DATABASE MARKETING PROCESS SUPPORTED BY ONTOLOGIES
System Architecture Proposal

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Abstract: This work proposes an ontology based system architecture which works as developer guide to a database marketing practitioner. Actually marketing departments handles daily with a great volume of data which are normally task or marketing activity dependent. This sometimes requires specific knowledge background and framework. This article aims to introduce an unexplored research at Database Marketing: the ontological approach to the Database Marketing process. Here we propose a generic framework supported by ontologies and knowledge extraction from databases techniques. Therefore this paper has two purposes: to integrate ontological approach in Database Marketing and to create domain ontology with a knowledge base that will enhance the entire process at both levels: marketing and knowledge extraction techniques. Our work is based in the Action Research methodology. At the end of this research we present some experiments in order to illustrate how knowledge base works and how can it be useful to user.

1 INTRODUCTION

Database Marketing (DBM) is a database oriented process that explores database information in order to support marketing activities and/or decisions. The Knowledge Discovery in Databases (KDD) process is well established among scientific community as a three phase process: data preparation, data mining and deployment/evaluation. The KDD has been successfully applied in various domains particularly in the marketing field. Nevertheless previous well established concepts and scientific dominance regarding each one of these methods, seem to have a lack of knowledge concerning its application amongst different requirements and conditions.

Available literature describe a DBM project as comprised of a sequence of phases and highlight the particular tasks and their corresponding activities to be performed during each of the phases. It seems that the large number of tasks and activities, often presented in a checklist manner, are cumbersome to implement and may explain why all the recommended tasks are not always formally implemented. Additionally, there is often little guidance provided towards how to implement a particular task These issues seem to be especially dominant in case of more complex analytical objectives at marketing activity understanding phase which is the foundational phase of any DBM project.

In computer science, ontologies provide a shared understanding of knowledge about a particular domain (Gruber, 1993). At the best of our knowledge the number of contributions to the construction of marketing ontologies is very low. However, they are starting to come to light through

some marketing or computer research centers (Grassl, 1999), (Bouquet et al., 2002), (Zhou et al., 2006).

This research is part of a larger project to build and develop a DBM Ontology (DBMO). The DBMO should cover a semantic description of processes supporting DBM, comprising classified marketing objectives and activities, knowledge extractions methods, objectives and tasks.

Our proposed research context focuses DBM as the intersection of two others disciplines (knowledge extraction techniques and marketing). Here, we introduce ontologies as support to the knowledge structure and integration of both.

One of the promising interests of marketing ontologies is their use for guiding the process of knowledge extraction in DBM projects. A tool that gradually accumulates knowledge of the previous domain developed processes is appropriate due its iterative nature. Researchers often rework their data in order to optimize further interactions. Integrating this knowledge with ontology extends the ontology usefulness.

We are proposing the initial conceptual structure to the domain ontology as an integral part of a global marketing system. According to some researchers our ontology can be classified as an application ontology (Sowa, 2000), serving our main global project.

2 THE USE OF ONTOLOGIES IN MARKETING

Ontologies are nowadays one of the most popular knowledge representation techniques. When ontologies are formalized in any kind of logic representation, they can also support inference mechanisms (Mylopoulos et al., 2004). For a given collection of facts, these mechanisms can be used to derive new facts or check for consistency. Such computational aids are clearly useful for knowledge management, especially when dealing with complex and heterogeneous knowledge problems or with large amounts of knowledge.

Ontologies use a formal domain or knowledge representation, agreed by consensus and shared by an entire community. Ontologies roles in DBM have particular significance in a cross research (both marketing and extraction techniques knowledge is needed) area focus. Indeed, ontologies can play an important role describing in a semantic form, all concepts and techniques around the process. Moreover, with such description it will also be

possible, to introduce metrics to compare and therefore select and suggest the best approaches and methods to a new project.

3 RESEARCH APPROACH

We have used action research based on two main reasons. Firstly, due the low number of scientific research works that has been conducted on supporting DBM process over intelligent structures like ontologies, the process by which this may be completed is unclear. Secondly, ontologies can play an important role in the knowledge development as long as they register past knowledge for future reuse. Thus exploratory research was required and action research provides this capability better than many other alternatives (Dick, 2008). Action Research approach develops in a four step framework: first formulate (plan), test (act), deploy (observe) and evaluate (reflect). In this work we introduce a connection element between each interaction: ontological support. Supported by a previous research work throughout the marketing knowledge we had constructed a symbolic model for representing knowledge and a tree structure (Figure 1). Here we intended to differentiate between different knowledge levels structure tree towards the following statements: Principal data information type identification in marketing database; Main DBM steps from marketing data to customer knowledge; and DBM process' matrix: Knowledge base elements identification and creation

