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IT, Proactive Environmental Strategy and Firm Performance: A Resource-based Analysis

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ABSTRACT

The study of the relationships between information technology (IT), environmental organizational issues and performance is a cutting-edge research topic for information systems (IS) research. However, at present we know very little about these relationships. Drawing on the perspective of IT-enabled capabilities and the literature on organizations and the natural environment, our study introduces the construct *capability of proactive corporate environmental strategy* (ES) to the IS community. Through a resource-based analysis, we propose that IT capability may enable the implementation of a proactive ES and that this strategy could play a significant role in determining the business value of IT. Using structural equations modelling (SEM) with data collected from 63 firms, we find that IT capability is an enabler of proactive ES and that this strategy plays a significant role in mediating the effects of IT capability on firm performance.

Keywords

Information technology capability, proactive environmental strategy, IT-enabled capabilities, organizations and the natural environment.

INTRODUCTION

The study of the relationships between IT, environmental organizational issues and competitiveness is an important research topic for IS scholars. Firms such as UPS have begun to leverage telematics to reduce environmental impact while improving its profitability and marketing performance (Watson et al., 2010a). While some organizations and IT departments have acknowledged the significance of environmental issues, however, the IS community has provided only limited contribution to creating knowledge on this pressing issue.

Prior research on organizations and the natural environment has studied the interface between the capability of ES and firm performance (e.g., Christmann, 2000). It has been argued that the implementation of environmental strategies (EESS) could be facilitated by the deployment of other resources (Aragon-Correa and Sharma, 2003). Prior studies in this literature have found that some resource-based variables may enable this implementation. The set of variables identified includes manufacturing activities (Sarkis, 2001), employee involvement (Bansal, 2003), international experience (Bansal, 2005) and innovativeness (Etzion, 2007). The prior literature has focused on different resource-based variables related to other functional areas and managerial decisions but has not studied how the IT department and the resource-based variables related to this function could enable the implementation of EESS in the firm.

Further, past IS research has argued that IT is a key enabler of the development of higher-order process capabilities. Particularly, research has discussed that IT, if properly leveraged, could facilitate the development of organizational capabilities such as new product development functional competencies (Pavlou and El Sawy, 2006). However, we know almost nothing about whether well-leveraged IT could be translated into higher-order capabilities associated with the implementation of EESS to enhance firm performance. Although prior IS research on IT-business strategic alignment has argued and demonstrated empirically that it is possible to translate this alignment into superior firm performance (e.g., Chan et al., 1997), we know nothing about the effect of introducing sustainability into this strategic alignment. Our research is motivated by the complete lack of research on this topic.

To the best of our knowledge, this is the first paper that studies conceptually and empirically the relationships between IT capability, proactive ES and firm performance. Our general purpose is to develop a better understanding of these relationships. To achieve this, we attempt to answer the following research questions: (1) Does IT capability have a positive effect on the capability of proactive ES? and (2) Does IT capability influence firm performance by means of the capability of proactive ES?

HYPOTHESIS DEVELOPMENT AND PROPOSED RESEARCH MODEL

Figure 1 presents our proposed research model.

