



FTiS: A new model for effective urban management: A case study of urban systems in Iran

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ABSTRACT

As citizens' needs increase and become more complex, governments must implement special policies and services to improve citizens' satisfaction levels. In this context, the municipality of Tehran, the capital of Iran, established an urban management system to respond to complaints about urban services. The system's database includes detailed information about citizens' calls and can be analyzed to identify their needs. One of the techniques that can be useful for extracting useful knowledge is data mining. In this paper, we use the citizen relationship management (CiRM) and data mining approaches to identify urban citizens' primary needs. Accordingly, a novel model is presented that is composed of three major factors: "Frequency", "Time interval" and "Satisfaction". Using these variables and the clustering technique, a new division of urban needs is proposed based on primary, secondary and uncommon needs. The results show that the data mining and CiRM approaches are useful for improving urban management. This approach could also be used in customer relationship management (CRM) in the public sector domain.

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Introduction

As an increasing number of cities expand, life in these cities becomes more complex and citizens' needs increase. As citizens' needs become more sophisticated and complicated, governments must implement special policies and services to improve citizens' satisfaction. Municipal governments are key institutions that can improve their responsiveness to citizens' needs and demands. Therefore, the municipality of Tehran established an urban management system to respond to complaints about urban services. The main purpose of this system is to provide qualified and timely responses to urban citizens' needs. Furthermore, detailed information from citizens' calls is stored in a database and can be analyzed to identify their needs.

Understanding citizens' needs is especially important in citizen relationship management (CiRM) and could be notable as the first step in CiRM (Sasaki, Watanabe, & Minamino, 2007). One of the techniques that has proven useful to extract hidden customer characteristics and needs from large databases is data mining (Berson, Smith, & Thearling, 2000; Ngai, Xiu, & Chau, 2009). In this paper, we concentrate on using information systems in urban planning

and use data mining techniques to understand urban citizens' primary needs.

The implementation of information systems is recommended in urban management applications (Benslimane, Leclercq, Savonnet, Terrasse, & YeÀtongnon, 2000). The widespread application of Geographic Information Systems (GISs) in urban cases demonstrates the usefulness of these systems. Several authors have studied the advantages of using GIS technologies to integrate other analytical methods (Bishop, Escobar, Karuppappan, Williamson, & Yates, 2000; Cooper, 2008; Kim, Lee, Oh, Choi, & Won, 2006; Mancin, Stecchi, & Gabbianelli, 2009). For example, Tsou, Hung, and Chang (2005) and Chang and Liao (2011) have used GIS to integrate spatial analysis models to achieve equity in the distribution of urban public facilities. Malcata Rebelo (2010) proposed a methodological approach based on GIS, decision trees and neural networks to fulfill the needs of different population groups. Luque-Martínez and Muñoz-Leiva (2005), AbuSada and Thawaba (2011) and Bugs, Granell, Fonts, Huerta, and Painho (2010) have also used GIS to incorporate other technologies and techniques.

With the growth of information systems used in urban planning, one of the techniques that could be used to efficiently analyze stored data is data mining, which can be viewed as a result of the natural evolution of information technology (Han & Kamber, 2006). Data collection, data storage and retrieval, database transaction processing, data warehousing and data mining are some aspects

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of the evolution of database system technology (Han & Kamber, 2006). Regarding the application of data mining in different domains, some recently published papers have also focused on using data mining tools in the area of urban planning (Lee, Tseng, & Tsai, 2009; Richards, Ghanem, Osmond, Guo, & Hassard, 2006; Spielman & Thill, 2008).

This paper focuses on the application of data mining and the CiRM approach in urban service management. Specifically, a new methodology based on the clustering technique and “Recency, Frequency and Monetary (RFM)” analysis is implemented to identify urban citizens’ primary needs. This methodology presents a novel approach, in contrast to traditional RFM usage. It presents three major factors: “Frequency”, “Time interval” and “Satisfaction”. These variables can be applied as the major factors in identifying citizens’ needs, while RFM attributes are used to identify more profitable customers. These three variables could also be used in a wide variety of cases to discover customers’ needs in the public sector.

The rest of this paper is arranged as follows: Section 2 provides an overview of related literature. Section 3 presents the proposed methodology. Section 4 states the experimental results. Section 5 explains the practical implementation of the results. Section 6 presents the conclusions.

Literature review

In this section, we summarize the existing literature related to customer relationship management (CRM) and related topics, including CRM adoption and implementation, CiRM and RFM. The application of data mining tools in CRM, the clustering technique, K-means algorithm and the Silhouette validation measure are also briefly described.

