

APPLICATION OF INTELLIGENCE ANALYSIS SOFTWARE IN COMPETITIVE INTELLIGENCE

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Abstract. *This paper shows the results of conducted research on applicability of analytical software in competitive intelligence. In so doing there were explored two types of intelligence analytical software of two companies: i2 and Xanalys. The paper shows practical usage of chosen features of selected analytical products. We specially investigated and defined the role of intelligence information system as necessary prerequisite for efficient usage of analytical software in competitive intelligence.*

Keywords. intelligence analytical software, competitive intelligence, Analyst's Notebook, Pattern Tracer, iBase, iTextChart, iBridge, Link Explorer, Link Designer, competitive intelligence information system

1 Introduction

In the preamble of this paper it is necessary to emphasize that the explored possibilities of usage of intelligence analytical software are of two specific companies: i2 and Xanalys. In this case the word intelligence describes the process, product or organization. For the purpose of this paper adjective intelligence is used only for the cause of specifying the nature and roots of analytical software. This paper shows the usage and application of analytical software in competitive intelligence - in other words it's usage in commercial purposes.

Therefore "... it is necessary to mention that the analyzing skill is the skill of raising right questions. Not single analytical software will not help you to find the right answer unless you do not know how to ask the right question. Unfortunately, it is often seen that only by mastering analytical software one becomes an analyst. Learning the lessons of this book is just one part of the mosaic of necessary analytical knowledge and skills and knowing the methodology of analytical

techniques is only a prerequisite of successful usage of such techniques..." (from the book Kopal, R: Usage of analytical software, Ministry of Interior, Republic of Croatia, 2002.).

Although the area of usage of intelligence analytical software in competitive intelligence is wide, for the purpose of practical review of these tools it was chosen the field of corporate security, specially the analysis of financial data. Competitive intelligence "is a systematic process that transforms random bits and pieces of data into strategic knowledge. It is information about current competitive position as well as specific future plans of competitors. It is information about the driving forces within the marketplace. It is information about the specific products and technology. It is also information external to the marketplace, such as economic, regulatory, political, and demographic influences that have impact on the market." (from Tyson, K. W. M.: The Complete Guide to Competitive Intelligence, Leading Edge Publications, Chicago, Illinois, 2002.). "Strategic and competitive analysis intends to help analysts, strategists, managers, and decision makers to effectively and efficiently make sense of the environment and of their organizations' evolving and dynamic position within it. This is the primary objective underlying the process of managing strategic and competitive analysis." (from Fleisher, C. S.; Bensoussan, B. E.: Strategic and Competitive Analysis: Methods and Techniques for Analyzing Business Competition, Prentice Hall, Upper Saddle River, New Jersey, 2003.)

2 Brief Overview of Intelligence Analytical Software from i2 and Xanalys

Although there are around ten serious companies in the field of intelligence analytical software, for the scope of this work it will be shown the products of i2 and Xanalys companies.

Description of features and capabilities of all mentioned products is beyond the goal and purpose of this paper so there will be only presented brief descriptions of certain products that can be relatively quickly implemented in the domain of competitive intelligence and can obtain remarkable results with moderate costs and relatively short training that is needed for the users.

The most important intelligence products of the i2 are:

- area of visualization and data analysis:

- Analyst's Notebook 7
- Analyst's Workstation 3
- Analyst's Workstation TCA 2
- ChartReader 7
- PatternTracer
- iXv

- area of structuring and data processing:

- Analyst's Workstation 3
- Analyst's Workstation TCA 2
- iBase 5
- TextChart 3

- area of data retrieval and searching:

- ChartExplorer 2
- iBridge 3
- iXa

Cost benefit analysis of usage of i2 intelligence analytical software in competitive intelligence pointed out following tools as best ones: Analyst's Notebook 7, PatternTracer, TextChart 3 and iBridge 3.

