

The relationship between IT infrastructure leveraging, talent management and operational sustainability, and their effects on the business value of the operations strategy

Completed Research Paper

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ABSTRACT

The purpose of this research is to examine the role of information technology (IT) in the adoption of human resources (HR) and environmental management activities, a research topic that has not received much attention in prior literature. Drawing on the theory of operational and dynamic capabilities, we propose a model in which IT infrastructure leveraging enables the firm to create value from its operations management both directly and indirectly through talent management and operational sustainability. We test the model using the structural equation modeling (SEM) technique with an innovative secondary data set collected for a sample of 63 large firms. The empirical analysis suggests that IT infrastructure leveraging enables the firm's proficiency to manage talent, which in turn facilitates execution of a more sustainable operations strategy to increase firm performance. The analysis also shows that IT infrastructure leveraging impacts firm performance directly in the long-term.

Keywords

IT infrastructure, talent management, operational sustainability, operations strategy.

INTRODUCTION

HR and environmental management are core activities in the execution of operations strategy to increase firms' performance. HR management activities influence employee behavior to achieve operational goals and implement the firm's operational processes (Ahmad and Schroeder, 2003). Similarly, environmental management activities enable the execution of a more environmentally sustainable operations strategy by reducing the consumption of raw materials and waste generated to save costs, and by improving the firm's reputation to increase revenues (Montabon et al., 2007).

Prior research has studied the impact of HR and environmental management activities on firm performance (Ahmad and Schroeder, 2003). Although in a limited way, the literature has also investigated the determinants of environmental management (Hofer et al., 2012) and the impact of IT on supply chain management activities (Rai et al., 2006). Not much attention has been paid, however, to analyzing the impact of IT on the adoption of HR and environmental management activities. Our study fills this gap by examining the role of IT in the adoption of HR and environmental management through the following research questions: (1) Does IT enable the management of talent? (2) Does IT-enabled talent management facilitate the execution of operations strategy in a more sustainable way to create value?

THEORY AND HYPOTHESES

Theory of Operational and Dynamic Capabilities

Operational routines are patterns of activities that a firm performs at the operations level. Operational capabilities are the firm's proficiency in using a collection of interrelated operational routines to solve operational problems and implement the operations strategy (Peng et al., 2008). Dynamic capabilities refer to the firm's proficiency in building, integrating and reconfiguring its resource base in response to changes in the business environment (Tece, 2007).

IT Infrastructure Leveraging and Talent Management

IT infrastructure leveraging capability indicates the firm's proficiency in leveraging its IT infrastructure by using multiple IT applications to acquire/provide accurate, timely, reliable, secure and confidential information from/to key users (Mithas et al., 2011). IT infrastructure leveraging is a dual-purpose capability (an operational and dynamic capability) because it encompasses the firm's proficiency to use a collection of IT applications and to reconfigure its IT resource base to meet changing needs (Benitez-Amado and Ray, 2012).

Talent management is the firm's proficiency in recruiting (sourcing, attracting, selecting), getting on board, developing, retaining and leveraging talent to achieve goals and execute organizational strategies (Stahl et al., 2012). We posit that talent management is a dynamic capability determined by working culture, working conditions and talent development. Working culture refers to the patterns of working beliefs and values that are shared and assimilated by organizational members. Working conditions are shaped by the firm's policies on compensation and rewards, scheduling and workplace flexibility, and work-life balance programs. Talent development is the firm's proficiency in stimulating, motivating and developing the organization's talent (CRF Institute, 2012). Talent management is a dynamic capability because it implies the design of the talent base, its integration in the firm and the reconfiguration of talent to respond to business opportunities in the long-term (Teece, 2007).

