A new framework for the Development of CRM Business Intelligence applications

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Abstract——**While Business intelligence (BI) is a flourishing research area that has mostly been driven by business and IT vendors ,The research area of DSS can provide a set of theoretical foundations upon which to build future BI development and applications. this paper deals with this issue and provide a framework for building BI applications for CRM depending on survy and case study. It provides a conceptual overview of CRM and its relationship to the main reference disciplines (DSS,KM and SE). It describes a model of building business intelligence systems for the CRM, using two case studies. The first case study explore issues related to current CRM practice and identify challenges and future opportunities using survey. The second case study tries to exploit the main basic reference disciplines to develop possible CRM application.**

Keywords——**CRM, Data warehouse, DSS, KM, SE, Business intelligence**

I. I. INTRODUCTION

Various trends are emerging in the field of CRM technology which promises a brighter future of more profitable customers and decreasing costs. One of the most important trends include the move toward the business intelligence (BI) tools, Business intelligence is a flourishing research area that has mostly been driven by business and IT vendors [1][2] . Most of the business intelligence research has come from within the IT industry, and there has been very little academic research within the area of BI compared with DSS (Decision Support Systems).

In this research we want follow The design science paradigm [3] which seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts. Both paradigms are foundational to the IS (Information Systems) discipline, positioned as it is at the confluence of people, organizations, and technology. It can be conformed to Environment relevance factors in the Design Science Methodology which is People, Organizations and Technology. So these three dimensions are also the main factors that affect CRM development [4] , and to develop a successful Solution we have to take care of these dimensions.

Accordingly, multi-paradigm research, is emerging and gaining acceptance within the IS community [5], this methodological proposal arose from the combination of two main paradigms DSS, SE and 3d paradigm KM which represents the perspective of selecting the most suitable CRM development method. In order to specify our reseach, we discussed some special applications of the data warehouse, by giving Customer relationship management (CRM) example and suggest a solution by showing a case study in Airlines industry,

In order to get insight into the development process of CRM, we are planning to use design science approach in analyzing the data from case study. Our first research question was:

1- To what extent the role of CRM in the creation of loyalty of customers. (in terms of communication, interactive and relational functions). This issue will be discussed in section 4 in the Exploration phase.

2- How can we develop CRM applications according to the main basic research areas. This issue will be discussed in section 4 in the Exploitation phase:

The remainder of this paper is structured as follows: Section 2 decripes and discusses the main basic reference disciplines used in this research. Section 3 shows the Contribution of the research. Section 4 discusses our preposition to solve the problem by applying the case study , and we conclude and present future work in Section 6.

II. II. BACKGROUND

A. CRM

Customer relationship management (CRM) implementation has become a hot topic for the past five decades, . CRM can be viewed as s a strategy that integrates the concepts of Knowledge Management, Data Mining, and Data Warehousing [6] in order to support the organization's decision-making process to retain long-term and profitable relationships with its customers. What is important in our research is the Loyalty of customers, According to the empirical "Pareto principle," it is assumed that 20 percent of a company's customers generate 80 percent of its profits [7]. In other words CRM is based on the idea that not all customers are of the same value to a company. It is therefore crucial for a company to direct its marketing efforts towards retaining the top 20% of existing customers rather than spending it on communicating with customers who are likely to be unprofitable.

The key for success is to focus on measuring and managing customers with the intention to create loyal and profitable customers is to build lasting relationships with customers through identifying, understanding and meeting their needs . Identifying the most profitable customers has been a difficult task, but the development of analytical techniques such as data mining , Data Warehousing and web technology has enabled

companies to start pursuing this goal with a whole new level of intensity [8].

According to [9], there is little theoretical empirical research that meaningfully addresses issues of how companies evolve from a transactional focus to a market-driven, relational customer focus. Furthermore, while customer segmentation (or customer classification) [6] can be a powerful analysis, there are some limitations on using single classification techniques when the customer may belong to multiple segments (or classifications). Cunningham [6] discussed data mining algorithms can be classifiedinto three categories:

(1) math-based methods such as neural networks and linear discriminant analysis,

(2) distance-based methods and

(3) logic-based methods such as decision trees and rule induction. .

Although these methods are powerful and accurate but they can be time consuming, especially for business analysts and Software developers. So, another potential research area would be to develop better software development methodologies that can be used efficiently and effectively to analyze customers that belong to multiple segments. We can't achieve this goal without expanding the research methodology into more theoretical and practical bases. in this paper we will show our solution in section 4.