Analyst's Notebook 7, awarded visualisation and analytical product of i2, enables users, beside graphical representation, analysis of the data displayed in the graphical representation. Key advantages of Analyst's Notebook are: quick production of graphical reports, intuitive data import, strong analytical functionalities, creation of graphical representations regarding the type of the data, integration with other i2 products etc.

Addition to Analyst's Notebook 7, PatternTracer with its efficient analytical functionalities enables analysis of data contained in for example telephone calls listings with the goal of identification of clusters and finding "key players" in the data. Pattern tracer uses proprietary algorithm developed in i2 to find repeatable samples in telephone calls data regardless of some missing data.

TextChart is intuitive tool for visualisation and text extraction which enables overcoming of limits that are usual when processing unstructured data.

User can quickly identify and transform key data (represented in textual format like plain text, rich text, HTML, PDF, MS Word, MS Excel and others) into structured graphical format that enables easier analytical processing.

iBridge enables connection between Analyst's Notebook with existing databases in real time. User can execute queries and analyze the data stored in many different databases like Oracle, MS Access or MS SQL Server. Among other functions of iBridge one needs to be pointed out: it is possible to connect simultaneously to maximum of three different databases and iBridge will automatically recognize same entity regardless of the database of origin of that entity.

The most important intelligence products of the Xanalys are:

- PowerCase,
- Link Explorer,
- Link Designer,
- Indexer.

Cost benefit analysis of usage of Xanalys intelligence analytical software in competitive intelligence pointed out following tools as best ones: Link Explorer and Link Designer.

Link Explorer is powerful analytical and visualisation tool that enables analysis of data contained in internal or external databases. Some of the functionalities of Link Explorer are: analytical functionalities which enable searching for relations between objects and relations can lead to certain conclusions; functionality of advanced graphical representation of the data; ability to enter, change and merge the data contained in the databases and so on.

Link Designer enables advanced data modelling and creation of templates with the aim of analytical defining and describing the data, objects and links contained in the external databases which can be connected by ODBC link.

At the end of this section it is necessary to point out following: analytical capabilities of before mentioned analytical intelligence software from i2 and Xanalys are highly complementary and their usage in specific situation depends on sort of data, type of problem, form of analysis, type of analytical product and analyst's skills and knowledge to choose suitable analytical software in order to maximize efficiency of existing data considering given limitations.

3 Usage of Intelligence Analytical Software for the Analysis of the Financial Data

First a remark: analysis of financial data in a way as described in this section is not necessary the way that suites competitive intelligence yet it is just an

example of how to use intelligence analytical software for analyzing the data.

In this example of usage of intelligence analytical software for the analysis of the financial data it will be briefly shown the creation of the template. For the template construction it is necessary to use Link Designer analytical software (in order to connect to the database that holds financial data with Link Explorer analytical software).

Debate on conceptual and logical design of analytical database is beyond the scope of this paper. That's why in this paper it will be explained how to create one object (Account in this case) and one link between two objects (Transaction in this case).

After selecting the database (external database in this case) and selecting the table in the database (a table with the data regarding accounts), clicking on the button Build Class starts the procedure for creating the Account object (Figure 1).

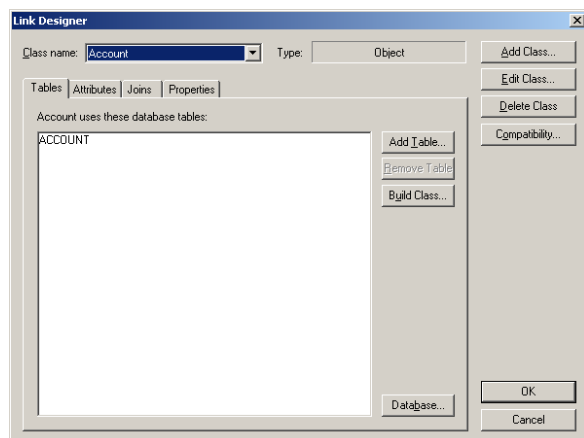


Figure 1. Account class.