IT infrastructure leveraging may enable the management of talent. It has been suggested that IT infrastructure leveraging is a key enabler of dynamic capabilities (Benitez-Amado and Ray, 2012). We believe that it is thus rational to expect that IT infrastructure leveraging facilitates development of the dynamic capability of talent management. Through IT infrastructure, the firm may acquire/provide timely information from/to the market to recruit and get on board talent to design and integrate its talent base. For example, Cortefiel (a Spanish apparel manufacturer) uses IT-based social media tools such as LinkedIn, Facebook and Twitter to recruit managerial talent that fits the profile needed in designing its talent base. Similarly, the integration of HR management and social media tools enabled by IT allows Cortefiel to recruit talent with greater agility, thus facilitating the reconfiguration of its talent base to respond to variations in demand (Uriondo, 2012).

IT infrastructure leveraging may contribute to shaping the firm's working culture, thus improving its talent management. Email, Intranet and wireless devices enable the firm to diffuse mission, working values, goals and strategies easily among its members. For example, Nestle has recently used Intranet resources to communicate its organizational values to the members of all its business units.

Leveraging IT infrastructure can also improve the firm's talent management by facilitating deployment of the firm's working conditions. Providing organizational members with mobile phones and laptops with Internet connection, and flexible access to corporate databases will enable them to work independently of time and workplace, thus enabling scheduling and workplace flexibility and enhancing work-life balance, which in turn increases members' job satisfaction and retains the talent (Chinchilla-Albiol et al., 2011).

IT infrastructure may also lead to developing the firm's talent. IT infrastructure provides the foundation for using enterprise resource planning systems that include HR development applications. These applications provide managers HR data to evaluate employees' efforts and performance and to implement courses of action to optimize the employees' efforts, thus developing the firm's talent (Aral et al., 2012). HR development applications also improve the relationship with employees by giving them information on goals, performance appraisal, compensation and rewards, and career planning to develop the firm's talent. Finally, leveraging of electronic communication networks enables the firm to train members online and offer virtual seminars to develop its talent.

Hypothesis 1 (H1): There is a positive relationship between IT infrastructure leveraging and talent management.

Talent Management and Operational Sustainability

Operational sustainability capability is the firm's proficiency to use a collection of interrelated sustainable operational routines to solve operational problems by reducing the impact of the operations management system on the natural environment (Sarkis et al., 2010). Operational sustainability is an operational capability that facilitates the execution of the operations strategy to increase firm performance.

Operational sustainability may be improved through talent management. Dynamic capabilities can help to develop operational capabilities (Pavlou and El Sawy, 2011). The firm can align and reconfigure the talent base needed to implement sustainable operational routines to seize opportunities related to sustainability.

Talent management may increase operational sustainability through working culture. Prior research suggests that working culture facilitates the implementation of operational routines (Naor et al., 2008). It is also rational to expect that working culture enables the implementation of operational routines that are environmentally sustainable. Specifically, the firm's values on environmental sustainability may be used to recruit talent with a high degree of environmental awareness, which will contribute to increasing operational sustainability (Bansal, 2003).

Through working conditions, talent management enables operational sustainability. The use of a just compensation and rewards system and the implementation of work-life balance programs will motivate the firm's members to go the extra mile to adopt innovative behaviors and achieve the sustainability goals inserted in the operations strategy (Ahmad and Schroeder, 2003).

Finally, the management of talent may lead to operational sustainability through talent development. Training may enhance the skills of organizational members so that they participate successfully in the implementation of sustainable operational routines (Dao et al., 2011). Similarly, the environmental behavior of the firm's members may be stimulated by introducing goals on sustainability in performance evaluation and career planning to improve the sustainability of the operations strategy.

Hypothesis 2 (H2): There is a positive relationship between talent management and operational sustainability.

Operational Sustainability and Firm Performance

We conceptualize firm performance as a multidimensional construct that refers to marketing and financial performance. Firm performance is determined by competitive position, net margin and profitability (Mithas et al., 2011). Operational sustainability may increase firm performance. Prior literature argues that operational capabilities enable implementation of the firm's operations strategy (Peng et al., 2008). Operational sustainability is an example of operational capability that also can increase firm performance through better execution of sustainable operational routines to earn more money and to reduce the firm's impact on the natural environment.

