*International Research Journal of Social Sciences*_____ ISSN 2319–3565
Vol. **2(4),** 1-6, April **(2013)** *Int. Res. J. Social Sci.*

Tools and Techniques Used in Customer Relationship Management Inside Software Company

Tuţă M. and Zara I.A.
Faculty of Marketing, Academy of Economic Studies, Bucharest, ROMANIA

Available online at: www.isca.in
Received 18th February 2013, revised 12th March 2013, accepted 5th April 2013

Abstract

This paper describes how the regression analysis of temporal variability of crop yield and temperature can be used as a tool to easily assess the quantitative impact of increased temperature, due to climate change, on crop yield. The time series crop yield and weather data are readily available for different districts. The last 30 years yield data of the seven mustard growing districts and the weather data of Hisar were used to model the yield of mustard crop to assess the impact of temperature on the yield of mustard in Haryana. It was estimated that an increase of one degree centigrade in the temperature during the crop growth period will increased the mustard yield in the state by around 140 Kg ha^{-1}.

Keywords: Mustard, temperature, yield, climate change, regression models.

Introduction

During last decades organizations are more and more interested to develop long term relationships with their customers and gain their loyalty. This is not a very difficult thing to do for small companies, where employees can interact directly with their customers and begin to know them very well. Things are very different for larger companies, where there is low or no interaction between employees and customers. The good news is that nowadays all large organizations have informatics systems where each transaction made by a customer is recorded. The first objective of these systems is to help the business cover the daily operational tasks. At a higher level, the data stored in the systems can be used to define loyalty policies for different customers.

A simple definition of data mining is that it is a collection of tools and techniques, offering support for informed decisions for the organizations that are interested in adapting to their customers' needs[1].{ XE "(Berry, 2003):1} It is a process of extracting information from a large data volume, without prior assumption or model. Taking a look in the marketing field, a data mining process should be based on the data collected using a Customer Relationship Management (CRM) system. This way, companies have the opportunity to observe their customers and learn from the past interactions and act according to what has been observed. In time, companies adapt to customers' needs more quickly and the customers' value for the organization may increase.

The main objective of the data mining is to discover patterns in the analyzed data and based on those patterns to help the managers taking different decisions. Some authors refer to data mining as Knowledge Discovery in Database[1].

"Knowledge mining" a shorter term may not describe the importance of mining from large amount of data[2].

According to Data – Information - Knowledge- Wisdom (DIKW) model,"Data simply exists. It gains context to become Information by human interaction, which itself becomes Knowledge by interconversion of different forms of information. Wisdom comes from repetition of DIK cycle"[3]**.** Data mining helps organizations to learn from the data they have from the past, extract information and apply what was learned in the future activities

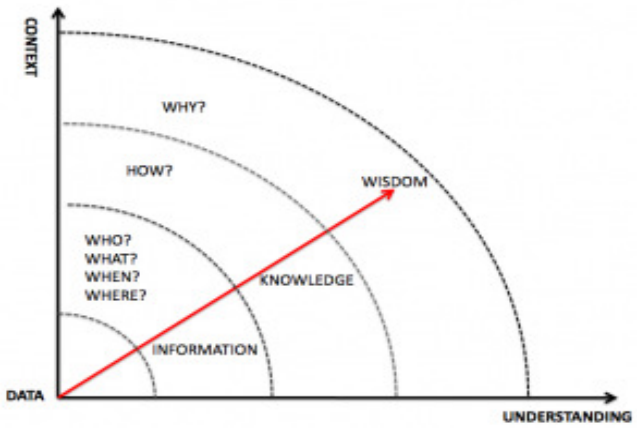


Figure – 1
DIKW model

The data mining developed a lot due to following reasons: companies collect much information based on customers' transactions (e.g.: supermarkets, banks, telephone companies). If a person has a loyalty card from a supermarket that is scanned each time that person buys something and, moreover, he uses a

card to pay for the merchandise, one visit at the supermarket will be recorded at least in two places (in the database of the supermarket and in the database from the bank). Another possible reason is that the IT technologies developed a lot: the hardware is cheaper, the data processing technologies are being developed constantly (e.g.: cloud computing, parallel processing) and networks become more secure (WMN)[5] and more accessible for the public).