While creating the Account class it is necessary to define identification attribute (or attributes). Identification attribute is very similar to the primary key term which is used in relational database design. Object or relation can have one or more identification attributes. Next Figure shows that the attribute "Account ID" is the identification attribute of the Account object. It is important to mention that the object or relation can be created from one or many tables of relational database. Also, besides adding columns that will become attributes from any database table, it is also possible to create derived attribute (like day of the week can be derived from the date attribute).

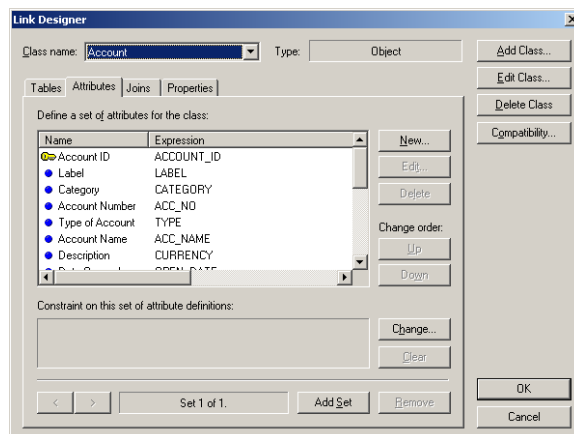


Figure 2. Account attributes.

When all of the attributes of the Account class are defined, next step is defining the style for displaying instances of that class (icon, object title on graphical display etc.). Next Figure shows the icon of the Account class and the account name which is displayed beneath the icon in the top row and the account label in the bottom row beneath the icon.

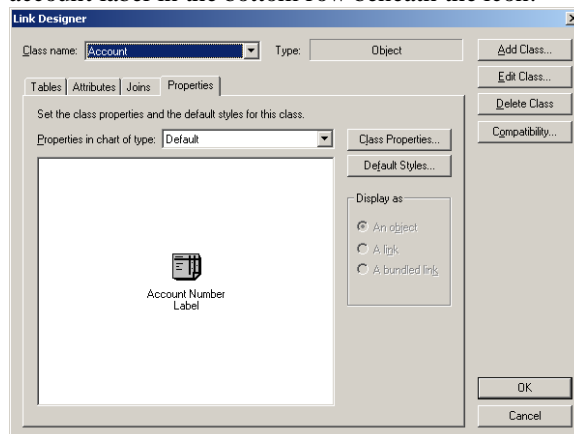


Figure 3. Account class style.

Account object can be related to many other accounts what depends on the structure of relational database and conceptual and logical design of analytical database.

For example, one transaction can link two accounts. But, in the same way, account can be linked with the natural persons or the legal persons. Following figure displays that the account object is linked with few other objects.

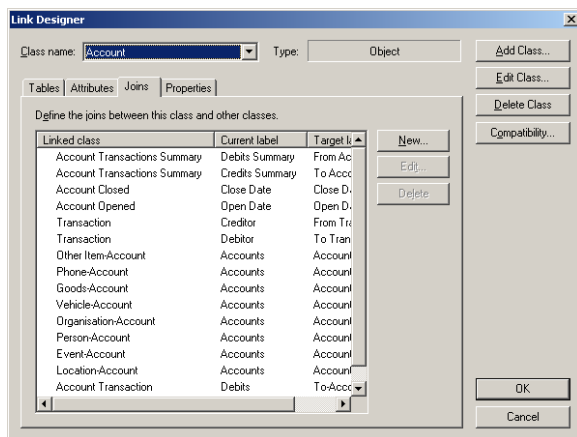


Figure 4. Account class links.

Object linking is achieved by creating links. Link can be created from one table (link table of any relational database) or from many tables. Beside simple links it is possible to create special types of links. Special types of links are:

- *Directed*. Directed link is a link with direction.
- *Bundled links*. Bundled link is used to display certain number of single links between two objects. Therefore, one bundled link on graphical display represents many single links.
- *Summary links*. Summary links are special types of links that hold summary information about all links between particular objects. Summary links usually have attributes whose values have been calculated from the values of single links between two objects like the total number of links, sum of attributes, average etc.).
- *Multilinks*. Multilinks represent different kinds of links between two objects. No matter how many single links exist between two objects, Link Explorer displays them with one line which gets the characteristics of single links.