Operational sustainability increases firm performance by saving costs and increasing revenues. The remanufacturing of materials and old products and the reduction of packaging will reduce the consumption of raw materials and the amount of waste to save costs (Sarkis et al., 2010). For example, Nike has manufactured the sole of last Air Jordan using ground-up bits of old Nike sneakers to save costs and increase firm performance (Benitez-Amado and Walczuch, 2012). Similarly, Mercadona (a leading Spanish retailer) has reduced the size of packaging of its home brand products to save costs and increase firm performance (Ton and Harrow, 2010).

Operational sustainability may also increase revenues to improve firm performance. Sustainable operational routines enhance product and process innovation, which in turn leads to a higher firm performance (Montabon et al., 2007). Through operational sustainability, the firm can also improve its product quality and enhance the brand image, which will increase its sales and revenues. Finally, firms with sustainable operations have a better reputation, more legitimacy and recognition from regulators, which enable them to obtain approval of more capital projects and access to more markets to increase their revenues (Benitez-Amado and Walczuch, 2012).

Hypothesis 3 (H3): There is a positive relationship between operational sustainability and firm performance.

IT Infrastructure Leveraging and Firm Performance

Prior research on the relationship between IT investments and firm performance has obtained mixed results (Mithas et al., 2011). However, most previous studies suggest a positive impact of IT capabilities on firm performance, which may be generated either directly (Bhatt and Grover, 2005) or indirectly through development of other firm capabilities (Rai et al., 2006). We posit that IT infrastructure leveraging may increase long-term firm performance not only indirectly through talent management and operational sustainability but also directly. Statistically speaking, we believe it is rational to expect a direct and positive relationship between IT infrastructure leveraging and long-term firm performance in the proposed model for two reasons. First, the literature has proven that some firm capabilities such as business flexibility play a mediating role (Benitez-Amado and Ray, 2012). Second, there may be other mediator variables that have not still been suggested in the literature or introduced in our model.

IT infrastructure leveraging is a dual-purpose capability that helps the firm to create value. In its operational facet, IT infrastructure leveraging provides accurate information to improve the current business processes of the firm. In its dynamic facet, leveraging IT infrastructure facilitates the reconfiguration of the IT resource base to improve further business processes and meet future needs (Benitez-Amado and Ray, 2012).

Through the acquisition of information, IT infrastructure enables organizational members to search and scan the environment to sense business opportunities and threats before competitors do. IT infrastructure also provides the foundation for using sophisticated analytical tools to evaluate a vast amount of data, which in turn allows managers to improve the speed and quality of decision-making processes to exploit opportunities and respond to threats before competitors do, thus outperforming them (Mithas et al., 2011).

IT infrastructure may be leveraged to increase firm performance by improving relationships with suppliers and customers. Electronic communication networks enable firms to exchange information with suppliers and customers and facilitate real-time collaboration with them on forecast, schedule and replenishment, thus improving operations' efficiency and increasing firm performance (Rai et al., 2006).

IT infrastructure leveraging is a dual-purpose capability that requires time, learning and experience to be developed in a way that can convert it into an idiosyncratic capability of the firm (Bhatt and Grover, 2005). For this reason, some scholars have suggested that its direct effect on firm performance is generated in the long-term, that is, with some time lag (Aral and Weill, 2007). It is thus rational to expect a direct and positive impact of IT infrastructure leveraging on long-term firm performance.

Hypothesis 4 (H4): There is a positive relationship between IT infrastructure leveraging and firm performance.

RESEARCH METHODOLOGY

We collected an innovative secondary data set from five sources in a sample of 63 large Spanish firms distinguished by CRF Institute Spain (a consulting firm) as top employers in 2007. The sample includes some of the most admired firms in Spain and represents a total of 22 industries that reflect the most important industries in the Spanish economy. Despite its relatively small size, our sample exceeds the minimum sample size required to ensure an adequate level of accuracy and statistical power (Benitez-Amado and Walczuch, 2012).

