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Intelligent Customer Relationship Management (iCRM) by eFlow Intelligent Portal

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Abstract: *Customer relationship management (CRM) has become a strategic initiative aimed at getting, growing, and retaining the right customers. A great amount of numeric data and even more soft information are available about customers. The strategy of building and maintaining customer relations can be described with `if... then` rules acquired from experts. Doctus Knowledge-Based System provides a new and simplified approach in the field of knowledge management. It is able to cope with tacit and implicit rules at the same time, so decision makers can clearly see the satisfactory solution (then and there). It reasons both deductive and inductive, so it enables the user to check on the model graph why is the chosen solution in the given situation most appropriate. It is upgradeable with intelligent portal, which presents the personalized (body-tailored) information for decision makers. When we need some hard data from a database or a data warehouse, we have automatic connection between case input interface and the database. Doctus recognizes the relations between the data, it selects them and provides only the needed rules to the decision maker. Intelligent portal puts our experience on the web, so our knowledge base is constantly improving with new `if... then` rules. We support decision making with two interfaces. On the Developer Interface the attributes, the values and the `if... then` rules can be modified. The intelligent portal is used as a managerial decision support tool. This interface can be used without seeing the knowledge base, we only see the personalized soft information. ICRM (intelligent Customer Relationship Management) helps customer to get the requested information quickly. It is also capable of customizing the questionnaires, so the customer doesn`t have to answer irrelevant questions and the decision maker doesn`t have to read endless reports.*

Keywords: *Business Intelligence, Knowledge-Based System, Intelligent portal, Data Mining*

I. INTRODUCTION

Today, CRM has become a strategic initiative aimed at getting, growing, and retaining the right customers, which leads to long-term profitability. "Every company needs to apply Customer Relationship Management (CRM) in the broad sense of the word. But it may not pay for the company to put its energy into thinking about each individual customer and his or her special needs. At best, a company should pay full attention to the 20% of its most important customers, treat them as individuals, and be prepared to provide customized solutions. CRM requires a costly investment in data collection and sophisticated data mining and is not for every company nor every industry. When it does work, however, companies will gain a competitive advantage in being able to build stronger brands building and create loyal customers." [7]

A great amount of numeric data and even more soft information are available about customers. The knowledge on customers is called customer habits. It is much more then the purchaser habit, as the 'knowledge on customer when not purchasing' may be of importance as well. The customers can be categorized according to these habits. Studying customer habits will help to keep present customers and to increase the customer share, which is much cheaper then seducing new ones. Customers with different habits are to be treated differently; they may need different products or services. "A

company should always try to make its products different and better. If this is not possible, the company must invest in making its services different and better. Many of today's leading companies are winning on superior service since their products are not much different from competitors. Smart companies are moving toward Customer Relationship Management. This involves acquiring data on each valued customer and customizing the company's offerings and services to each customer. These companies are developing a rich customer database and have the skills of analyzing and "mining" the customer database to detect new segments and new trends." [7]

The strategy of building and maintaining customer relations can be described with "if… then" rules acquired from experts. On the basis of previous experience it can be concluded, which customer will be the "good customer". The result can also be used to decide how much to be concerned with a particular customer. Customer requires the appropriate answer to his question, and he wants it as fast as possible. The vendor wants to accomplish this with as less work as possible. The customer relationship management (CRM) balances these two requirements. By providing a complete understanding of each customer's value to the business over the life of the relationship and his or her unique characteristics CRM helps a company become customer-centric. It personalizes the relationship and tailors services to exact customer needs [11].

II. KNOWLEDGE MANAGEMENT AND E-COMMUNICATION

A process of developing a customer centric approach consist of the several activities: accessing data about customers, filtering, integrating, transforming, modeling, discovery interesting relationships and learning. Raghunathan (1999) [10] concluded: "The decision quality improves with higher information quality for a decision maker that has knowledge about the relationships among the variables. However, the decision quality of a decision maker that doesn't know these relationships may degrade with higher information quality". For this reason, it is worth to share knowledge. People's work becomes more effective; it supports their carrier development. Knowledge is fugitive and perishable. If the knowledge is not used it recede its value quickly, it might be used by someone else. The knowledge sharing makes greater gain then loss. Putting the conception, the idea into words helps forming and further developing.