Following figure shows the process of creating Transaction class (link).

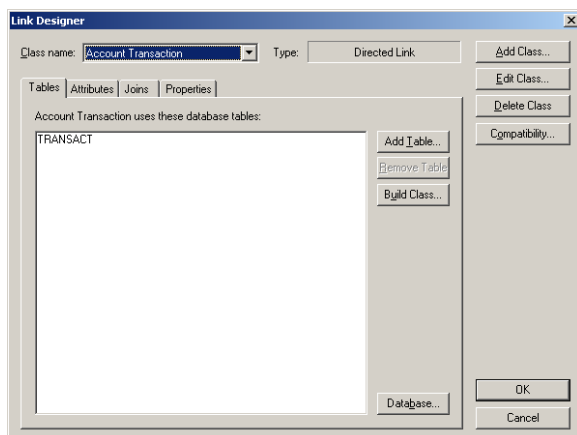


Figure 5. Transaction class.

Following figure shows that link Transaction has three identification attributes: "From Account ID", "To Account ID" and "Transaction ID". Therefore, it

is clear that this creates links to the tables that hold outgoing account (account that initiates the transaction) and tables that hold incoming account (account that receives the funds) for each transaction. At the same time it is possible to identify the direction of the transaction. Those accounts, outgoing and incoming, can be stored as objects in the same table of the relational database.

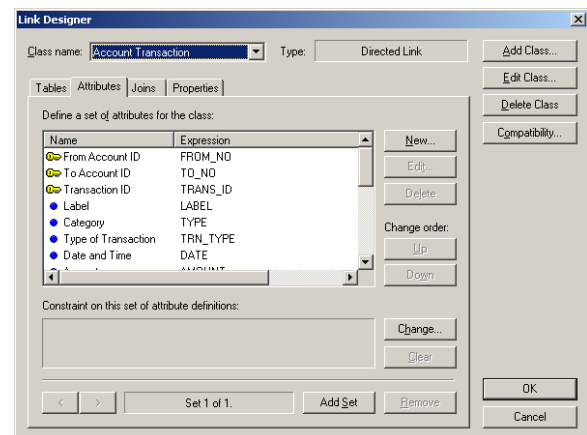


Figure 6. Transaction attributes.

Following figure shows the way how to define link to the Account objects based on the object that started the transaction and the object where the transaction has ended.

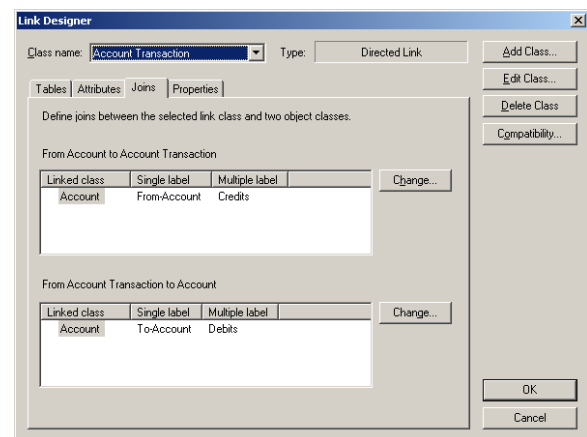


Figure 7. Links.

After the objects that define the link have been defined, it is necessary to define the style of the link (in this case the Transaction). Following figure shows that when transaction will be displayed on the screen the direction will be also visible. The number of the transactions between two accounts together with the total amount of all transactions between those accounts will be also visible.

