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An ontology based multi-agent system to support HABIO outsourcing framework

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ABSTRACT

In recent years the widespread application of outsourcing to help improve finance and maintain competitiveness is growing rapidly, and has been accompanied by a growth of academic research in this field. Most of the outsourcing literature has focused primarily on the social and cultural impacts, the organisational and management perspectives of outsourcing and very few tools have been developed to assist managers in making outsourcing decisions. Incorrect decision-making in outsourcing can lead to devastating consequences for their business. To guide decision makers in managing the complexity of outsourcing a holistic approach to outsourcing has been developed by taking business, information and organisational perspectives (HABIO). The purpose of this paper is to demonstrate how HABIO can be applied to help managers evaluate the impact of their decision-making by providing them with a set of 'what-if' scenarios, which are enacted by intelligent agents. The case example, discussed in this paper, demonstrates that HABIO can be applied effectively using a multi-agent system to analyse the outsourcing decision for a call centre sector in the retail industry. A prototype of the multi-agent system is presented where intelligent agents are endowed with specific domain ontologies, appropriate to solve a specific problem, and with a reasoning mechanism to achieve specific goals and to collaborate together to produce a set of "what-if scenarios" to the outsourcing managers.

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1. Introduction

In recent years outsourcing, though not a new phenomenon, has become one of the strongest trends within business, who sought outsourcing as a vehicle to cost savings and in particular to reduce IT costs and maintain competitiveness (Takac, 1994). PricewaterhouseCoopers (2008) argues that the outsourcing trend is likely to accelerate given the difficult economic conditions. The widespread use of outsourcing activities has been accompanied by a growth of academic research in this field, most of which focused on issues and challenges posed to decision makers from either a management perspective (e.g. Domberger, 1998; Lonsdale, 1999) or social and organisational dimensions (e.g. Kessler, Purcell, & Coyle-Shapiro, 1999; Krishna, Sahay, & Walsham, 2004). Furthermore the literature survey carried out by Dibbern, Goles, Hirschheim, and Jayatilaka (2004) indicated that outsourcing research appeared to be diverse in its coverage though strongly focused on information systems. However, very few research activities have provided decision makers with appropriate tools to assist them in managing the complexity of outsourcing and understanding the impact of their strategy on their business. The current research outlined in this paper is an attempt at addressing this gap.

The purpose of this paper is to demonstrate how HABIO, which advocates a holistic approach to outsourcing by taking business, information and organisational perspectives, can be applied to help decision makers manage the complexity of outsourcing (Ho & Atkins, 2005). With the help of intelligent agents managers can evaluate the impact of their decision-making by providing them with a set of 'what-if' scenarios. A multi-agent system is applied to a call centre retail industry to demonstrate the merits of this framework.

This paper gives an overview of the current outsourcing of call centres, and outlines the main concepts behind HABIO which provides the building blocks for the development of the multi-agent system. This is followed by a description of the three layered multi-agent architecture and the ontological modelling of agents necessary to support the communication and coordination of outsourcing tasks among the agents. Some challenges and future investigation are given in the conclusion.

2. Call centre and outsourcing

The multi-agent system focuses on the call centre industry which is still growing and taking advantage of reduction in the salary cost, technology and communication. Bristow, Munday, and

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Gripaios (2000) explain that corporate strategy and the pursuit of low-cost competitive advantage were the driving forces behind the expansion of call centres. A call centre is defined as ‘‘a business unit within an organisation consisting of 20 or more persons whose primary role is to make or receive telephone calls be it for customer service, account handling, billing enquiries, technical support or telemarketing, and working to pre-set measurable objectives. Its operation is usually dependent upon the use of sophisticated IT and telecommunications hardware and software'' (Mitial, 1997).

Call centres are represented in almost every sector of economy and provide a variety of functions ranging from sales to purchase-oriented centres, banking to emergency information services. The largest call centres tend to be financial services, retail, telecommunications, and travel (Holman & Wood, 2002). A study conducted by Datamonitor (2005) estimates that there will be over a quarter of a million new call centres in India and the Philippines throughout 2009 driven by the US business demand.

