

Chapter 3.6

An Ontology–Based Intelligent System Model for Semantic Information Processing

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ABSTRACT

In the context of increasing usage of intelligent agent and ontology technologies in business, this study explores the ways of adopting these technologies to revitalize current executive information systems (EIS) with a focus on semantic information scanning, filtering, and reporting/alerting. Executives' perceptions on an agent-based EIS are investigated through a focus group study in the UK, and the results are used to inform the design of such a system. A visualization prototype has been developed to demonstrate the main features of the system. This study presents a specific business domain for which ontology and intelligent agent technology could be applied to advance information processing for executives.

INTRODUCTION

Many executive information systems (EIS) failed to provide strategic significant and meaningful information to executives (Bussen & Myres, 1997; Rainer & Watson, 1995; Xu, Kaye, & Duan, 2003) despite enormous efforts to make EIS easy to use for executives. This is due to the nature of strategic information for executives and technological weakness in semantically scanning and processing information. On the one hand, information needed by executives is primarily about the external environmental changes, which is often diverse, dynamic, and usually scattered in locations and not readily available (Xu & Kaye, 1995); in addition, making sense of emerging events and signals from the environment relies on

executive's interpretation and knowledge, which is subtle and tacit in nature (Choo, 1998). Moreover, an individual manager has limited capacity to notice and process all the information needed from the external environments, which results in limiting the scope of input coverage and the stretch of the output delivery (Martinsons, 1994; Xu & Kaye, 2002). On the other hand, semantic information processing technology, for example semantic indexing, ontology have the potential to advance future EIS design, however, they have not been applied to the domain of EIS. As suggested by Fensel, Harmelen, Klein, and Akkermans (2002), the main burden in information access, extraction, and interpretation, still rests with the human users. Current document management system on market exhibits the main weaknesses: (a) existing key-words-based search for information cannot avoid retrieving irrelevant information if a word has different meanings, or missing retrieving relevant information if different words have the same meaning; (b) current automatic agents do not possess the commonsense knowledge required to extract information from textual representations. Human browsing and reading are required to extract relevant information from various sources.

There are specific challenges to the domain of executive information processing. Data extraction from current EIS is usually based on key performance indicators (KPIs), which are drawn from existing databases or data warehouse. Information provided to executives is often internal and historical orientated (Xu et al., 2003a). Besides, information provided from EIS is often already existed in other forms (Koh & Watson, 1998). Moreover, information provision is reactive not proactive, that is executives need to initiate their information search. Automatic, systematic and proactive information scanning and provision for executives has yet been realized in practice. As a result, information can easily become stale in most current EIS due to static presentation of data and incapability of handling soft information

semantically (Watson et al., 1997). Despite the over emphasis on easy of use, friendly interface and wireless access features, the usefulness of the information contents of EIS is often neglected (Xu et al., 2003). Although EIS has been enhanced with data manipulation and decision support tools, the key deficiency still remains, that is the lack of intelligent functionality (Liu, 1998a, b; Montgomery & Weinberg, 1998). For instance, very few EIS can systematically scan business environment, automatically and semantically filter information, and proactively report/alert significant information to executives.

With the emerging semantic Web and domain specific ontology, it is imperative to explore the possibilities and the potential of applying latest technologies in the domain of executive information systems. Within this context, a project was initiated to examine how intelligent agent and ontology-based semantic information processing could be applied to revitalize information processing for executives. This study reports the perceptions of executives towards an agent-based EIS, based on which an ontology driven EIS visualization prototype has been developed. The following sections will present a review of the intelligent and ontology technology, a brief introduction to the methodology, the main findings of executives' perception on agent-based EIS and the main features of an ontology driven intelligent EIS through the visualisation prototype.

LITERATURE REVIEW

Intelligent Agent Technology

Agent technology has contributed to intelligent systems development (Klusck, 2001). Intelligent agents are *"software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in doing so, employ some knowledge or representation of the user's goals or desires"*

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