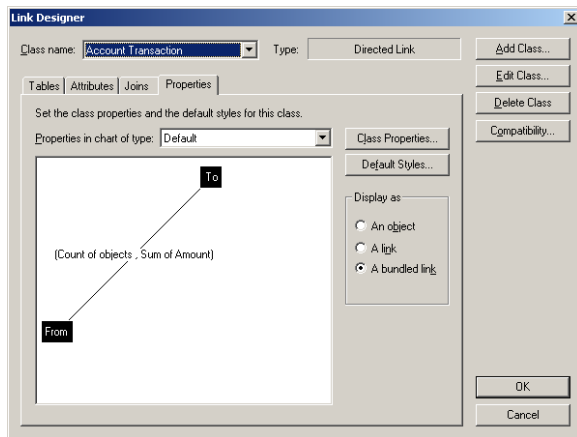


Figure 8. Transaction class style.

After the template has been defined, it is possible to use Link Explorer to connect to the external database (by using ODBC link) which, in this case, holds the financial data.

By setting a simple query “show all transactions between any two accounts” all the links will be shown as displayed on the following figure.

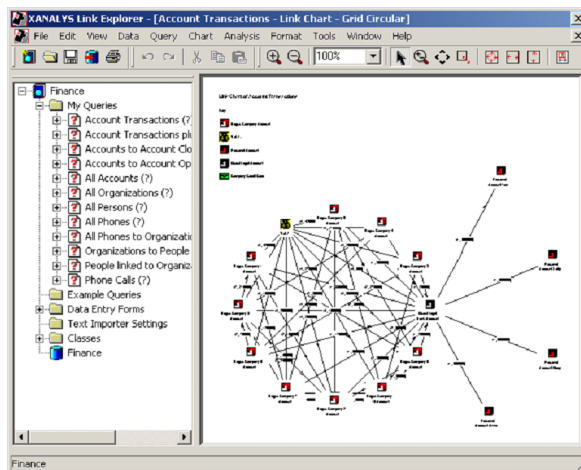


Figure 9. Transactions graph.

Finding and opening specific account will result with the screen displayed on the following figure. On that screen it is possible to view and analyze the data on tabs that display account attributes and links to other objects.

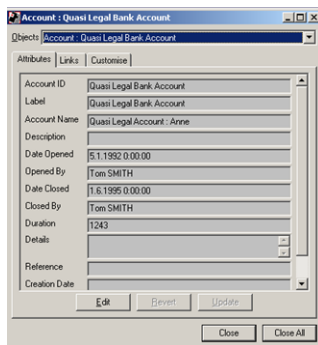


Figure 10. Account details.

Next steps explain how to get the result of the query “find and display all the transactions that occurred in September”. First, query editor must be activated and query that links two Account objects with the Transaction link must be entered. This example is displayed in the following figure.

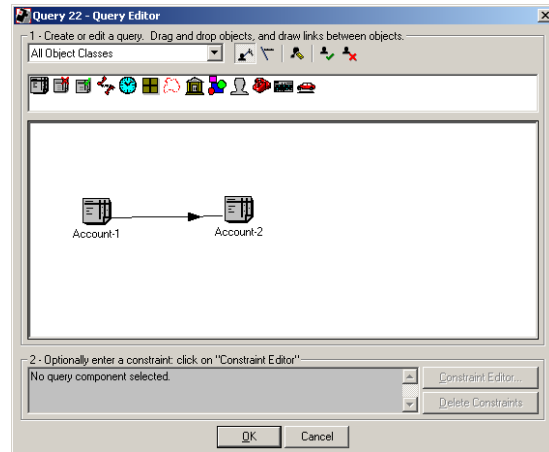


Figure 11. Query.

After this step, clicking the button Constraint Editor launches constraint editor where following constraint must be entered: “Account Transaction-1.Month of Transaction = ‘September’” as the following figure displays.

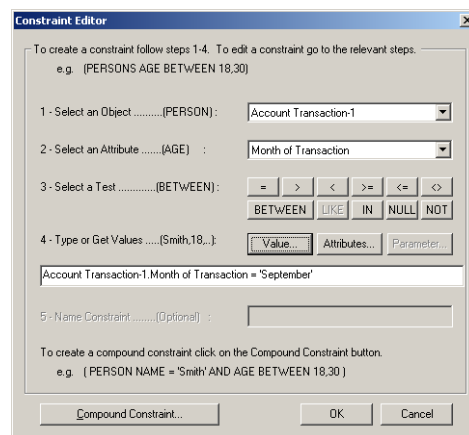


Figure 12. Constraint editor.