B. DW and DSS

A data warehouse is characterized as a "subject-oriented, integrated, time varying, non-volatile collection of data that is used primarily in organizational decision making." [10]. Since 1990 many organizations [2] have needed to create Data warehouse (DW) . However when we talk about BI as geneeral concept and its specific concept DW, we must refer to KM (knowledge Management), and DSS, the most reference disciplines [11] that have impact upon DW , Data warehouse can be defined as Data-driven DSS .

On the one hand , the term DSS and its offshoot, Executive Information Systems (EIS), have all but disappeared from vendors web sites and a new generation of systems have emerged, namely the BI applications [2]. This is the viewpoint of many researchers who involved in industrial application. On the other hand , no one can deny that DSS technologies [12] can be and have been successfully implemented in practice in order to help solve business problems, It seems clear [13] that the DSS profession has a lot to be proud of, and has made major positive contributions to the organizations, that have seen fit to deploy our collective talents along with the AI technology .

This situation can be interpreted as a sign that the field of BI development should soon enter into new stage of multiplicity of perspectives depending on its main refernce disciplines DSS and KM. This viewpoint copes with the DSS research agenda proposed by Nemati et al. [14]. Specifically, they said, bone research area of DSS becomes the development of a set of theoretical foundations upon which to build future development and applications.

C. Relationship between DSS and DW

The development of DSS includes the specification of the DSS technical components, namely, the DSS user interface, model base, and data base. At the same time, individuals have to work within a social and organizational environment,

Data warehouse can be considered as Data-driven DSS, Data-driven DSS: provide access to large amounts of data and decision support analysis. They enable display and manipulation of data sets. Data-driven DSS can be divided into the subcategories: data warehouses, on-line analytical processing (OLAP) systems, executive information systems (EIS), and spatial DSS [15] .

Software development of CRM is a knowledge intensive activity , an understanding from a Knowledge Management perspective offers important insights about Software Development Methodology [9] for designing and implementing CRM .

D. The effect of KM

Recently, companies have integrated their customer relationship management (CRM) and knowledge management efforts because they realize that knowledge management plays a key role in CRM success [16].

Determining the most valued customer is a sophisticated knowledge task before Technical Software development tasks,. Technology can assist but knowledge management [16] puts the information processing power of technology to effective use, because Collaborating with customers requires a strong clutch of social process exchange, and anticipating or predicting new customer needs can be delivered competently using statistical methods first and then Technical Software development methods.

Nonaka and Takeuchi's SECI model [17] provides an explanation of the social process by which knowledge is created and shared within an organization , beginning from either individual to collective groups , considering knowledge as either explicit or tacit. Nonaka and Takeuchi also proposes corresponding knowledge processes that transform knowledge from one form to another: socialization (from tacit to tacit, whereby an individual acquires tacit knowledge directly from others through shared experience, observation, imitation and so on); externalization (from tacit to explicit, through articulation of tacit knowledge into explicit concepts); combination (from explicit to explicit, through a systematization of concepts drawing on different bodies of explicit knowledge); and internalization (from explicit to tacit, through a process of learning by doing and through a verbalization and documentation of experiences).

Designers need to recognize that with the realization of KM [18] classes of activities in the decision making process it is actually a more complex context than what was once thought, Only after this understanding and realization can a CRM be built that is both efficient and effective Furthermore, the complexity of decisions requires more collaborative approaches to analyze, and CRM as a type of DSS depends on the voluntary commitment of personnel [11], therefore the study of knowledge and KM [1] has increase the possibilities of what a CRM can and should do.
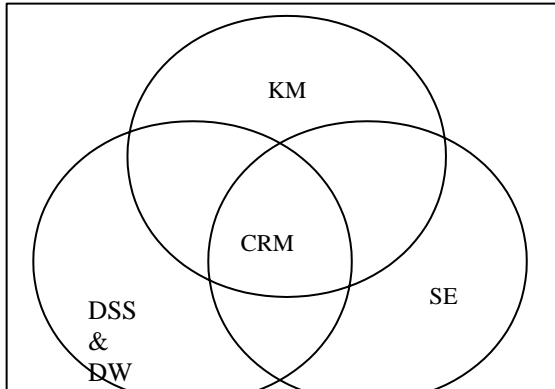
III. CONTRIBUTION OF THE RESEARCH

Fig 1 The proposed Solution is the intersection of the three areas

At a general level, development of CRM applications dpeending on the combination of the three distinct areas, DSS, SE, and KM can be considered to be a contribution in itself as depicted in Figure 2. According to what is founded [19], these fields have not been combined before. DSS as a special kind of information system, SE as a way to provide solution for building DSS, and KM as one of the most reference discipline that have an impact upon DSS and SE. The research problems originate from both DSS and SE fields in away that SE provides "solution" for DSS problems. KM offers the line of thought that effect on the criteria of selecting the suitable development methodology.