A modern organization needs knowledge management (KM). It consists of the following elements (Figure 1):
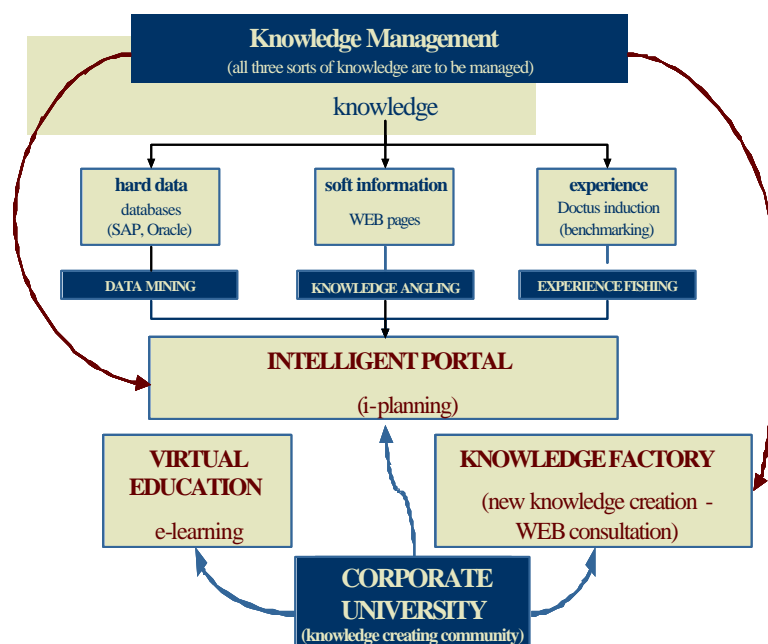

Figure 1: Elements of Knowledge Management

Couple of hypothesis were taken. Essential is the belief that the web-based knowledge increase will differ from modern trainings, case studies and long-distance learning.

- In future, the majority of training programs will be based on deep knowledge (problem exploration determined. and solution oriented).
- A "surplus teacher" is needed who can teach the fundamental concepts to knowledge thirsty — the basic terms in "the world of keywords".
- After training we should not collect the standard facts of yesterday, but current data to support our decisions (**data mining**).
- Relationship between data is meaningful (soft knowledge). This knowledge is stored in expert's long-term memory (knowledge bases). In case we need it, we can browse expert studies (**knowledge angling**).
- Benchmarking examines and searches for the leading practice. Basic rule is: "don't copy". It is of crucial importance to understand and then to judge the current situation (**experience fishing**).

For e-communication, as for everything on the web, the presence of a new trust is essential. In the future the e-communication will no longer be the swap of information, but creation of knowledge, using the possibilities of the web interactivity. Today we can learn anything that we find, if we find it and if it fits our head. The interactivity facilitates such creation of knowledge within the e-community, which from day to day rearranges the meta-patterns. The communication with less standardized univocal signs, with countless purport pictures will be the fruition of Chinese saying "one sign – thousand pictures". The e-communication moves forward aggressively. It is a new medium still using the conventional rules. We have just started to learn it. It is hard to cope with huge amount of unsettled information, more then we need, and more then we have time for. In this situation the e-communication can be less effective, moreover it can be harmful.

III. EFLOW INTELLIGENT PORTAL

Intelligent portal allows an user to aggregate and share content: information, knowledge and applications, with customers, partners, employees and suppliers. Portals enable human users to surround themselves, in a few web-interfaces, with all kinds of information and applications. Notice that portals are about the user; and the users can influence the visual interface and change it as they see fit.

EFLOW Intelligent Portal (eFIP) is connected to knowledge-bases and to the organizational databases. It retrieves data from organizational databases, data warehouses, data marts and external databases as well. External applications can also provide portlets with data and soft information. Doctus knowledge-bases are usually embedded into portlets, which can also retrieve soft information from knowledge-bases. Built-in knowledge-bases can be modified by multiple experts, which therefore provide a space for knowledge interchange between them. The knowledge interchange between experts leads to knowledge creation, which is a competitive advantage for the organization [6].

eFLOW Intelligent Portal (eFIP) is based on Doctus[1] Knowledge-Based Expert System Shell. Doctus uses symbolic artificial intelligence for three types of reasoning: deduction, induction[2] and reduction. *Thereby it is capable of learning so it enables learning capability of eFIP.* Doctus Knowledge-Based System provides a new and simplified approach in the field of Knowledge Management. It is able to cope with tacit and implicit rules at the same time, so decision makers can clearly see, using "if… then" rules, the satisfactory solution (then and there). It reasons both deductive and inductive, so it enables the user to check on the model graph why is the chosen solution in the given case most appropriate. When we need some hard data from a database or a data warehouse, we have automatic connection between case input interface and the database. Before Data Mining we have data galore. After Data Mining we are left with a huge amount of relations between data. Doctus takes it to a higher level: it recognizes the relations between the data; it selects them and provides only the needed rules to the decision maker. Intelligent portal puts our experience on the web, so our

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[1] www.doctus.hu/en

[2] For induction Doctus uses a modified ID3 algorithm [5], which is a type of machine learning in the form of decision trees.

knowledge base is constantly improving with new "if… then" rules.