The result of running the query is graphical representation that displays all the transactions that occurred in September and their directions as displayed on the following figure.

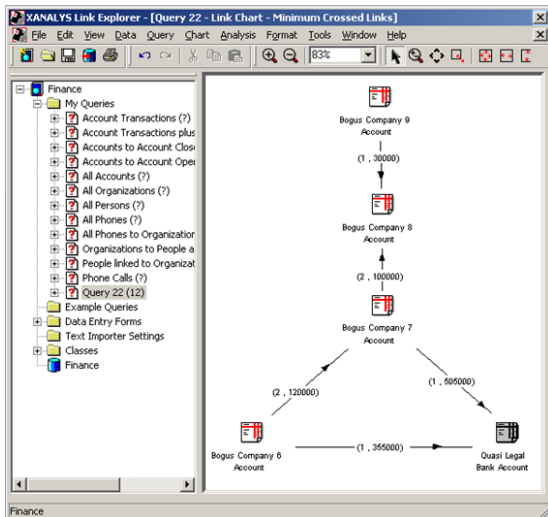


Figure 13. Graphical query results.

The same data can be displayed in a form of a report that can be printed or exported to a spreadsheet table with a purpose of performing future analysis.

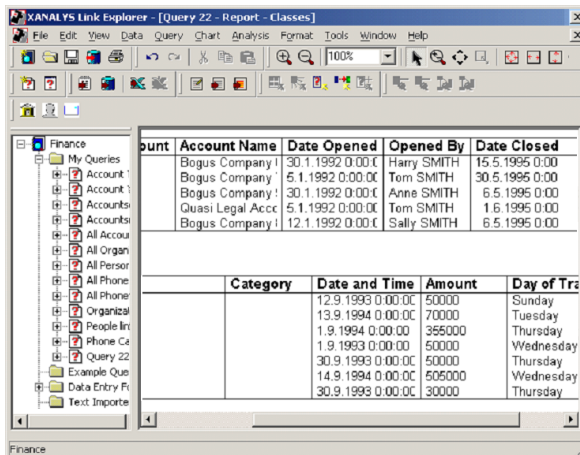


Figure 14. Query results displayed in form of a report.

Furthermore, the same data can be displayed in another graphical view that has built in time dimension which enables temporal analysis of query results.

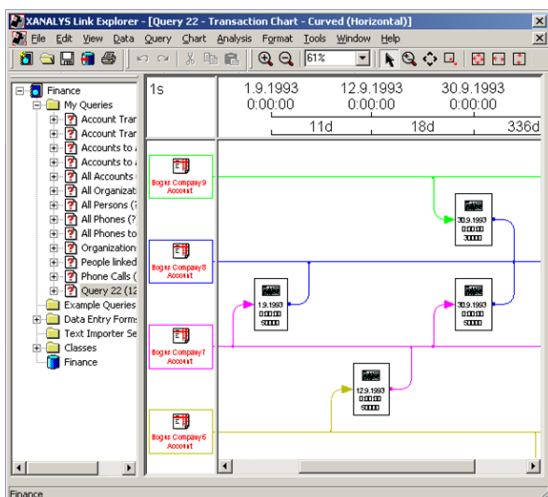


Figure 15. Query results with temporal dimension.

For new query “show all transactions between two specific accounts” it is necessary to create complex constraint in the Constraint Editor in a same way as simple query was constructed. After running that query and after all of the transaction between two specific accounts has been displayed on screen, it is possible to apply Explore analytical function to govern further detailed analysis on specific account. Following figure displays all transactions between two specific accounts (three transactions with total amount of 230.000). Further investigation can be made on the account of the Bogus Company 1 by applying Explore function and the result were natural and legal persons linked with that specific account.