IT infrastructure leveraging, talent management and operational sustainability are measured through information collected from the 2007 CRF Institute Spain database. This database contains a rating from 0 to 10 of a set of business practices. We measure IT infrastructure leveraging through the rating from 0 to 10 of technological IT effort. Technological IT effort is a good proxy of IT infrastructure leveraging because it refers to and measures the firm's ability to leverage its IT infrastructure by using applications to manage information in the firm. We conceptualize talent management as a first-order construct determined by working culture, working conditions and talent development. Working culture, working conditions and talent development are measured through a rating from 0 to 10 of working culture, working conditions and talent development practices. Operational sustainability is measured through the rating from 0 to 10 of the implementation of environmental management practices. Due its strong conceptual proximity, the measure used is a good proxy of operational sustainability. Thus, through the use of environmental management practices such as reduction in the consumption of raw materials or recycling, the firm can execute a more sustainable operations strategy.

Firm performance is measured as a second-order construct determined by competitive position, net margin and profitability (Mithas et al., 2011), using panel data for the years 2007-2011 with information collected from the Actualidad Económica and SABI databases. Competitive position is measured as a first-order construct determined by the rate of sectoral excellence (RSE) for the years 2007-2011. RSE is estimated using information from the Actualidad Económica database as follows: $RSE = 1 - (\text{Ranking position of firm in the business sector} / \text{Total number of firms in the business sector})$ (Benitez-Amado and Walczuch, 2012). Net margin and profitability are estimated as two first-order constructs determined by net margin and return on assets respectively for the years 2007-2011, using information obtained from the SABI database (Bou-Llugar and Satorra, 2007).

We control for firm size, industry and quality management, which are measured using information collected from the 2007 edition of the CRF Institute Spain and the Spanish Association for Standardization and Certification databases. Firm size is measured as the natural logarithm of a firm's employees. We code industry using a dummy variable. We estimate quality management by creating a dummy variable to indicate the presence or absence of implementation of a quality management system according to the ISO 9001 standard (Zhu and Sarkis, 2004). The analysis also includes alternative measures of IT infrastructure leveraging, talent management, operational sustainability and firm performance drawn from the websites of the firms in the sample, and the Actualidad Económica and SABI databases. In our study, all of the constructs at first- and second-order level are conceptualized and measured as formative (Petter et al., 2007).

EMPIRICAL ANALYSIS

We employ partial least squares (PLS) SEM estimation for the following reasons. First, the use of PLS has been recommended when theoretical knowledge about a topic is scarce (Petter et al., 2007). Insofar as our study covers research questions that have not been explored in prior literature, it reveals the degree to which prior theory is limited and PLS estimation is appropriate. Second, PLS works better with small data samples and formative constructs like those employed in this study than do covariance-based SEM techniques (Chin, 2010). Finally, the use of SEM is advisable to estimate models that employ longitudinal secondary data, like the model in this research (Bou-Llusar and Satorra, 2007).

Measurement Model Evaluation

We assess content validity, multicollinearity, weights and loadings for our constructs. Prior to performing the empirical analysis, we asked six executives their opinion about the congruence between the measures and constructs employed in the study. They indicated that there was good conceptual proximity between the measures and constructs. Overall, this shows satisfactory content validity.

We also examine multicollinearity by calculating variance inflation factors (VIFs) for the first-order constructs that serve as independent variables in the model. Measures have a multicollinearity problem if their VIFs are higher than 3.3 (Petter et al., 2007). The VIFs values are below 3.3, indicating that multicollinearity is not a serious problem in our data.

Weights and loadings of indicators and first-order constructs are also analyzed. Most of the indicator weights and loadings are significant at a level of 0.05. The weights of competitive position, net margin and profitability are 0.815^{***}, 0.288[†] and 0.308[†], respectively ([†]p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001). All of the loadings of these first-order constructs are significant at a level of 0.05. Overall, this analysis suggests good properties for our measures (Cenfetelli and Bassellier, 2009). The detail of VIFs, weights and loadings values has been omitted to satisfy the word limit. This detail is available upon request from the first coauthor.