In some action portlets Doctus is used as data mining tool. To find interesting rules [1] a new approach is developed. The knowledge-base is built for the decision maker. It contains soft information only. But some of the soft information can be tracked back to the soft relations between hard data. To transfer data (numbers) to soft information (concepts) Doctus uses a clustering algorithm. The previously filled fields retrieve data. The decision maker fills the rest. Then Doctus performs the reasoning. This approach to the data mining uses symbolic logic, as we believe, that results of statistics or neural networks are hard to interpret [12].

eFIP is based on four intelligent evaluation processes (modules): *process management, customer management, supplier management* and the *human resource management*. There is also a zero module "***user***" which is a space for personalization

Each module has three functions:

1. The ***decision*** function is based on the deductive reasoning[3] of Doctus knowledge-bases and also retrieves data from management information system (MIS). Here the user gets evaluations on processes, customers, suppliers and employees. It also monitors the data changes in MIS and knowledge changes in the knowledge-bases.

2. The ***deputation*** function helps the decision maker to depute the routine decisions. The decision maker selects the appropriate subordinate and transfers the knowledge-base to him.[4]

3. The ***business planning*** function is an intelligent redesign solution. It updates changes in plan and in work-in-processes as well. It also handles scenarios.

There is also a zero function "***my page***" where the user has an overview of the selected module.

For the user's convenient news, things to do "today" and a calendar appropriate for time management appear on each page.

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[3] Actually it starts with deductive reasoning. Doctus collects the cases and uses them for learning, which is induction. The starting deductive knowledge-base is then updated on the basis of the new experience using reduction. Induction and reduction make a part of tacit knowledge explicit.

[4] Transferring the Doctus knowledge-base to the subordinate does not mean creation of a programmed decision maker. A part of tacit knowledge always remains tacit. The knowledge-base contains only the explicit knowledge of the decision maker. The subordinate also has to pay attention on changes in the decision environment. When the changes transform the routine decision to original one — called non programmed decision by Simon [4] — the subordinate has to give it back to the decision maker.

IV. EFLOW INTELLIGENT PORTAL SOLUTIONS FOR CRM

Observing business of modern organization we came to the conclusion, that the decision maker is primarily interested in deviations from the plan and the responsibilities. Therefore the following model (Figure 2) is suggested to be the starting point of the intelligent CRM portal (iCRM):
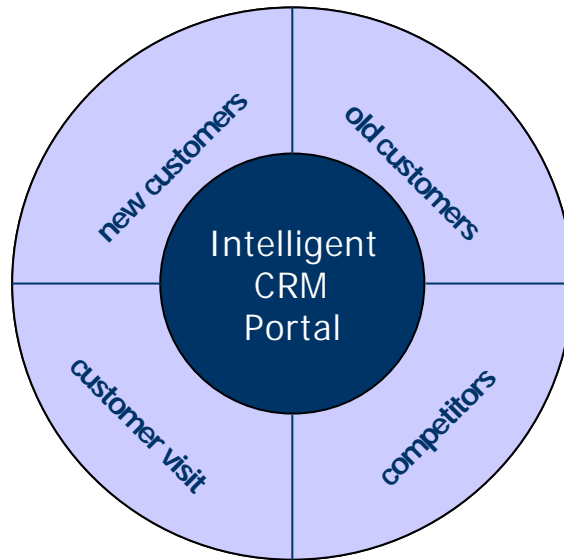

Figure 2: Modules of the iCRM

This portal should provide the answers to the questions:
- Which data is needed?
- Where is the data?
- What was the data good for?
- What relations we need to know?
- Who knows the relations?
- What new knowledge can be assembled?
- Which experience we need to know?
- Who knows the leading practice?
- What can we use from the experience of the decision maker?

