthetic diagnose its functioning and determining its position in comparison with competitors.

A verified research method in this area is environment scanning. Scanning provides constant control over particular environment indexes according to assumed premises. It also allows taking full advantage of tools supplying information about appearing differences from the assumptions.

Environmental scanning is aimed at creating a reasonable appreciation and vision of the context for business operation, and to alert managers to the possible shift or invalidation of old appreciation. Scanning is both purposeful search and undirected viewing. A complete scanning process is an interactive process of search and noting (data collection), meaning developing and impact analysis (interpretation), as ell as learning (adaptive action taken) [2].

Enterprise's environment monitoring with the use of Client relation management (CRM) system. Numerous interpretations of CRM can be found in relevant literature. The CRM is understood as a method of managing the most important clients, as an information system or as a business philosophy. The basic assumption underlying the CRM philosophy is the individual handling of each client and maintaining constant contact with him.

Scott defines CRM as a set of business processes and overall policies designed to capture, retain and provide service to customers [3].

Shahnam defines CRM as the first and foremost business strategy for realizing higher profit and enhanced competitive advantage, which comprises three fundamental aspects: operational CRM, analytical CRM and collaborative CRM [4]. It was mentioned that CRM application architecture must combine operational and analytical and collaborative technologies [5, Fig. 1].

Operation systems, such as the ERP, SCM systems, are responsible for the everyday maintenance of business processes. These systems are independent of each other and constitute a basic source of data for the remaining parts of the architecture.

The most important element in the analytical module is the Data Mart, or an integrated, time-invariable store of thematic data, encased in special analytical systems that enable the retrieving of knowledge from the stored data and discovering new relationships using the Data Mining Techniques. Data Marts store common information aggregates that are subsequently used for multi-dimensional analyses.

The interactive CRM (the communication layer) allows direct contact with a client, offering both traditional and modern communication channels. The CRM
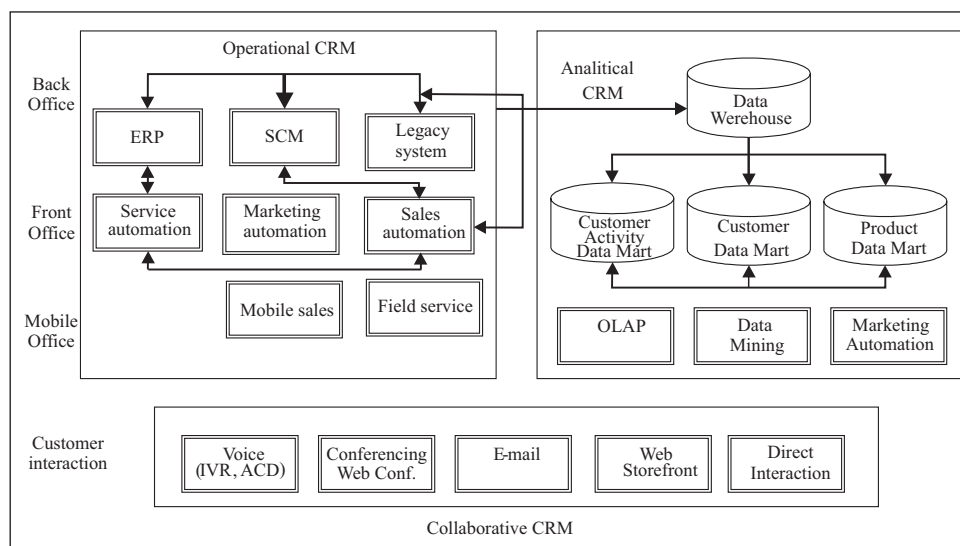
Fig.1. The architecture of CRM system: ERP is a Enterprise Resource Planning; SCM is a Supply Chain Management; IVR is a Interactive Voice Response; ACD is a Automatic Call Distribution; OLAP is a On-Line Analytical Processing

is a system assisting in cooperation with the customer and in information exchange among the enterprise's departments.

CRM systems basically make three things possible:

having an integrated, single view of customers, by using analytical tools;

managing customer relationships in a single way, regardless of the communication channel: telephone, website, personal visit, and so forth;

improving the effectiveness and efficiency of the processes involved in customer relationships.

As a result, the implementation of a CRM system will involve changes in the organisation and operation of each company, resulting in an improvement in its performance and competitiveness. The most notable improvements that can be predicted are the following [6]:

greater customer satisfaction, through offering a better service;

greater business coherence, defining corporate objectives linked to customer satisfaction;

managing to increase the number of customers and secure greater loyalty thanks to the reorganisation and computerisation of business processes surrounding the customer relations life-cycle (sales, marketing, customer care services);

improving and extending customer relationships, generating new business opportunities;

knowing how to segment customers, differentiating profitable customers from those who are not, and establishing appropriate business plans for each case;

increasing the effectiveness of providing customer service by having complete, homogeneous information;

lower costs;

sales and marketing information about customer requirements, expectations and perceptions in real time.

