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A novel approach to conduct the importance-satisfaction analysis for acquiring typical user groups in business-intelligence systems

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ABSTRACT

Business intelligence (BI) is a powerful tool to conduct causality analysis and corporate diagnoses since it provides a data-driven approach to link firms' strategic goals into tactical policies and operational actions. Specifically, BI consists of a series of architectures and techniques like database, data warehousing, and data mining that transform raw data into useful information to provide decision supports. In reality, typical BI user groups involve financial analysts, marketing planners, general managers, field staffs, upstream suppliers, and downstream customers. Inspired by the concept of STP (segmentation-target-positioning) and product family design, BI systems need to be customized to satisfy diverse user groups and tailored to a firm for solving complicated but specific business problems. Consequently, a novel framework is proposed to fulfill the following goals: (1) incorporating user preferences to identify key design features that best fit BI's main segments for achieving customer acquisition, (2) transforming user perceptions into quantitative degrees of satisfaction for accomplishing customer retention, and (3) conducting the importance-satisfaction analysis to generate managerial insights for developing next-generation BI systems.

1. Introduction

The concept of business intelligence (BI) can be traced back to 1958, when an IBM researcher Hans Peter used the term in an IBM Journal article. In 1980s, decision support systems (DSS) became popular, and then BI started to emerge as an umbrella in mid 1990s to cover software-enabled innovations in performance management, business planning and analytics, *ad-hoc* reporting, end-user querying, and predictive modeling (Ravi, 2012). According to Eckerson (2003), the main reasons that an organization wants implementing BI are summarized in Fig. 1, including accessing information, identifying threats and opportunities, knowledge discovery, and so on. Recently, rapid advances in information technologies such as database management, data warehousing, and big data mining further embarks the use of BI (see Table 1). In choosing an enterprise information system, project executives need to answer the followings in advance (Tsai, Lee, Liu, Lin, & Chou, 2012a; 2012b): (1) what are your business requirements? (2) how much return on investment do you expect? (3) how to tailor commercial software to the legacy system (business process transformation)?

Today, enterprise software assessment & implementation becomes a critical issue since it may significantly affect the performance of corporate diagnosis (Tsai et al., 2011; 2012b; Wang, 2015b). For example, there is an increasing trend to purchase software packages for enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), and product lifecycle management (PLM). Although functional features are well documented and easily understood by the technical users, many studies (Calisir & Calisir, 2004; Chang, Hsu, & Shiau, 2014; Chien, Lin, & Yu, 2014) highlighted the importance of non-technical features for developing software in a "*user-driven*" manner. In this study, both functional and non-technical features are combined into design attributes of the BI.

According to Elbashir, Collier, Sutton, Davern, and Stewart (2013), Fig. 2 demonstrates the frequent-user profiles in the BI systems. Apparently, BI's top three user-groups include financial analyst, marketing planners, and general managers. The following issues are usually incurred when making decisions on investing BI platforms (Turban, Aronson, Liang, & Sharda, 2007; 2008): (1) reporting what has happened, (2) analyzing why it happened in the past, (3) monitoring what is happening now, (4) indicating which actions should be taken now and (5) predicting what might happen in the future. Recently, following the paradigm of SaaS (software as a service), cloud BI, social BI, and mobile BI are growing rapidly

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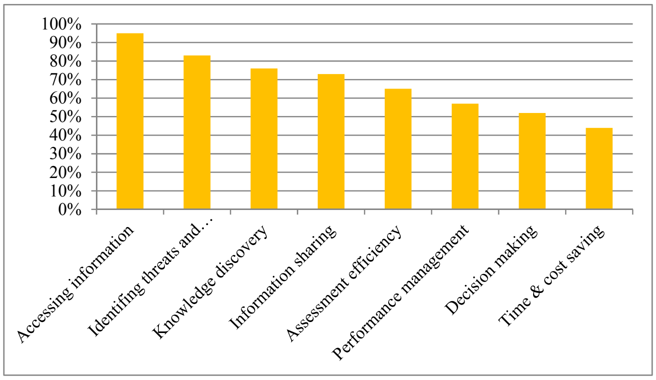

Fig. 1. The benefit items of using business intelligence (Eckerson, 2003).