Call centre employees often complain of stress because of the ‘low value' work, repetitive and intensive nature of their work resulting in major attrition rate problems, high risks, high customer expectations, and the complex decision-making process by the managers who have to achieve economies of scale and provide consistent quality of customer service. Other critical issues related to the successful off-shore operation include the reliability of telecommunications, and the high cost associated with disaster recovery planning (DTI, 2004). A wrong decision can have a devastating effect on the companies both economically and politically. In recent years issues related to poor customer services, hidden costs, high staff attrition rates, and negative PR have forced some companies to relocate their technical support back from India to the US as in the case of the computer manufacturer Dell following complaints from their customers (Frauenheim, 2003) and of Shop Direct, which moved its call centre from Bangalore back to the UK following customer complaints (CWU Research, 2004).

Most of the research into call centres have focused on the organisation, management, technology and social learning surrounding the environment, namely the study by Callaghan and Thompson (2001), Kinnie, Hutchinson, and Purcell (2000), Knights and McCabe (1998), Taylor, Mulvey, Hyman, and Bain (2002), and Bain and Taylor (2002). The aim of our research is to provide a framework and a system to aid decision makers in managing the complexity of the call centre environment.

3. Application of a multi-agent system to call centre – a case study

A multi-agent system can play an important role in the organisational decision-making process by helping managers identify problems and risks, and understanding the impact of their strategic decisions through various simulations. A multi-agent system is a community of agents, each of which is a software program that performs specific tasks/activities on behalf of its user. Agents can communicate through messages to accomplish individual and/or common goals. This paper describes how agents can be designed to support strategic decision-making in outsourcing within a call centre environment based on the HABIO framework, which is introduced in the next section.

3.1. HABIO framework

HABIO, which takes a holistic approach to outsourcing, provides a conceptual framework for assessing the viability and utility of outsourcing decisions. This framework provides the potential for a company to develop a dynamic outsourcing capability, and considers the organisation as a whole rather then carrying out an analysis of its separate business activities. It advocates a ‘tri-perspective' strategic approach to decision-making to address outsourcing issues, namely organisational, information and business perspectives. The model views the outsourcing process as a set of linked capabilities for the proposed organisation covering issues related to people, technology and process (Fig. 1). Typically the organisational perspective addresses issues related to staff development, legislation, historical precedence, internal policies, union pressure and risk management, whereas the information perspective focuses on quality of service, performance management, and external expertise. The business perspective, on the other hand, covers the financial aspects of the organisation (Ho & Atkins, 2005; Atkins & Ho, 2008).

The HABIO framework is applied to assist decision makers in outsourcing in call centre A by providing a set of ‘what-if scenarios'. Call centre A is a leading UK retail company with over 600 stores with annual sales of over £3 billion offering a wide variety of products. As part of the company strategy, customers can place their order through its direct retail websites, their stores or by telephones to one of its call centres around the UK. The customer service department (CSD) is the business unit, which manages all

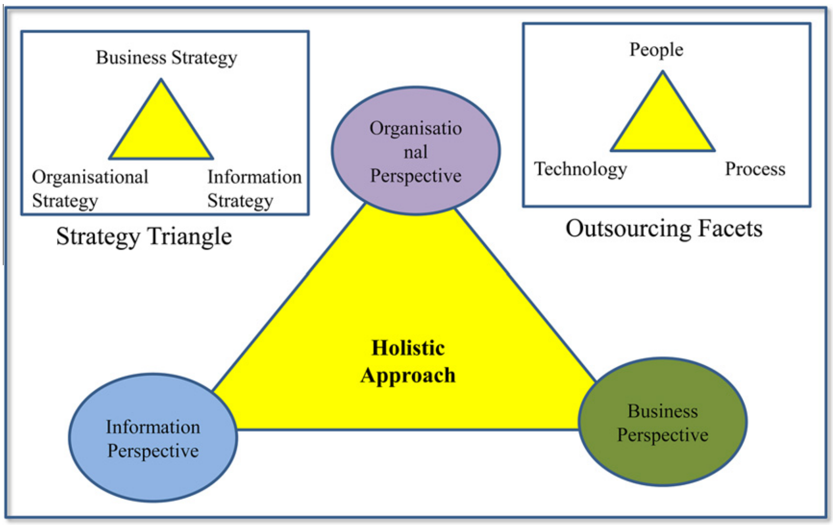

Fig. 1. HABIO framework (Ho & Atkins, 2005). This figure illustrates the ‘tri-perspective' strategic approach of HABIO and shows how HABIO views the outsourcing process as a set of linked capabilities. (The colour scheme is important as each agent is identified by its colour throughout the paper and system outputs.)

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