



Inter-organizational information systems adoption for service innovation in building sector[☆]



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ABSTRACT

The building sector has experienced a significant decline in recent years in Spain and Europe as a result of the financial crisis that began in 2007. This drop accompanies a low penetration of information and communication technologies in inter-organizational oriented business processes. The market decrease is causing a slowdown in the building sector, where only flexible small and medium enterprises (SMEs) survive thanks to specialization and innovation in services, which allow them to face new market demands. Inter-organizational information systems (IOISs) support innovation in services, and are thus a strategic tool for SMEs to obtain competitive advantage. Because of the inherent complexity of IOIS adoption, this research extends Kurnia and Johnston's (2000) theoretical model of IOIS adoption with an empirical model of IOIS characterization. The resultant model identifies the factors influencing IOIS adoption in SMEs in the building sector, to promote further service innovation for competitive and collaborative advantages. An empirical longitudinal study over six consecutive years using data from Spanish SMEs in the building sector validates the model, using the partial least squares technique and analyzing temporal stability. The main findings of this research are the four ways an IOIS might contribute to service innovation in the building sector. Namely: a) improving client interfaces and the link between service providers and end users; b) defining a specific market where SMEs can develop new service concepts; c) enhancing the service delivery system in traditional customer–supplier relationships; and d) introducing information and communication technologies and tools to improve information management.

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1. Introduction

Inter-organizational information systems (IOISs) are information systems that two or more companies share (Kumar & van Dissel, 1996). Some examples of IOISs are Supply Chain Management (SCM), and Collaborative Planning Forecasting and Replenishment (CPFR) systems. The concept of IOIS consists of the general idea of a collaborative system for supply chain management, enabling the flow of information between enterprises for competitive and collaborative advantages (Criado-Fernández, 2000).

IOIS adoption requires cooperation and collaboration among trading partners, and therefore depends on the relationships between the business parties (Kim, Park, Ryoo, & Park, 2010). Facing the inherent

complexity of the adoption process, Kurnia and Johnston (2000) developed a theoretical model to study IOIS adoption. Further studies use this model as a starting point for research (Ali, Kurnia, & Johnston, 2008).

Recent research on SCM systems' design in the building sector looks to improve process efficiency because flexible, specialist small and medium enterprises (SMEs) have better chances of survival (Carbonell-Ureña, 2012). This specialization of SMEs is the cause of the current business focus on building small houses, restorations, or complete renovations (BIC-Galicia, 2010). This kind of specialization is an example of an innovation in services by adapting to new market demands.

The ultimate goal is to design an IOIS for the SMEs in the building sector to help them cope with the financial crisis. Unfortunately, however, the low penetration of Information and Communication Technologies (ICTs) in inter-organizational oriented business processes in this sector hinders the attainment of this goal (Ecorys, 2008). Therefore, determining which factors contribute to IOIS adoption in this sector is a key issue for improving the efficiency of SMEs.

The remainder of this paper has the following structure. Section 2 presents the research framework to analyze the contribution of these factors, Section 3 explains the methodology of the empirical study, Section 4 discusses the main findings, and, finally, Section 5 lays out the main conclusions of this research.

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2. Research framework

Following the arrival of the financial crisis, the trend in the literature on ICTs in the building sector is to seek how to improve information management as a tool to optimize resources and service innovation (Carbonell-Ureña, 2012). Authors mainly propose the deployment of SCM systems in SMEs to cope better with the financial crisis. Some potential benefits that SMEs in the building sector may achieve are: time savings, reducing costs and error rates, and improvements in project efficiency and control (Carbonell-Ureña, 2012; Chung, Kumaraswamy, & Palaneswaran, 2009).

IOIS adoption requires a commitment from participating firms to work collaboratively in order to achieve common objectives and goals. Because of the inherent complexity of the IOIS adoption process, authors employ different approaches to analyze the influence of enterprise characteristics on IOIS adoption (Chwelos, Benbasat, & Dexter, 2001; Ham & Johnston, 2007; Koch, 2005; Kurnia & Johnston, 2000; Nøkkentved, 2009). These approaches stress the importance of inter-organizational relationships, but no empirical validation supports this statement. This absence of empirical evidence is especially true in the building sector, which leads to the formulation of the following research questions. *Could an empirical model analyze the key factors contributing to IOIS adoption in the building sector? If so, what is the specific contribution of each factor?*

2.1. IOIS adoption model

Kurnia and Johnston (2000) classify IOIS adoption variables following a factor approach and a process approach, suggesting dynamic interactions among the players in the supply chain. They propose three different variables to characterize IOIS adoption.