Even if data may be stored in different databases inside an organization, they can be collected in a common data warehouse that becomes the memory of the organization and provide the raw material for the data mining process. Last but not least, companies are more and more interested in developing long term relationships with their customers and this is the reason why they need to adapt to their needs very fast and create customized offers.

Material and Methods

The data mining process is creative process and depends on the informational needs of the organization. The main steps of a data mining process are: defining the business problem that needs a solution (e.g.: define the profile of the individuals who are likely to respond to a direct marketing campaign), mining the data and transform it into information that will be the basis for decisions and the last step is to measure the results after the decisions have been implemented. Many times, Data Mining and forecasting face the same challenges of building predictive models in a nonstationary and hierarchical reality[6].

The whole data mining process may not be as simple as it seems. It is essential to define very well the business problem one would like to solve. The common pitfall of not having a good description of the business problem and not having set a clear objective is to learn things that are not useful.

There are two main types of data mining models: supervised models and unsupervised models[7]. The supervised models are defined by two types of fields: input field (predictors) and an output field. The input field is analyzed with respect to their effect on the target field. "An input-output mapping function is generated by the model, which associates predictors with the output and permits the prediction of the output values"[7]. These models are categorized into classification and estimation models.

Compared with the supervised models, the unsupervised models have no output field and the pattern recognition is not guided by a specific target attribute. The unsupervised models are categorized into clusters and grouping. Some researchers deep further into association rule mining[8], but these are out of the scope of the current research article.

Data mining methodologies were created to help the specialist to avoid the pitfalls that may appear in the process. The most popular data mining methodology is Cross Industry Standard Process for Data Mining (CRISP-DM) having six steps to be performed by data miners. Some authors[1] described an eleven steps data mining methodology. The common frame of these two methodologies is: i. Defining the business problem and transforming it into a data mining problem; ii. Defining the data requirements; iii. Selecting the required data; iv. Validating and consolidating the data; v. Creating a model for data mining and choosing a technique (e.g.: for predictive models: splitting the dataset into training set and testing set for evaluation purposes); vi. Applying the model chosen during the previous step; vii. Testing the results and making decisions.

As discussed earlier, the data mining is the process of extracting information from large data volumes and discovering patterns without making any prior assumption. Data analytics favors data visualization to communicate meaningful data patterns.

"Business Intelligence (BI) represents the capability to look inside a business and the environment in which it operates to fundament the most productive and profitable Decisions"[9,10]. It is also known as a powerful support for decision making and the most common technologies used inside a Business Intelligence tool are: reporting, data mining, benchmarking, predictive analysis.

In 1989, Howard Dresner, researcher at Gartner Group defined Business Intelligence as "a set of concepts and methods for improving the decision process, using support systems based on facts".

The main tasks that can be performed with suing a Business Intelligence tool are[11,12]: i. "What-if" analysis; ii. Accessing "ad-hoc" data to answer specific business questions; iii. Forecasting based on the historic data;

Nowadays, the Business Intelligence tools are based on the existence of the Datawarehouses, OLAPs and Data Mining algorithms.

The Datawarehouse collects and consolidates the internal and external data, coming from different parts and systems inside the organizations.

OLAPs (Online Analytical Processing) provide users with the ability to explore and analyse summary of detailed information stored in a Datawarehouse[13].

In 1995, the OLAP Council defined this concept as "a category of software technology that enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user."

Data mining tools can answer the questions like "How?" and "Why?" in comparison with the OLAP's question "What if?"[13].

The Business Intelligence tools include Data Visualization capabilities that enable access to reports, graphics, web pages that can be integrated into organizational portals or any other Customer Relationship Management (CRM) solutions, Supply Chain Management (SCM)[14]. Business Intelligenge can be used also for talent managent if the company uses a Human Resource Management solution (HRM)[15].