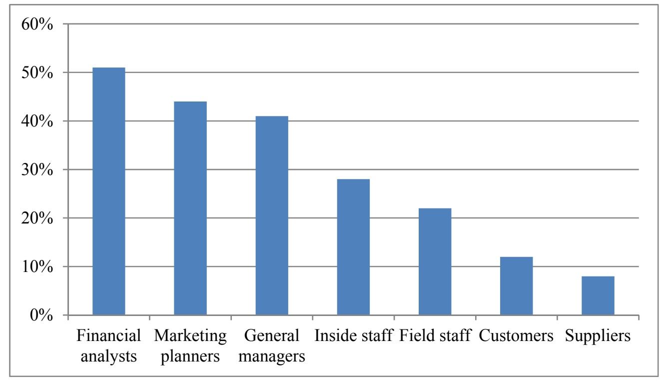

Fig. 2. The frequent-user profiles in BI market (Elbashir et al., 2013).

(Chen, Chiang, & Storey, 2012). In the future, a tremendous amount of customers may use different carriers, such as smart pads or mobile phones, to run their "customized" BI.

Intuitively, BI users care less about whom they buy from than they do concern about ease-of-use, domain-specific customization, and power to make decisions. In reality, they are usually frustrated in integration with legacy systems, recognizing key performance indicators (KPIs), and conducting causality tracking between KPIs and an outcome. Inspired by the conceptual framework (see Fig. 3), this paper attempts to help BI vendors better develop customized BI for the sake of acquisition and retention of customers. In particular, the following issues are highlighted and addressed:

- User assessments, user perceptions, and user preferences are systematically captured and incorporated into the entire decision-making process,
- User preferences are extracted to identify key design attributes for characterizing the ad-hoc user groups (i.e. analysts, planners, and managers),
- User perceptions of design attributes are converted into quantitative degrees of customer satisfaction for providing managerial implications.

The remainder of this paper is organized as follows. Section 2 introduces software engineering design and user involvement in enterprise software development. Section 3 details the proposed techniques, including correspondence analysis and Kano model. A real example is illustrated in Section 4. Conclusions are drawn in Section 5.

2. Overview of user involvement in enterprise software development

According to Hevner, March, Park, and Ram (2004), behavioral science and design science are two paradigms to characterize most of the research in information system. Furthermore, Gregor and Hevner (2013) explored the impact of design science research on knowledge contribution framework. Basically, this research follows a paradigm of design science and adopts a framework of "exaptation" (seeking solutions from other fields). For convenience, we initially review the history and concepts in the field of software engineering design. Then, a technology acceptance model (TAM) is introduced to emphasize the importance of user involvement in the process of software development. Finally, inspired by the concept of product family design (Sabin & Weigel, 1988; Wang & Chen, 2012), this research plans to construct a user-driven framework for assisting BI solution vendors in developing the optimal commercial modules.

2.1. Software engineering and development

Referring to the history of software engineering and development, two classical models are commonly adopted, namely, a waterfall model (Royce, 1987) and a spiral model (Boehm, 1988). The waterfall model originates from the manufacturing industries in which a couple of sequential processes incepting from requirement analysis, design, testing (debugging), implementation, to the phase of maintenance are seen as flowing steadily like a waterfall. In contrast, unlike a linear waterfall, the spiral model is based on the risk pattern of a software project to guide a team to adopt incremental or evolutionary prototyping (Wikipedia). By virtue of setting anchor point milestones, the degree of risk determines the level of effort. In order to decrease the possibility of failure, user-interaction and user-experience need to be incorporated.

Nowadays, software as a service (SaaS), sometimes referred to as "*on-demand*" software, is a new wave in which software and associated data are centrally hosted on the cloud. Typically, users are allowed to alter the set of configuration parameters and usually access SaaS via a web browser. For instance, SaaS has become a

Table 1
An overall comparison among various information technologies.

	Database system	Data warehousing	Data mining	Business intelligence
Main objectives	On-line transaction processing	On-line analytical processing	Knowledge discovery	Decision support
Core techniques	Relational database, normalization	Star schema, snowflake schema, data mart	Association, clustering, classification	Data warehousing, data mining, data visualization
Strengths	Transaction data, data storage	Historical data, *ad-hoc* queries	Big data, data analysis	Performance management
Limitations	Low speed, data irregularity, and security	Cost of extraction, transformation, and loading	Variety of data and high dimensionality	Identifying causality between predictors and outcomes

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