4 FINDINGS

The research project was done with a group of database marketing practitioners. Our preliminary findings are summarized in Table 1. Ending the action research a practical and functional analysis was made towards a possible conceptual semantic map. Turning our action research to analytic generalization, we can build a theoretical framework (Yin, 2003). Linked to extant literature that shows how the DBM process is developed, how associated marketing knowledge can be structured and which knowledge discovery approaches may be used.
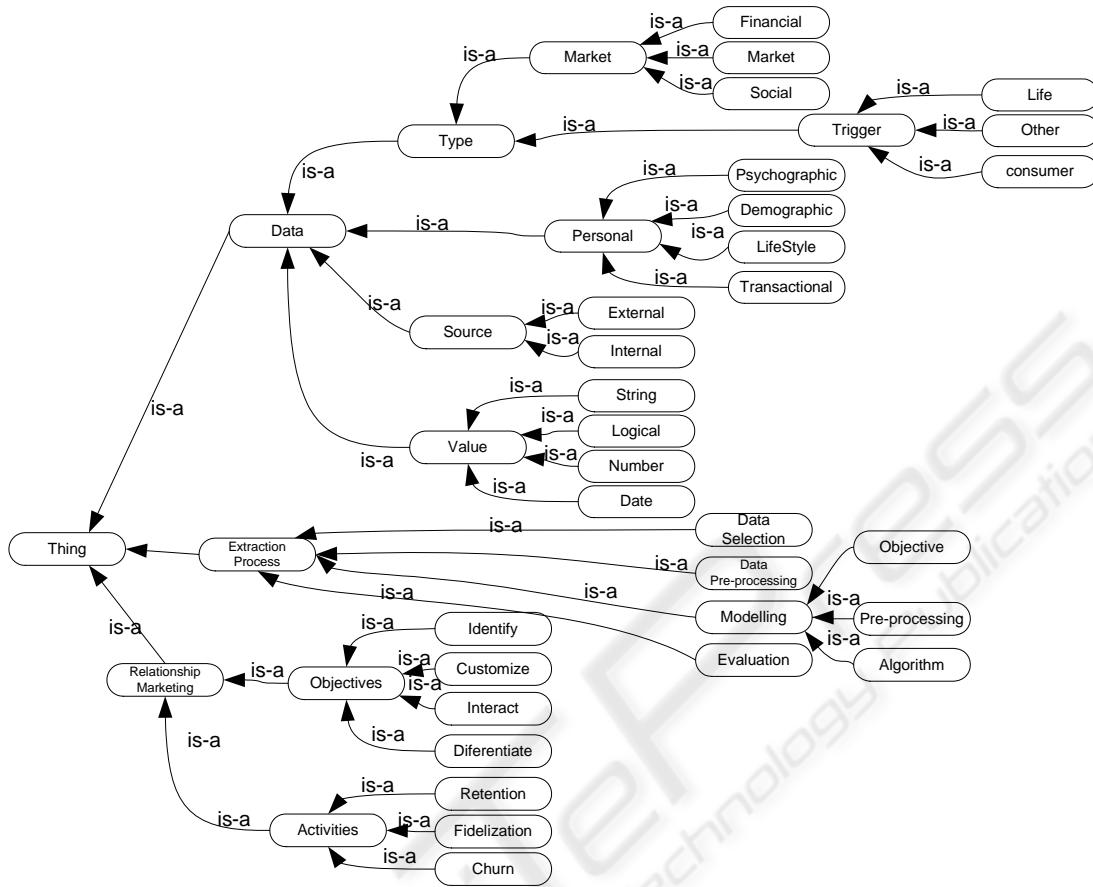
Figure 1: Current Database Marketing Ontology.

Table 1: Action research findings.

Research issue	Findings about the research issues
Principal marketing database data type information	From some literature review and supported by previous work done we found four main marketing data types: Psychographics; Demographics; Life style; and, Transactional.
Main DBM steps	Based on both practice and literature review we considered the following steps as a stable DBM process framework: Marketing objectives definition and activity selection; Data selection; Data preparation; Data pre-processing; Modelling; Model evaluation; and Business deployment and evaluation.
DBM process' matrix	

	Marketing Objectives | Activities
Knowledge Extraction cases	Description record set: { Data set Data selection Data pre-processing Data Preparation Algorithm used Technical evaluation Business evaluation }

5 DISCUSSION AND CONCLUSIONS

The extent, degree and simplicity of communication enabled by the ontology makes it a synergistic component of DBM strategy. An ontological DBM approach solution appears promising for both marketers and computer scientists.

One of the promising interests of DBM ontologies is its use for guiding the process of knowledge extraction from marketing databases. This idea seems to be much more realistic now that semantic web advances have given rise to common standards and technologies for expressing and sharing ontologies (Coulet et al., 2008). In this way DBM can take advantage of domain knowledge embedded in DBMO. The results of this research have implications for both theory and practice. The first practical results relate the possible feedback between different DBM projects through a table with all used resources registered. It will be possible to implement, through ontologies, a knowledge base with suggestion or work profile capability. That Knowledge base, according to the previous registered experiments will be also capable to suggest to each marketing objective which marketing activities, data to be selected and also tasks to be performed should be chosen. Another implication relates to the benefits of a global view of marketing databases role in marketing objectives: then is possible to fill them with appropriate data.

Our model further emphasizes the importance of the marketing knowledge to be structured in order to allow resources reuse or even to achieve synergies in marketing activities development. Thus managers and marketers should be aware of this issue, because there is a loop through which performance of DBM process can effectively be improved.

The research findings and contributions have several implications for the theory about ontologies and DBM, as well as the use of Action Research methodology. This research provides new insights into DBM theory in two ways: First this research appears to provide the first global investigation about the intersection of ontologies and DBM in organizations, and how it may be achieved. Thus this research contributed to the theory-deficient area of the integration of ontologies and DBM. Second there is to few literature dedicated to marketing ontologies and thus this research appears to be one of the first academic investigation of this phenomenon.

The impact of that ontology is the future initiation to a shared DBM knowledge platform that will provide a trusted base between marketers, DBM practitioners and artificial intelligence researchers. Indeed this research identifies a number of areas requiring further research, namely to marketing knowledge tree and therefore marketing ontology.

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