We triangulate the measures used to assess the key constructs of our study with alternative measurements. First, the firm's Internet technology capability was evaluated by collecting information from the firm's website in 2007. The correlation between IT infrastructure leveraging and Internet technology is 0.636^{***}. Second, we perform an alternate measure of talent management and operational sustainability with information on talent management and corporate social responsibility obtained from the 2007 edition of the Actualidad Económica database. The two measures of talent management are correlated (0.397^{***}). Operational sustainability and corporate social responsibility are also correlated (0.362^{***}). Finally, we collected data on the firm's return on equity (ROE) for the period 2007-2011 with information obtained from the SABI database. The construct firm performance is highly correlated with ROE (0.92^{***}). Overall, the results of these triangulations provide more credibility to the validity and reliability of our measures.

Test of Hypotheses

We find support for all of the proposed hypotheses. The impact of IT infrastructure leveraging on talent management (0.583) is bigger than its impact on firm performance (0.236), which suggests a bigger relative importance of the IT impact on the formation of dynamic capabilities than on firm-level performance.

The path coefficients to test the hypotheses range from 0.236 to 0.613, three are significant at the 0.01 level and one is significant at the 0.05 level. The R² values for the three endogenous variables range from 0.34 to 0.447. Overall, the evaluation indicates good explanatory power for the structural model (Chin, 2010).

We determine the robustness of the proposed model by estimating two alternative measurement models and three alternative structural models. Overall, none of the five alternative models significantly improves the explanatory power of the proposed model, indicating that the proposed model provides a very good explanation of the data (Benitez-Amado and Ray, 2012).

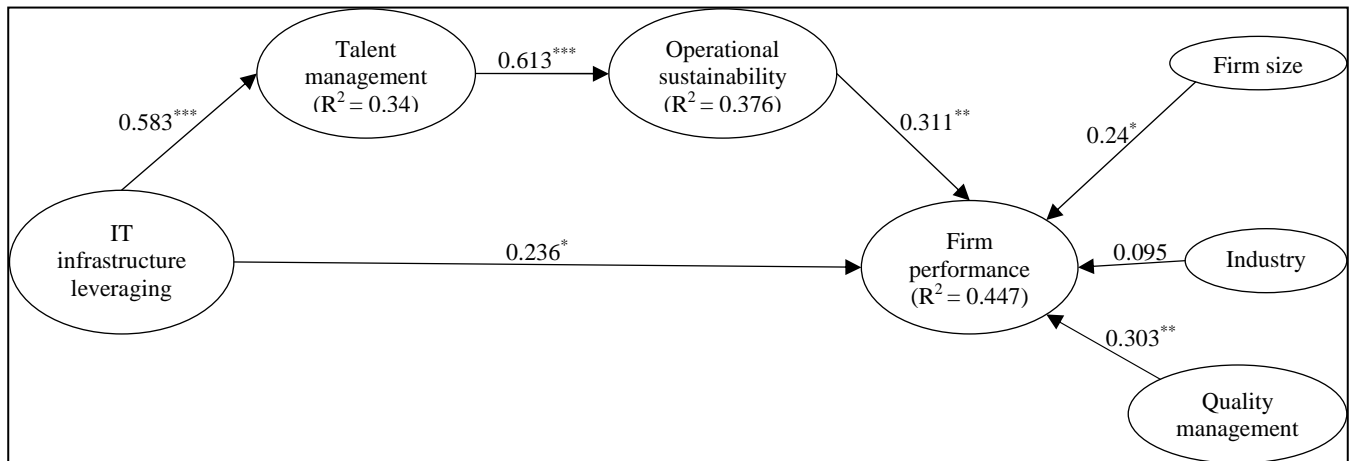


Figure 1. Results of the PLS Estimation

DISCUSSION

We find that IT infrastructure leveraging improves talent management and that IT-enabled talent management facilitates the execution of a more sustainable operations strategy to increase firm performance.

