Towards Automation of Business Intelligence Services Using Hybrid Intelligent System Approach

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ABSTRACT

Business Intelligence (BI) includes many tools, techniques and technologies. BI processes often involve team of human decision makers and end-users to extract, explore and analyse the data. The results, decisions or models after analysis need to be implemented into operational systems. There can be considerable time delay between business events happening and action taken thus loosing opportunities. Intelligent techniques such as rule-based reasoning and case-based reasoning have been used extensively to address wide range of intelligent tasks including personalisation and recommendation. Some BI tasks can be modelled, automated and delivered through services rather than done on ad-hoc basis. The authors represent a service based approach to BI where a service corresponds to a well defined analytical functionality implemented using intelligent technique(s), filtering techniques or hybrids of them accessing only relevant data from database specifically modelled and designed for such tasks. The authors discuss an application of the approach for a value-added service in mobile domain.

Keywords: Business Intelligence (BI), Case-Based Reasoning, Filtering Techniques, Hybrid Intelligent Systems, Personalisation, Recommendation

INTRODUCTION

Many organizations are increasingly using BI tools such as data mining that work on top of data warehouse to build analytics especially domains like customer relationship management (CRM) to identify, attract, understand, serve and retain the customers (Ngai, Xiu, & Chau, 2009). The customers of hyper competitive retail businesses such as telecom, e-tailing, insurance, media and entertainment have been pampered with choices. New products and services are introduced on ongoing basis and time to market has been substantially reduced. Changes in job profiles, income levels, locations, family statuses, life styles along with availability of various new options and choices, their tastes and requirements keep changing.
Analysis that is done based on what they did many years back may not be relevant in the current context. Analysis should be done on ongoing basis tracking every activity the customer does, looking for opportunity and taking immediate action or within reasonable time. In competitive environments, the business firms require continuous analysis of data generated through various activities for insights, only episodic and ad-hoc or craft-based will not suffice (Davenport, Harris, & Morison, 2010). Delays in recognizing, interpreting and acting on insights and changes are critical emerging impediments to competitiveness (Prahalad & Krishnan, 2008).

BI many a times includes tasks such as classifying millions of customers into loyal and non-loyal, clustering or segmenting them into few groups like platinum, gold, iron, lead etc., however, in the worst-case scenario each one can have an unique behavioural patterns based on his or her demographic profile, interactions or transactions that he or she does with the firm. It may not be that effective to apply the broader group rule(s) or behaviour(s) to the customer or try to fit the customer into a group to understand and serve him or her. The bottom line is: even a firm is dealing with millions of customers the firm must analyse, understand and serve one customer at a time (Prahalad & Krishnan, 2008) to get better customer life time value.

Firms like Amazon, Netflix offer unique personalised experiences to their users based on their past transactions, likes and dislikes. Large number of products and contents (catalogues) are made available online and they are personalised and recommended. So that each user gets what he likes or tastes are. It helps to form groups of niche: people who like particular kind of product or product (Anderson, 2006). Various filtering techniques (Felfernig, Friedrich, & Schmidt-Thieme, 2007) have been used to implement personalization to offer unique experiences to individuals. While personalisation has been successfully applied in domains like e-Commerce (Adomavicius & Tuzhilin 2005; Balabanovic & Shoham, 1997; Burke, 2007; Felfernig et al., 2007; Mandl, Felfernig, Teppan, & Schubert, 2011), one of the challenges is, offering it on various mobile interfaces like SMS, voice and WAP (wireless application protocol). The interfaces like SMS and voice are less interactive not much of information is available compared to WAP kind of interfaces where click-streams can be tracked like on the Web. Another challenge is the size of mobile screen. The personalised items (we used the common term item to refer to product, service, content, campaign, offer etc.) to be targeted and pushed to the individual mobile subscriber must be very relevant based on his or her changing likes and dislikes, preferences and needs, objectives and constraints.

In retail domains, it makes sense to have a BI approach which: (1) automates BI activities: making BI systems as part of overall operational systems. Implementation or integration of results or models becomes easier (instead of following ad-hoc approaches); (2) facilitates time-based action: no time delay between business event happening and action taken thus gaining on every opportunity; (3) uses operational data stores: only required and relevant data based on BI tasks to be automated are stored instead of storing all historical data to decrease the volume of storage and data analysis; (4) analyses data at granular level: analysis is done at an entity level at a time such as customer rather at macro-level. Figure 1 shows conventional approach to BI. We propose an approach to BI that uses conventional database systems which are capable of managing and handling huge amount of data in real-time, and intelligent techniques (and filtering techniques implemented using them) which are capable of solving wide-range of tasks like classification, segmentation, diagnosis, optimization, intelligent matching, personalisation and recommendation etc. called as KB.BIF: knowledge-based business intelligence framework illustrated in Figure 2.

As mentioned earlier KB.BIF is backed by intelligent techniques such as rule-based reasoning (RBR), case-based reasoning (Aamodt & Plaza, 1994) and hybrids of them called hybrid intelligent systems (Corchado, Corchado, & Abraham, 2008; Goonatilake & Khebbal,
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