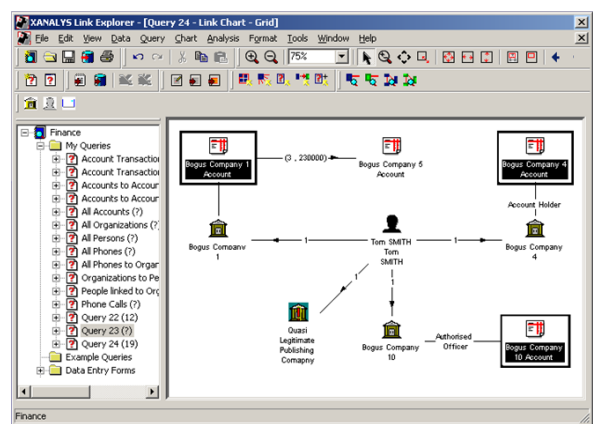


Figure 16. Explore function.

This scenario very briefly explains only a small number of possibilities of Link Explorer analytical software for analysis of competitive intelligence data (in this example we analyze financial data). Analytical features of this tool are much greater but for their efficient usage it is first of all necessary to “have the data” that will serve as a starting ground for analysis. It is also important to have purified data what usually includes ETL procedures and data warehouses.

4 Design, Development and Implementation of Competitive Intelligence Information System

Definition of competitive intelligence information system (CIIS) encompasses not only software and equipment but also procedures that are being used for collection, storage, exchange and distribution of data, information and intelligence. Especially important is lifeware component of the CIIS i.e. employees that collect, process and analyze the data. Therefore, we can say that the competitive intelligence information system represents specialized system for information support to business process of collection, entry,

processing, storage, searching and analyzing data and linking with intelligence analytical software and tools.

That kind of system must allow controlled sharing of data in the system and outside of the system ruled by the “need to know” and “right to know” rules simultaneously enabling timely access to the data. The goal of development of CIIS is enhancing operative efficiency and productivity of employees and organisations that use it and integration of available business information, applications and services that will enable making of right business decisions.

During the development of such system many issues needs to be addressed - inadequate regulations, methodologies and procedures are only some of them. In a case that information needs to be shared with other organizations then procedures on cooperation and data exchange needs to be defined during the development phase. Some of the important decisions needs to be made regarding the time period after the data from the system needs to be archived and removed from the active system, document classification procedures, assessment of reliability and authenticity of data sources and auditing procedures needs to be established and all aforementioned needs to be aligned with positive legislation directives. One important issue that needs special attention during the design and system implementation is to create a system not only for storing the data but to facilitate intelligence processes through built in procedure. Planning and carrying out user education who will work on such system must be included in the system implementation plan.

As a part of CIIS it is necessary to implement a portal that will allow secured access to all data and information (that employee is authorized to) published in CIIS databases. Without the portal or the component that will aggregate the data and display them in one place and that will enable data retrieval and searching, users will have the feeling that the system is like black hole. In fact, data are being entered to CIIS but it is also impossible to find them or the data retrieval procedure is time consuming. Furthermore, by regular usage of the system the quantity of the data can become significant. Thus the portal must have built in functionality of predefined simple queries and possibility of creating complex custom queries.

For authorization of all actions that are initiated in the system every component must use shared security subsystem that is in charge for access right checks during the usage of the system. CIIS must be built in that way that allows consistent way of checking access rights so authorized users must be granted access solely to the information that are entitled to whether this right was explicitly assigned or was inherited because of specific position in the organization. Another important function of security subsystem is recording all important operations that users performed in CIIS. Every time a user opens a

document, performs search or edit some attribute of financial transaction a record needs to be recorded to the special audit database. Access to audit database must be allowed only for very small group of employees, usually administrators who can, when is necessary, extract the data of usage of the system and find out for example which users had access to the data that leaked from the organization.