By doing this we increase the opportunity of developing CRM successfully. By taking the impacts of these important fields on CRM we will present a new framework for CRM development.

This review of theory and practice of DSS,SE and KM may help the Information System developers and Business analysts to have a clear mind of the development of many CRM applications. This kind of studies is exploratory in nature, and it may be the seed for ongoing research on more than one emergent direction.

IV. CASE STUDY AND PROPOSED RESEARCH METHODOLOGY

This study contributes to the limited literature on using CRM on Jordanian Airline industry since little is known about the impact of CRM on loyalty in the Airline industry in Jordan. One of the most important topics in user experience is the Loyalty of customers in the Airlines companies, The scope of this work fall in the topic of integration of operational CRM which is considered OLTP into analytical CRM or FFP (Frequent Flyer Program) which is considered OLAP, there are many examples show scenarios of booking flights through the internet which was served by ARS (Airline Reservations System) , this need a Database with suitable user interface , But when we want to extend ARS to FFP , In this case , we need more than database and user interface ,we need a model base built upon the data model.

To make balance among previous areas discussed in section 2 we proposed a new model depend on [19] , Our Model consists of two phases: the first phase Exploration phase ,which incorporates an introspective analysis that maps well into the second phase Exploitation phase. The first phase address the first research quistion :To what extent the role of CRM in the creation of loyalty of customers. (in terms of communication, interactive and relational functions). The first phase address the first research quistion : How can we develop CRM applications according to the main basic research areas.

A. Exploration phase:

we should determine first high value customers ,so in Exploration phase it is preferable to begin with user requirements , this could be done through statistical analysis and Collecting the Data using a questionnaire survey of the Airline companies in Jordan. The study aims to find if there is there is a relation between the independent variables (Communication , Transaction and Relational functions) and the dependent variable (customer's loyalty).

Communication function [20] refers to the use of Internet as customer service tool to disseminate information and answer to all enquiries from customers. Examples of this tool include email, chat rooms or bulletin board, and simply Frequently Asked Questions (FAQ). Transactional function reflects the use of Internet technology as a platform to transact with companies such as place orders, check an order status, and view profile of previous activities" . The relational function stated that relational tools include value-adding features such as personalized recommendations personalized webpages, and customized service.

B. Exploitation phase:

Depending upon the previous stage, Our approach should starts from customer (passenger),

TABLE 1
LEVELS OF BUILDING CRM

CRM function	DSS Component	Required System
Communication	User Interface	Booking System
Transactional	Data base	ARS
Relational	Model base	FFP

Table 1 shows the levels of building DW , we noticed that DW is part of DSS , this can be inferred from the gradual representation of complexity from Communication , Transaction to Relational levels of CRM .

after determining the Customer needs and software requirements for CRM software we need to a conceptual framework for DSS that can cope with the diverse techniques and capabilities of DSS. This can be achieved through the conceptual capability assessment framework for DSS (CAF-DMSS) [19[.By using this framework we can determine to which extent of the computation power the 3 main components of CRM.

In this implementation phase we begin bottom-up , from user interfaces , transactional databases to relational models.
1- Communication level
Communication through forms (User Interfaces) to take data from Passengers , As Web users interact with websites via

their web browsers they are providing a vast source of "clickstream" data about their web usage and behavior. This raw data can potentially reveal initial unprecedented detail about the users' attitudes and wishes.

2- Transaction level

After the passengers enters their information through reservation form (flight's number, and other details …) ,the server (through Server side programming languages: Php program and mySQL) store this data into reservation table , this transaction Happens many times for many passengers per day , this information is recorded in FFP the next stage

3- Relational level:

In building FFP we want to determine the number of passengers who fly frequently, If the same passenger travels more than once, then he is candidate to be a member in FFP, FFP system should depends on the type of customer, or the membership tier, which is divided into many segmentation levels [21] : Blue Plus , Silver Plus , Gold Plus and Platinum Plus . This Tiers structure makes it easier for the passengers or members to qualify to the higher tiers based on either the miles they accumulate or the number of segments they travel. It also makes it easier for them to maintain their tier for another year.