The first contribution of this research is to introduce the construct *talent management*, which is conceptualized as being determined by working culture, working conditions and talent development. Although there is a notable body of research on HR management practices, talent management (currently a burning issue among real-world practitioners) has been examined in a very limited way. The weight analysis shows that the main contributions to talent management come from working culture and talent development. Working culture attracts outstanding talent to the firm, and talent development programs improve and retain the talent in the firm.

The analysis shows that IT infrastructure leveraging improves the management of talent. IT infrastructure provides the base for using IT applications that enable agile recruitment of talent and transmission of the organizational values to get talent on board. Further, by providing mobile phones and laptops with Internet connection and flexible access to corporate databases, the firm can motivate employees, implementing scheduling and workplace flexibility programs to enhance their work-life balance and retain the firm's talent. Similarly, IT infrastructure provides the foundation for using HR development applications that facilitate talent development by providing managers HR metrics to evaluate and optimize employees' efforts and performance, while providing employees with detailed information on their goals and career. This finding constitutes the second contribution of our study, as it proves how IT infrastructure leveraging improves the firm's talent management, a research question to which prior literature has not paid much attention.

The analysis also indicates that IT-enabled talent management facilitates execution of a more sustainable operations strategy to enhance firm performance. Overall, the firm's talent can be used to search for, discover, experiment with, and implement sustainable operational routines, which in turn help to execute the operations strategy to increase firm performance. Particularly, firms that value environmental sustainability can attract talent that shares these values, which in turn leads to operational sustainability. Providing attractive working conditions persuades organizational members to go the extra mile to achieve the sustainability goals inserted in the operations strategy. This research also extends the literature on the relationship between HR and environmental management. While the prior literature has focused on the role of specific HR management practices in the implementation of environmental management activities, this study emphasizes the impact of talent management, a new phenomenon of interest.

Although very little research has been done on IT and environmental sustainability, recent literature suggests that IT infrastructure may be leveraged to reduce the firm's impact on the natural environment (Benitez-Amado and Walczuch, 2012). The analysis in our study suggests that IT infrastructure leveraging leads to operational sustainability by improving the management of talent. We conduct a post-hoc mediation analysis to reexamine the possible mediation effect of talent management in the relationship between IT infrastructure leveraging and operational sustainability. To do this, we perform Baron and Kenny's (1986) four-step procedure, for which the four steps are met. This analysis suggests that talent management fully mediates the impact of IT infrastructure leveraging on operational sustainability, which reinforces the results obtained in H1 and H2. Leveraging IT infrastructure digitizes and transforms business processes such as those

associated with talent management to generate operational sustainability (Melville, 2010). The fourth contribution of this research is to illustrate how IT infrastructure leveraging enables operational sustainability through talent management. We believe, however, that it is conceptually unlikely that talent management is the only mediator through which IT infrastructure leveraging increases operational sustainability. For example, IT infrastructure may be leveraged to implement energy efficiency processes to increase the sustainability of the operations strategy (Watson et al., 2010).

The empirical analysis shows that operational sustainability increases firm performance. The firm's proficiency in using sustainable operational routines leads to better performance by saving costs and increasing revenues. This finding is consistent with prior research on environmental management and firm performance (Montabon et al., 2007). Our study contributes to the development of this body of research by conceptualizing operational sustainability using the theoretical base that links operational routines and capabilities (Peng et al., 2008).

The analysis also suggests that IT infrastructure leveraging has a direct and positive relationship with firm performance in the long-term. IT infrastructure leveraging has an operational facet, as it improves the current business processes of the firm. IT infrastructure leveraging has also a dynamic facet, as it enables reconfiguration of the IT resource base to improve further business processes and meet future needs. This finding is rational because IT infrastructure provides the foundation for using sophisticated analytical tools that enable the firm to sense and respond to business opportunities and threats before competitors do, which leads to superior firm performance. This research also contributes by reevaluating the relationship between IT infrastructure and firm performance. This is particularly important, since prior literature has obtained mixed results that suggest primarily direct and indirect effects between IT capabilities and firm performance (Mithas et al., 2011). Our finding is consistent with this body of research and suggests that IT capabilities impact long-term firm performance both directly and indirectly.

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