CrM

In recent years, CRM has become a top priority for scholars and managers and has been identified as an important business concept (Becker, Greve, & Albers, 2009; Ngai, 2005; Ngai et al., 2009). According to Ngai (2005) and Ngai et al. (2009), some definitions were proposed by Swift (2001), Kincaid (2003), Parvatiyar and Sheth (2001) for CRM but there is still no universally accepted definition (Ling & Yen, 2001; Ngai, 2005). However, all of these works described it as a set of strategies for managing relationships with customers in marketing, sales, and service and support within the organization. CRM includes a wide range of areas and domains. The topics relating to this research are discussed below.

CRM adoption and implementation

CRM adoption is growing rapidly and many companies have started implementing CRM strategies. This subject has been considered by many academic and practitioner researchers, and many markets have invested in this domain (Bohling et al., 2006; Sharma & Iyer, 2007; Becker et al., 2009). The growing body of literature on this subject also illustrates its importance. Many papers have been published on CRM adoption and implementation, and some frameworks have been presented for successful CRM implementation (Hart, Hogg, & Banerjee, 2004). According to Hart et al. (2004), these studies fall into one of four categories: “objectives set for CRM”, “evaluation methods for CRM”, “determinants of success of CRM and effectiveness of CRM tasks” and “reasons for failure”. Most of these papers refer to the successes and the failures of CRM implementation.

The rate of failure is high in CRM implementation, and many companies fail when using CRM strategies (Askool & Nakata, 2011; Gartner Group., 2003; Greenberg, 2004; Kamprath &

Roeglingery, 2009; Rigby, Reichheld, & Schefter, 2002; Zablak, Bellenger, & Johnston, 2004). There are also successful cases of CRM implementation (Finnegan & Currie, 2010), but the rate of failure is higher than the rate of success. Accordingly, many scientists have focused on the factors that affect the adoption of CRM (Askool & Nakata, 2011) and the causes of failure in CRM projects and systems.

Finnegan and Currie (2010) declared that these failures relate to the fact that companies use CRM as a software package without considering the integration of culture, process, people, and technology within and across the organizational context. They believe that a more in-depth understanding of the integration of these issues is needed for successful CRM implementation.

Askool and Nakata (2011) also stated that the main reasons for these failures relate to a focus on the technological aspects of CRM projects without considering behavioral and cultural issues. Mendoza, Marius, Pérez, and Griman (2007) grouped the main causes of failure in such projects into four categories as follows:

- Organizational change (29%)
- Company policies/inertia (22%)
- Little understanding of CRM (20%)
- Poor CRM skills (6%)

Mendoza et al. (2007) presented a model for successful CRM implementation that includes 13 critical success factors, which refer to three main items: human factors, processes, and technology. Alshawi, Missi, and Irani (2011) also categorized the factors affecting CRM adoption and implementation into three groups: organizational, technical and data quality factors.

Most of the related literature studies the success and failure of CRM projects but there are also some papers that have investigated other subjects in the domain of CRM implementation and adoption. Below, some of these studies are briefly mentioned.

Some authors have studied the impact of CRM implementation on the performance of the company. For example, Becker et al. (2009) investigated the effect of CRM implementation on the initiation, maintenance, and retention of customer relationships. In another example, Beldi, Cheffi, and Dey (2010) studied the relationship between project management and CRM implementation via the different phases of the implementation process. The point is that project management is very important in CRM implementation because of the organizational and technological changes in such projects. Sharma and Iyer (2007) also investigated the effects of marketing infrastructure and institutions on the success of CRM implementation projects.

There are also some studies that investigated the relationship between knowledge management (KM) and CRM implementation. Among such studies are Croteau and Li (2003), Gebert, Geib, Kolbe, and Brenner (2003), Stefanou, Sarmaniotis, and Stafyla (2003), Sigala (2005), Dous, Kolbe, Salomann, and Brenner (2005), Shi and Yip (2007), Lambe (2008), Hung, Hung, Tsai, and Jiang (2010) and Garrido-Moreno and Padilla-Meléndez (2011). For example, Sigala (2005) proposed a model for successful CRM implementation that integrates KM with ICT capabilities. Garrido-Moreno and Padilla-Meléndez (2011) applied a structural equation model to investigate the relationship between KM and CRM success. The main result is that using KM is very important for the success of CRM but not sufficient in and of itself. Indeed, they declared that KM could be considered the main success factor for CRM implementation, and other factors introduced in the literature have direct or indirect effects on CRM success. Garrido-Moreno and Padilla-Meléndez (2011) found that an integration of KM capabilities with organizational, technological, customer orientation and CRM experience factors is needed for the success of CRM solutions.

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