V. CONCLUSION

The discussion of current development approaches of CRM applications illustrates the importance of the concept of user understandability for DW development.. However it is not enough to study the techniqal approaches of DW development, we need DSS field to expand the boundaries of sollutions.

To give an example, we previewed a case study about CRM or FFP in the Airlines companies, We have described the initial step of an ongoing research effort towards establishing a unified for building CRM, the next phases of this research are in progress,.

REFERENCES

[1] Carlsson .C and Turban .E ,"DSS: directions for the next decade", Journal of Decision Support Systems, Volume 33, Issue 2, Pages 105-110 , 2002.

[2] Power, D.J. "A Brief History of Decision Support Systems". DSSResources.COM, World Wide Web,
   http://DSSResources.COM/history/dsshistory.html, version 4.0, March 10, 2007.

[3] Hevner, A.R., March, S.T., Park, J. and Ram. S.,
   "Design Science in Information Systems Research," MIS Quarterly, Vol. 28 No. 1, pp. 75-105, 2004.

[4] A. Gericke and T. Bucher, "Realization Approaches of Customer Relationship Management - A Design Science Research Contribution to Support the Construction of Situational CRM Artifacts", ;in Proc. DESRIST, 2010, pp.349-364.

[5] Vessey, I., V. Ramesh and R. L. Glass, ?Research in Information Systems: An Empirical Study of Diversity in the Discipline and its Journals?, forthcoming Journal of Management Information Systems, 2002.

[6] C. Cunningham, I. Song, and P.P. Chen, "Data Warehouse Design to Support Customer Relationship Management Analyses", ;presented at Database Technologies: Concepts, Methodologies, Tools, and Applications, 2009, pp.702-724.

[7] Sathyapriya.P, Naghabushana R, and Silky,"Customer Satisfaction of Retail Services Offered in. Palamudhir Nizhayam" International Journal of Research in in Finance & Marketing , 2012

[8]Abu-Kasim, N.A. and Minai, B. , Linking CRM strategy, Customer performance measures, and performance in Hotel Industry. International Journal of Economics and Management, 3(2), 2009, pp 297-316.

[9]Gharaibeh ,N , Challenges In Building Data Warehouse Regarding to End User And DSS , 2012 5th International Conference on Advanced Computer Theory and Engineering , (ICACTE2012), 2012,

[10] Turban, E., Aronson, J.E., Liang, J.E. & Sharda, R. "Decision support and business intelligence systems" (8th ed.). Upper Saddle River, New Jersey, USA: Pearson, Prentice Hall , 2007.

[11] Eom, S , The Changing Structure of Decision Support Systems Research: An Empirical Investigation through Author Cocitation Mapping, The 2004 IFIP International Conference on Decision Support Systems - Prato, Tuscany, 2004, pp.243-251.

[12] Lang, K., Whinston, A., "A design of a DSS intermediary for electronic markets", Decision Support Systems, 1999, .181–197.

[13] Cassaigne, N, Lorimier, L A, "Challenging Future for i-DMSS", In: Intelligent Decision-Making Support Systems (i-DMSS): Foundations, Applications and Challenges. Springer, 2006, pp401-422.

[14] Nemati, H., Steiger, D. , Iyer ,L., Herschel, R, "Knowledge warehouse: an architectural integration of knowledge management decision support, artificial intelligence and data warehousing", Journal of Decision Support Systems 33, , 2002,43– 161.

[15] Power, D.J, "Decision support systems: concepts and resources for managers". Westport, Conn., Quorum Books, 2002.

[16] Analyzing the impact of knowledge management on CRM success: The mediating effects of organizational factors , Volume 31, Issue 5, 2011, pp 437–444

[17] Nonaka, "A Dynamic Theory of Organizational Knowledge Creation", Organization Science, Vol. 5, No. 1, 1994, pp.14-37.

[18] Kiku, J., "Knowledge Management as a foundation for Decision Support Systems", The Journal of Computer Information Systems articles , 2006.

[19] Gharaibeh ,N ,DSS development and Agile methods: Towards a new framework for software development methodology, In International Journal of Machine Learning and Computing (IJMLC) , August , 2012

[20] Ab Hamid, N. R . E-CRM: Are we there yet? Journal of American Academy of Business, Cambridge, 6(1), 2005,pp 51-57.

[21]   (2013)   available   at www.rj.com/en/ffp_membership_tiers_benefits.html