As its name emphasizes this portal is intelligent. Intelligent portal is more than a data miner and the business intelligence. It is logic reasoning also, similar to decision maker's. A knowledge-base is built containing soft information needed for the marketing decisions. Elements of the knowledge-base of the iCRM are (Figure 3):
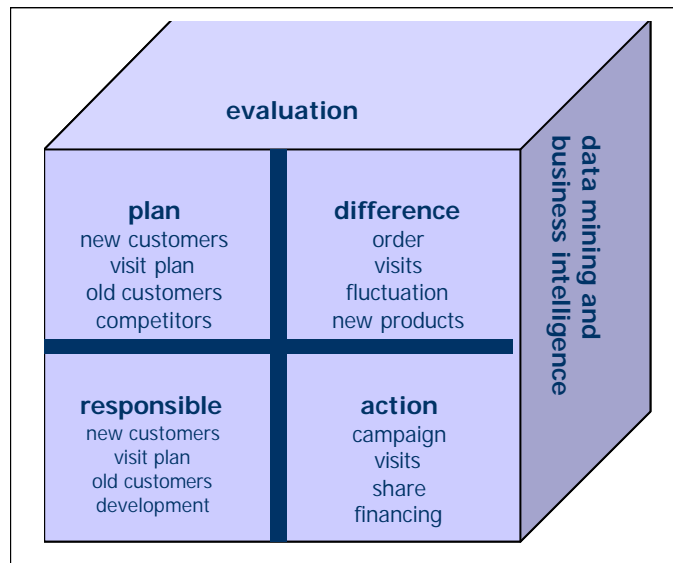
Figure 3: Elements of knowledge base for iCRM

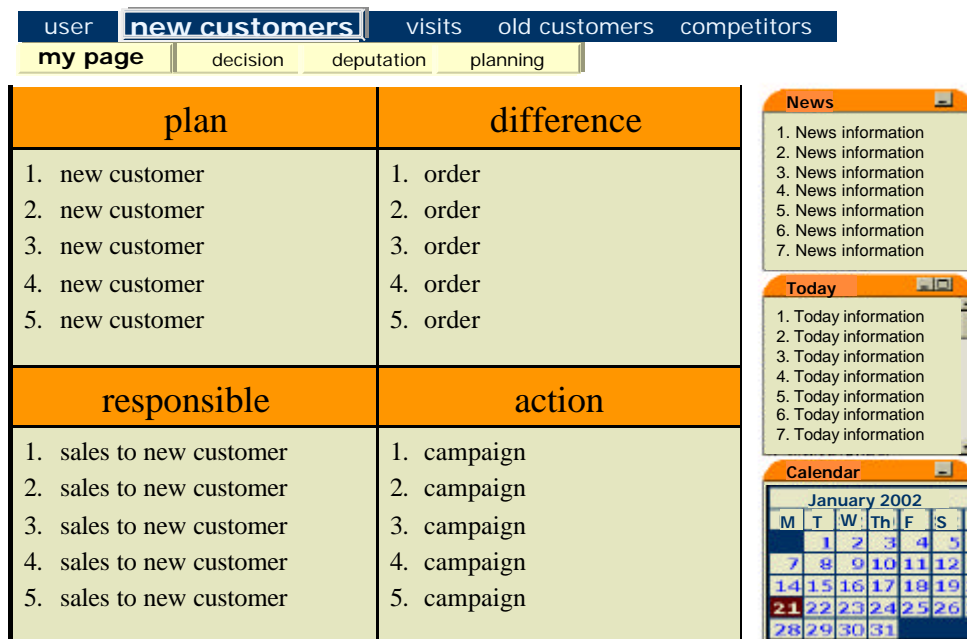On "new customers – my page" four portlets appear (Figure 4):

Figure 4: Portlets

The "plan" portlet shows how many new customers have we planned for a certain period. The "difference" portlet compares the plan to the realized new customer orders. The "responsible" portlet assigns new customers visit to the sales personal. The "action" portlet provides the intelligent CRM solution; it suggests what to do about particular new customers. Based on the difference between the plan and the realization it executes the rules of the Doctus knowledge-base. The reasoning selects the appropriate campaign for each new customer.

V. CONCLUSION

To exploit the advantages of the intelligent portal the leader has to be experienced decision maker. We can support only the decision maker, who can accept that routine decisions can be made using less information (fewer attributes). They will have the following benefits:
- personalized information
  - get to know the thinking of the decision maker
  - get to know the habit of the decision maker
- fresh information
  - produced today
  - needed today
  - can be delegated today
- pay for what is needed
  - free access to the knowledge (not without paying for it)
  - free increase of the knowledge
  - free distribution of the knowledge (not without paying for it)

Intelligent portals will be useful only to organizations where creation and division of labor is present and needles for "plan-accomplishers" without empowerment. The organizations will have the following benefits:
- smart data mining
  - which data was used?
  - what was it good for?
- smart knowledge angling
  - which relation was used?
  - who knows the relations if no data is available?
  - what kind of new knowledge can be assembled?
- smart experience fishing
  - which experience was used?
  - who knows the leading experience?
  - what can we use from the leading experience?

25 years ago we made our first program for business support. Our chief told us to make program for the processes that we know well and to wheedle the customer. Then we were able to program wage accounting. We did it. Now we are able to select data for the decision maker. Now we make intelligent portals.

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