In 2012, Jeremy Kolb defined Business Intelligence as "BI is also sometimes referred to as business analytics, decision support, or knowledge management, it encompasses the methods and tools businesses use to analyze and understand important data-both from internal sources like customer records and external sources like government and academic data. Business intelligence is usually differentiated from analytics by its focus. BI typically focuses on the intelligence needed to drive a business, while analytics is slightly more abstract and focuses on the manipulation of the data itself-the algorithms, processes, and techniques used to derive the information. In fact you could probably look at business intelligence as the end product of analytics, when analytics is applied to business data"[16].

Nowadays, from the business perspective Business Intelligence is associated with the software that delivers simple technical reporting solutions for end-users, while analytics is considered to be an advanced discipline within Business Intelligence[17].

The real advantage that BI tools give to entrepreneurs is that they can make more informed decisions, by understanding better the information about company's assets, supply chain management information, personnel data, sales and marketing data[12].

Case Study: The next part of the article is an example of how the use of a Business Intelligence tool can enlarge the service portfolio of a software company that produces, sells and offers support IT services. This is a pilot project and is presented as a didactical example of how can modern technologies and tools are used to strengthen the relationship between a company and its customers.

A well-known IT software company sells licenses and support services for customers acting in different industries worldwide. There are two lines of support services: the first line of support that responds directly when customers have issues and they log a case using a web interface. The technical specialists are grouped in clusters, the main differentiator being the area of expertise. The technical engineers working in the first line of support have a close relationship with the Development Department, in case there is a problem in the code of the products used by the customers.

The second line of support is both proactive and reactive and is organized in different areas of expertise. The proactive services try to help customers not to run into issues because they do not always follow the best practices. The reactive services assist customers with different specific tasks and also with the cases logged with the first line of support.

The first line of support is organized following the ITIL (Information Technology Infrastructure Library) best practices. Following the incident management workflow[19], each case logged by customers is prioritized taking into account the urgency of the incident (how quickly the business needs a resolution) and the level of impact it is causing. The impact can be showed by the number of users that are affected by the problem, or the money customers have to pay by the downtime caused by the failure of the software product. Taking this into account, each case logged by a customer has a severity. The most important ones are severity 1 issues impacting production or a go-live in less than three days and severity 2 cases that have a high impact on customers' business.

The severity 1 cases are worked using the "Follow the Sun" model, on a 24*7 basis, until the case is solved or until customer confirms it can be downgraded to severity 2.

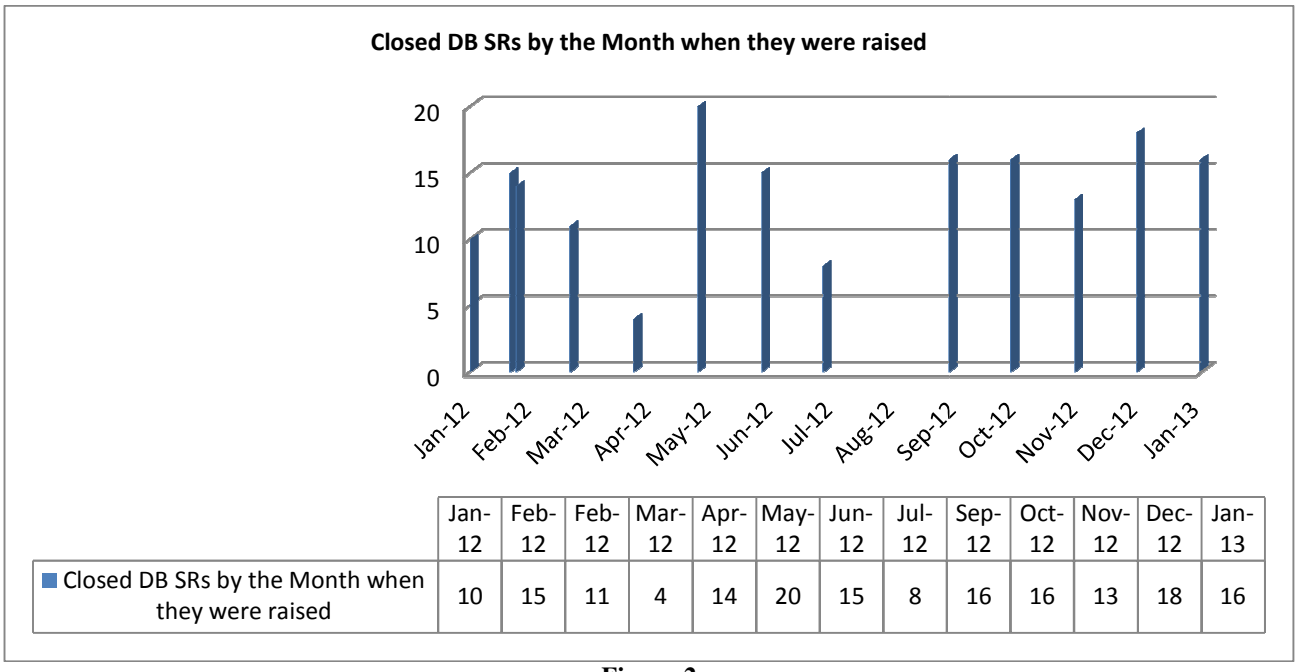
Due to the fact that the engineers from the first line of support can be overbooked, there can be delays in transferring the severity 1 cases from a shift to another and also delays in updating the cases to meet the service level agreement.