Achievement of above effects is possible thanks application of OLAP tools and most of all the use of Data Mining Techniques, which based onto huge data collections will be generating the knowledge of enterprise concerning monitored segment of customers.

The definition and evolution of data mining. Data mining is also defined as a sophisticated data search capability that uses statistical algorithms to discover patterns and correlations in data. The term is an analogy to gold or coal mining; data mining finds and extracts knowledge («data nuggets») buried in corporate data warehouses, or information that visitors have dropped on a website, most of which can lead to improvements in the understanding and use of the data. The data mining approach is complementary to other data analysis techniques such as statistics, OLAP, spreadsheets, and basic data access. In simple terms, data mining is another way to find meaning in data [7].

Data mining is also defined as the process of searching and analyzing data in order to find implicit, but potentially useful, information. It involves selecting,

Table 1. **Evolutionary stages of data mining**

| Stage	Business question	Enabling technologies	Product providers	Characteristics
Data collection 1960s	What was my average total revenue over the last five years?	Computers, tapes, disks	IBM, CDC	Retrospective static data delivery
Data access 1980s	What were unit sales in New England last March?	Relational databases (RDBMS), Structured query language (SQL), Open database connectivity (ODBC)	Oracle, Sybase, Informix, IBM, Microsoft	Retrospective dynamic data delivery at record level
Data navigation 1990s	What were unit sales in New England last March? Drill down to Boston	On-line analytic processing (OLAP), multidimensional databases, data werehouses	Pilot, IRI, Arbor, Evolutionary technologies	Retrospective dynamic data delivery at multiple levels
Data mining 2000	What's likely to happen in Boston unit sales next month? Why?	Advanced algorithms, multiprocessor computers, massive databases	Lockheed, IBM, SGI	Prospective, proactive information delivery
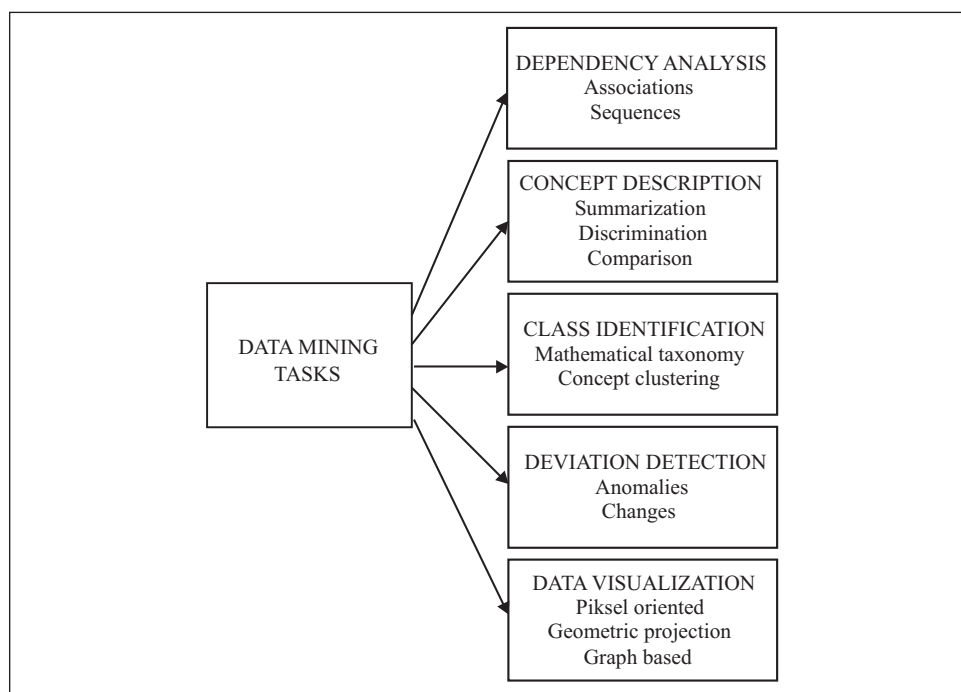
Fig. 2. A taxonomy of data mining tasks

exploring and modeling large amounts of data to uncover previously unknown patterns, and ultimately comprehensible information, from large databases [8].

Data mining techniques are the result of a long research and product development process. The origin of data mining lies with the first storage of data on computers, continues with improvements in data access, until today technology allows users to navigate through data in real time. In the evolution from business data to useful information, each step is built on the previous ones. Table 1 [7] shows the evolutionary stages from the perspective of the user.