- *Organizational capabilities (OC)* represent the organizational factors that relate to the intention to adopt information systems.
- *Inter-organizational environment (IE)* considers the supply chain structure or the external environment of the organization that may affect the decision to adopt IOIS.
- *Perceived benefits (PB)*, which Kurnia and Johnston (2000) refer to as *Nature of technology*, are the potential benefits for organizations from adopting IOIS.

Fig. 1 illustrates how this model proposes causal links between these variables and the outcome construct, *intention to adopt IOIS (ITA)*, as a predictor of IOIS system usage.

This model enhances understanding of how organizations adopt IOIS, but is unsuitable for empirical research (Ali et al., 2008). Ali et al. (2008) cite the need to operationalize model variables for quantitative

analysis and empirical validation, which is precisely what this study sets out to do.

2.2. IOIS characterization model

The IOIS Characterization Model (ICM) shows the operationalization that the discussion above alludes to, and characterizes IOIS according to how an enterprise performs across a set of features or variables within four categories or dimensions (Orero-Giménez & Criado-Fernández, 1999).

- The *strategic (S)* dimension considers IOIS as a source of competitive advantage, and encompasses a new value proposition for services.
- The *collaborative (C)* dimension empowers the creation of communication channels between companies–suppliers and customers– and the extension of the business value chain to larger geographic areas.
- The *organizational (O)* dimension reflects the degree to which IOIS represents a global organization, including interdependencies among participants.
- The *technological (T)* dimension covers the ICT features, enabling companies to achieve greater efficiency in information processing.

Criado-Fernández (2000) validates the ICM and proves that IOIS characteristics contribute to improving enterprise virtualization, thus promoting IOIS adoption. Fig. 2 shows the four dimensions of the ICM. These dimensions match up to the four dimensions, or areas, in den Hertog's (2000) model for service innovation; that is, service concept, service delivery system, client interface, and technological options (Pereira-Rama, Chaparro-Peláez, & Agudo-Peregrina, 2012). Therefore, these features correspond to the feasible ways of achieving service innovation through IOIS implementation and adaptation of processes to new market demands.

2.3. Research model design

Both models–Kurnia and Johnston's (2000) IOIS adoption model, and the ICM–have the same theoretical foundations: the analysis of the impact of an IOIS in supply chain management, following Holland's (1995) work, and Markus and Robey's (1988) research on organizational change. The models do, however, differ in terms of their approach to explaining the analysis of IOIS adoption, employing a factor approach and an information system characterization approach, respectively. Therefore, in this research, the model of IOIS adoption combines the theoretical approach of Kurnia and Johnston's (2000) model with the empirical approach of the ICM, in order to analyze the key factors contributing to IOIS adoption in the building sector.

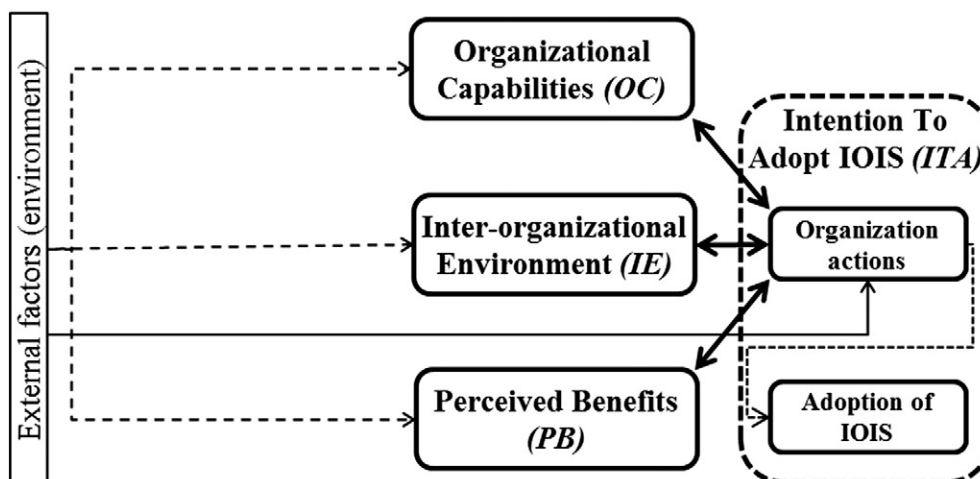


Fig. 1. IOIS adoption model.

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