The software company keeps the track of all the cases logged by all customers using a Business Intelligence Tool integrated in the Siebel[20] application. The most common information stored in the data warehouse refers to: the date and time the case was logged, the severity and highest severity for a case, the customer contact that logged the case, the technology, if the case has a bug attached (it was caused by an error in the software code), the last update date, the close date, the status of the issue. One of the greatest facilities of the Business Intelligence tool used to run reports is that it is able to show the time spent by a case in different buckets: customer, support or development.

Taking a look on the resolution time of the cases logged by few important customers, the sales persons observed that the resolution time was high for severity 1 and severity 2 issues. During the meetings with customers, they confirmed that they were dissatisfied with how their issues were handled by the first line of support and with the response times. It was clear that a new tailored service had to be created for these customers. The solution was to involve the second line of support, to monitor the critical cases raised by customers (severity 1 issues), to triage them, distribute to different technical teams and work on them in the same time with the first line of support. The second step was to train the customers to involve via email or telephone the second line support on the cases they considered to be top priority.

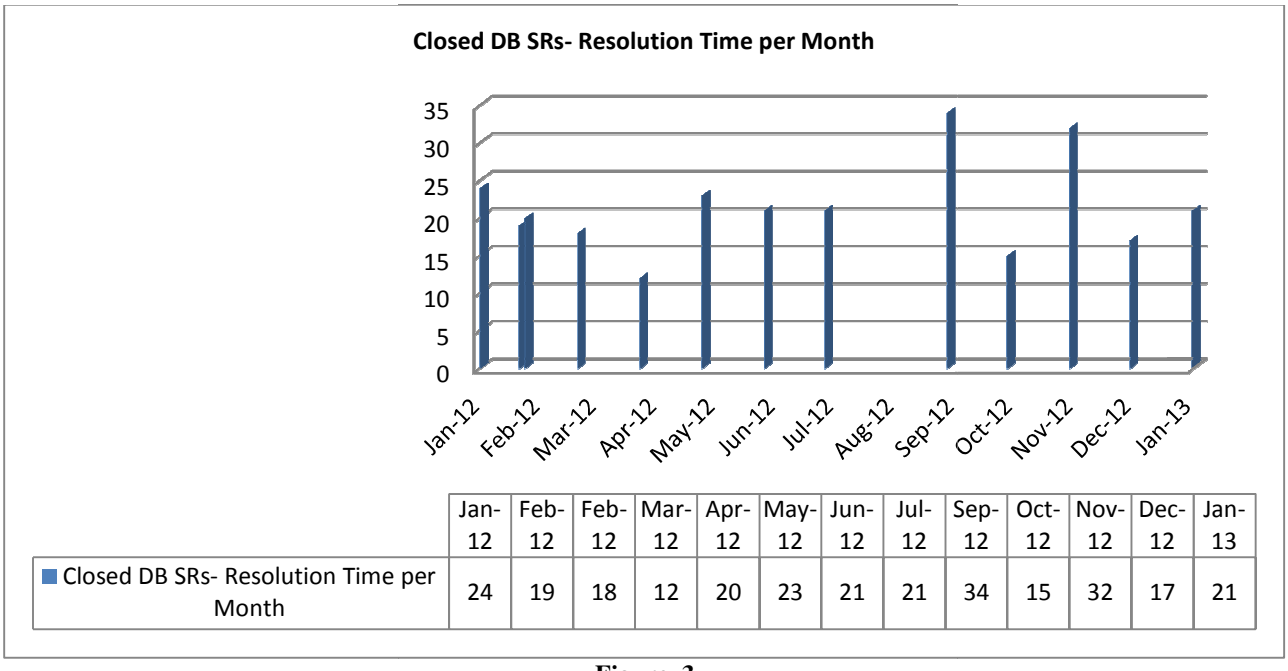
This model was applied to a customer working in the pharmacy industry with branches all over the world, 24*7 supports being mandatory. The data after the first three months of the contract are below:

The number of severity 1 cases is an independent variable that cannot be influenced by the support departments. It depends on the projects customer implements and the way third parties are collaborating towards the implementation.



	Jan-12	Feb-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Closed DB SRs by the Month when they were raised	10	15	11	4	14	20	15	8	16	16	13	18	16

Figure-2
The backlog of the cases logged by customer
Source: the data were collected from the software company, during January 2012 - January 2013



	Jan-12	Feb-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Closed DB SRs- Resolution Time per Month	24	19	18	12	20	23	21	21	34	15	32	17	21

Figure–3
Decrease in resolution time for severity 1 cases
Source: the data were collected from the software company, during January 2012 - January 2013

Results and Discussion

To see if the support activity for this customer improved during the contract, we compared some data collected in 2011 with the data collected in 2012. The number of cases logged increased from 116 in January 2011 to 203 during 2012. The evolution of the time spent with support is presented in the below table:

The decrease in the time spent with support, especially for severity 1 cases is important, mainly because the number of these SRs increased from 105 in 2011 to 198 in 2012.

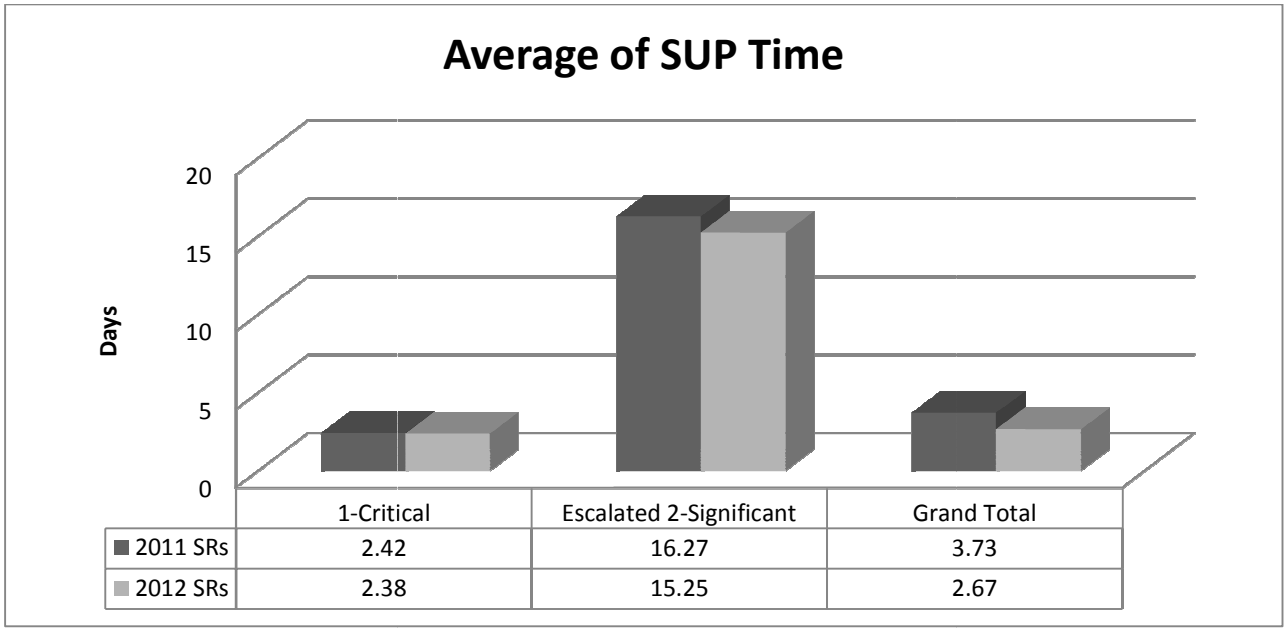


Figure – 4
Decrease in time spent with support
Source: The data were collected from the software company, during January 2011- January 2013

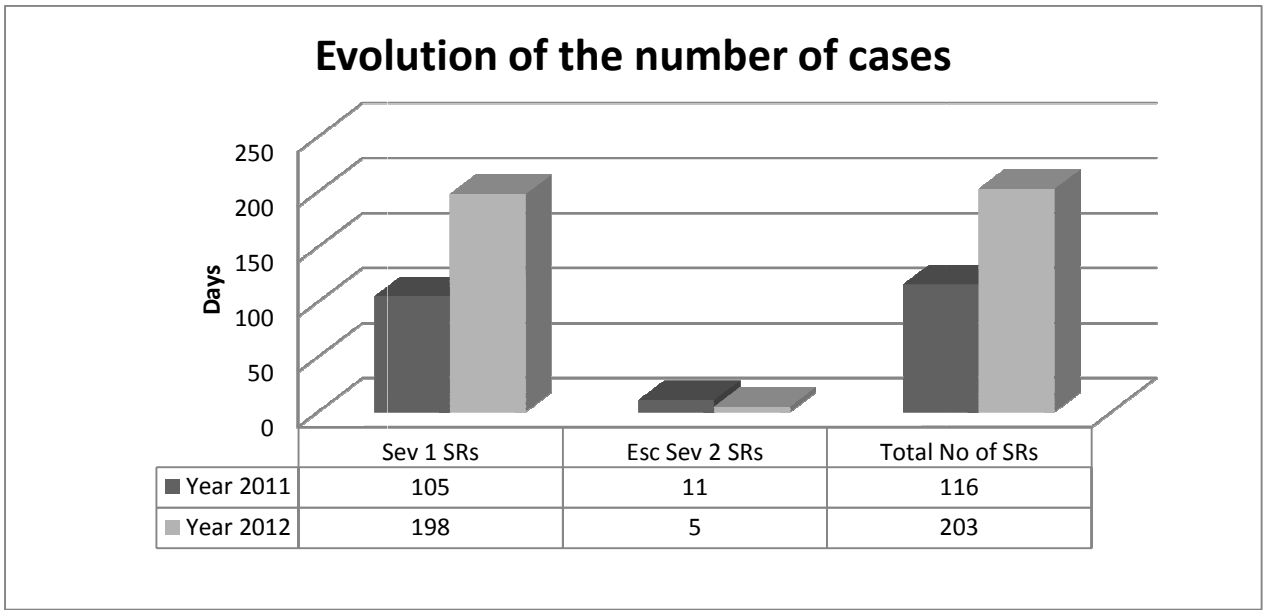


Figure - 5
The evolution of the number of severity 1 and severity 2 escalated cases during 2011 and 2012
Source: the data were collected from the software company, during January 2011- January 2013

The data were exported from the Business Intelligence tool to Excel where they were processed.

There are few conclusions we can extract out of this case study.

The first one is that the Business Intelligence tools have their limits and the information they are returning to the users depends on the data that are collected and the way the dashboard is configured. Particularly, for this case study, the BI tool provided just limited information for in-depth analysis of the Advanced Customer support contribution. The Business Intelligence tool helped in tailoring a customized solution for a particular customer and the direct feedback was good. The result was a renewed expanded contract for 2013.