In the first stage specific application programs were created for collecting data and calculations. Data Collection, individual sites collected data used to make simple calculations.

At the second step company-wide policies for data collection and reporting of management information were established. Because every business unit conformed to specific requirements or formats, businesses could query the information system regarding branch sales during any specified time period.

On-line analytic tools provided real-time feedback and information exchange with collaborating business units (Data Mining). This capability is useful when sales representatives or customer service persons need to retrieve customer information on-line and respond to questions on a real-time basis.

Table 2. **The types and purpose of analyses within the data mining**

Type of analysis	Purpose
Customer value analysis	Better understanding of own clients, improving the effectiveness of marketing actions, individualizing and customizing the offer
Customer satisfaction analysis	Development of services and products in order to enhance the satisfaction of customers, planning of actions aimed at enhancing the customer's satisfaction
Customer loyalty analysis	Undertaking effective actions aimed at retaining clients, developing loyalty programmes
Multidimensional client segmentation	Better understanding of the client, the customization of the offer and the personalization of the forms of contact. Enhancing the effectiveness of marketing actions
Basket analysis	Effective recommendation of products to clients, better planning of offers, increasing sale efficiency
Predictive classification and modelling	Reducing the number of questions that must be posed to the client in order to adequately determine his most important features in the context of mutual cooperation
Analysis of turning points in relationships with the client	Predicting changes in customers' behaviour, adjusting to those changes, undertaking proactively any actions that meet the customer's expected needs

With the application of advanced algorithms, data mining uncovers knowledge in a vast amount of data and points out possible relationships among the data. Data mining help businesses address questions such as, «What is likely to happen to Boston unit sales next month, and why?» Each of the four stages were revolutionary because they allowed new business questions to be answered accurately and quickly [7].

The scope of data mining methods usage. Selection of appropriate method of data analysis is dependent on character of a given problem. Data mining tasks are used to extract patterns from large data sets. The various data mining tasks can be broadly divided into five categories. Overview of chosen methods is presented in Fig. 2.

The taxonomy reflects the emerging role of data visualization as a separate data mining task, even as it is used to support other data mining tasks. Different data mining tasks are grouped into categories depending on the type of knowledge extracted by the tasks. The identification of patterns in a large data set is the first step to gaining useful marketing insights and making critical marketing decisions.

Data mining in monitoring customers' sector. Segment of customers is a very changeable area due to its range, structure, qualitative and quantitative changes. The knowledge about possible changes which may occur in a segment

is very valuable for people who are managers of a company. Data mining may provide the knowledge which is helpful in monitoring the changes of sector's range and its structure as well.

For example, outlays incurred for acquiring a new client are much higher than the costs of keeping a once won client. It is therefore worth collecting comprehensive information of each client, recording his data, examining his behaviour and expectations, so as to subsequently take advantage of the CRM system and its analytical capabilities in the assessment of clients.

Data mining offers comprehensive analyses concerning the relationship with the customer. The types and purpose of analyses within the Data mining are given in Table 2 [9, 10].

The available analysis will enable the optimization of the links with the customer in the long run. The system identifies the company's best customer and assists in activities towards the particular care of those customers.

Data mining will help to make an early identification of a client who might give up the company's services, while the loyalty actions undertaken in time may dissuade him from making such a decision.

Summary. Enterprises which want to achieve competitive advantage on the market must constantly monitor its environment, especially customers' sector. However monitoring procedures and tools in a classic view are not sufficient any more [2, 11]. Certain stages of the process such as: observation and data gathering are still inducted to employees of enterprise, who are in the nearest of monitored area (marketing department, sales department, service). Observers of a sector care of constant feeding of information resources of CRM system. Information technology also allows for other possibilities of customer's data gathering and for feeding databases (email, IVR, sms….)

Performance of analytic CRM is based onto gaining, storing, processing and interpreting data concerning customers. The most important analyses created by Data Mining are based on data coming from different sources data warehouse, and they are stored in customer's data repository. Those data undergo complex statistical analyses thanks to which the knowledge about customers' needs, purchase preferences, behaviors is obtained etc. Provided knowledge enable to correctly interpret signals from environment e.g. predict changes in purchase preferences of customers.

Among many advantages resulting from Data Mining application in customers' sector monitoring it is worth to score under the possibility of customers' knowledge distribution, estimation of customer's value in time, survival time analysis or analysis of customer's departure to the competitiveness company.

Отримання інформації про сектор клієнтів для підприємства є важливим фактором підвищення конкурентоспроможності. Ефективними засобами при обробці і використанні інформації у процесі прийняття рішень є методики отримання даних. Описано широкі можливості технології Data Mining Techniques на основі інформаційних ресурсів системи Client relation management.

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