Data collecting and processing is enabled by case management system – CMS. That kind of system leads users through data processing by means of tasks and it enables controlled sharing of the data inside one case. Data processing stores the data to the databases, creates documents that are stored in the documents database (DMS) and entities are created in entities database (EMS). Special care needs to be devoted to the quality of the data. Without correct and quality data the processing of the same data won't give satisfactory results. That's why it is necessary to use master data for all suitable attributes from Master Data Management System (MDM) which is used for consolidation all business entities in information system and represents the source of the “truthful” data for all other parts of the system.

Apart the users of operational level who only needs the access to the data through the portal and applications for data processing, there is another group of users who, beside portal, needs another way to access the data: through the intelligence analytical software. They use data stored in CIIS in a way that they use analytical software to directly connect to the CIIS databases. Minding the fact that the structure of those databases might not match analytical needs and requirements of analytical software, structure of the data in databases is adjusted for analytical software by means of database views. Exactly the views on the data represent program interface toward external analytical tools, whilst the same analytical tools have rich user interface which provides easy to use way of conducting analysis and investigation, presentation of the results, visualization etc. In a case when there is estimated major number of users of analytical tools it is necessary to reconsider is it worth to develop analytical tools inside the CIIS. It is necessary to estimate the total cost of licences that are necessary to cover all the analysts and to make a decision. Of course, the calculation assumes that CIIS is owned by the organization which does not pay the licences for usage of CIIS and whose investment is only in design, development and implementation of CIIS.

Design, development and implementation of competitive intelligence information system is a long term process that needs to be carefully planned. Meanwhile, it is necessary to develop administrative procedures, intelligence management procedures, management of human resources and necessary technical resources. But that kind of a system is necessary in order to collect and prepare data for analytical tools and Intelligence Analytical Software.

5 Conclusion

For efficient usage of intelligence analytical software in competitive intelligence it is necessary to:

1. create activity plan,
2. gather the data,
3. assess and process the data,
4. analyze the information and create analytical information and
5. based on analytical information carry out the activities.

This process represents simplified version of classical intelligence process and it is of iterative nature.

If specified activities are being correctly applied then the usage of intelligence analytical software will give the right results. At the same time it is necessary to use as many functions of specific analytical software over the same data. In fact, every analytical tool is in some aspects of usage better than the other one therefore it is necessary to know all of the possibilities of different analytical tools in order to achieve the best possible result. Furthermore, usage of specific functionality of analytical software depends on the goal that wants to be achieved. Before any data analysis it is necessary to know what should be done, respectively, it is necessary to know the goal of the analysis.

Also, for efficient usage of intelligence analytical software it is necessary to know analytical methodology and analytical techniques.

Sure, according the GIGO (*Garbage In Garbage Out*) principle, not a single analytical software will enable achievement of satisfactory results if available data are incorrect or old. It is also very important for the data integration process (which is often necessary for achieving suitable results in competitive intelligence) to solve the problems of extreme values, diagnostics and prediction of missing values, linking relational keys from different data sources, achieving data consistency, sampling, categorization of attribute values, forming derived attributes etc.

Successful implementation of CIIS will besides solving before mentioned problems enable synergy effect of applying intelligence analytical software, applying knowledge of using analytical techniques and integration internal and external sources of data.

Comparative set of features and possibilities of usage of intelligence analytical software of i2 and Xnanalys companies in competitive intelligence points out that both tools are equally applicable. But future trends of development of analytical software and distribution of appliance in competitive intelligence (and more) undoubtedly favour products of the i2 company.

Furthermore, i2 has developed much bigger spectra of intelligence analytical software with clear strategy which follows newest events not only in field of intelligence (their analytical products follow the development of analytical techniques, respectively the

needs of the analysts) but also some globalisation trends. For example, based on available information, the next version of i2 intelligence analytical software will have analytical functions related to the field of social networks.

Areas of application of intelligence analytical software in competitive intelligence are actually pretty wide: finance and banking (e.g. money laundry and frauds), controlling, credit cards (e.g. frauds), insurance business (e.g. insurance frauds), corporate security, competitive analysis, forensic data analysis (e.g. in the field of IT or accounting) and so on.

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