Another conclusion is that the Business Intelligence tools can only provide the data decision makers who need to know which kind of information is useful for them in a certain moment. The decision belongs to them and the success of the implementation depends on the teams that are delivering the final service and the way they are communicating with the customer.

Conclusion

Data Mining was the first process to extract information from data using different techniques and methodologies. At the moment, the data mining algorithms are integrated in the Business Intelligence applications that help organization to have a 360 view of their relationship with the customers. This type of software solutions offers the possibility to identify a possible customer need and also breaches in the services offered to customers. In the end, the added value for the organizations that are using tools that integrate data mining algorithms is the power to adapt to their customer needs faster.

Acknowledgement

This work was co-financed from the European Social Fund through Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/107/ 1.5/S/77213 „Ph.D. for acareer in interdisciplinary economic research at the European standards" (DOCCENT)

References

1. Berry M.J. A, Linoff G.S., Data Mining Techniques for Marketing, Sales and Customer Relationship Management - Third Edition. s.l. : Wiley, 1-15, 21-86 **(2011)**

2. Raorane A.A., Kulkarni R.V., Jitkar B. D., Association Rule – Extracting Knowledge Using Market Basket Analysis, *Research Journal of Recent Sciences.,* **1(2)**, 19-27 **(2012)**

3. http://www.spreadingscience.com/pdfs/1_DIKW.pdf, *Spreading Science* **(2012)**

4. http://www.cioupdate.com/cio-insights/implementing-knowledge-management-part-i-concepts-approach-1.html, *CIO Update,* **(2012)**

5. Mewada S., Singh U.K., Performance Analysis of Secure Wireless Mesh Networks, *Research Journal of Recent Sciences,* **1(3)**, 80-85 **(2012)**

6. Crone S.F., Mining the past to determine the future: Comments, *International Journal of Forecasting.,* **25(3)**, 441-451 **(2005)**

7. Tsipsis K., Choriannopoulos A., Data Mining Techniques in CRM-Inside Customer Segmentation, S.l. : Wiley, 17-127 **(2009)**

8. Neeraj S., Overview of Non-redundant Association Rule Mining. *Research Journal of Recent Sciences*, **1(2)**, 108-112, **(2012)**

9. Muntean M., Târnăveanu D.A., BI Approach for Business Performance. *5th WSEAS Conference on Economy and Management Transformation. (***2010)**

10. Mukhles Z., Business Intelligence: Its Ins and Outs, *Technology Evaluation Centers, (***2009)**

11. Muntean M., Brandas C., Business Intelligence Support Systems and Infrastructures. *Economy Informatics,* 7, 100-104 **(2007)**

12. Brandas C., Business Intelligence Support Systems and Infrastractures, *International Symposium,* 100-104 **(2006)**

13. Lungu I.C., Bara A., Fodor A.G., Business intelligence tools for building the executive information systems. *Proceedings of the 5th RoEduNet IEEE International Conference, "Lucian Blaga" University Publishers,* 313-315 *(***2006)**

14. Dev N., Attri R., Mittal V., Kumar S. and Kumar P., Strategic Supply Chain Management: Perception versus Reality – A Review, *Research Journal of Recent Sciences,* **1(5)**, 83-86 **(2012)**

15. Nasiripour A., Afshar Kazemi M., Izadi A., Effect of Different HRM Policies on Potential of employee Productivity, *Research Journal of Recent Sciences.,* **1(6)**, 45-54 **(2012)**

16. Kolb J., Business Intelligence in Plain Language: A practical guide to Data Mining and Business Analytics, S.l., Kindle Edition **(2012)**

17. Thorlund J., Laursen G.N.H., usiness Analytics for Managers: Taking Business Intelligence Beyond Reporting, S.l., Kindle Edition **(2010)**

18. Commerce, Office of Government., ***ITIL Service Operation.* S.l.,** The Stationery Office (TSO) **(2007)**

19. Corporation, Oracle., *Corporation Oracle,.* [Online] www.oracle.com/technetwork. **(2013)**