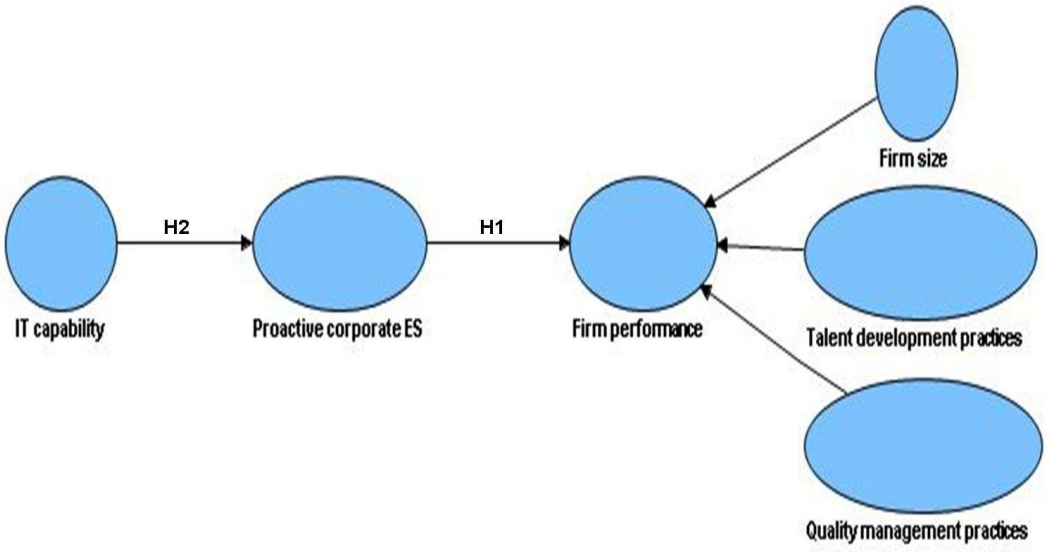

Figure 1. Research Model

Proactive Corporate ES and Firm Performance

Our research also builds on the conceptual foundations of the natural-resource-based theory of the firm (e.g., Hart, 1995). In a seminal work, Hart (1995) proposes a conceptualization of the natural-resource-based theory of the firm, a theory of competitive advantage based upon the firm's relationship to the natural environment. In other words, he introduces the natural environment into resource-based theory and indirectly into strategic management. Specifically, Hart (1995) explains the connections between three interconnected environmental strategies (pollution prevention, product stewardship, and sustainable development) with the sustained competitive advantage. Subsequently, an exceptional body of literature has used the natural-resource-based theory as its main conceptual framework (e.g., Aragon-Correa, 1998; Aragon-Correa and Sharma, 2003; Etzion, 2007; Russo and Fouts, 1997). Within this body of literature, a research stream on corporate environmental strategy has developed. Drawing on this stream of research, we then conceptualize the terms *environmental strategy (ES)* and *proactive corporate ES* and develop a natural-resource-based analysis to justify the first hypothesis of our study.

An ES indicates a firm's strategy to manage the interface between its business and the natural environment (Aragon-Correa and Sharma, 2003). EESS can be classified along a continuum that ranges from reactive to proactive. At one end of the continuum, a reactive posture responds to changes in environmental regulations and stakeholder pressures via defensive lobbying and investments in end-of-pipe pollution control measures. At other end, proactive postures involve anticipating future regulations and social trends and designing or altering operations, processes, and products to prevent negative environmental impacts (e.g., Aragon-Correa and Sharma, 2003; Bansal, 2005). Associated with the proactive postures of the continuum, *the capability of proactive corporate ES* refers to the firm's ability to implement environmental management practices voluntarily in advance of future environmental regulations and social trends, designing or altering the behaviour of all functional departments, business processes and products to prevent negative environmental impacts of business activities on the natural environment (e.g., Aragon-Correa, 1998; Russo and Fouts, 1997). This strategy is an organizational capability in general and a dynamic capability in particular because it is dependent on specific identifiable business processes and consists of the implementation of process- and product-focused sustainable business practices that enable the firm to align itself with changes in its business environment (e.g., Aragon-Correa and Sharma, 2003; Christmann, 2000; Hart, 1995). The rationale for such implementation is that the firm develops and implements voluntarily environmental management practices (e.g., an environmental management system according to the ISO 14001 standard) (e.g., Gonzalez et al., 2008) to reduce its environmental impact while simultaneously generating financial gains (e.g., cost savings), or commercial gains (e.g., improvements in corporate reputation).

We argue that the capability of proactive ES leads to superior firm performance. According to the resource-based logic, it is likely that this capability fulfils the attributes generally accepted as generating long-term competitiveness. This capability is valuable, as it enables a firm to implement proactive strategies that generate business benefits (Barney, 1991). The implementation of these strategies is not a common practice in firms, due to the scepticism among some executives about the benefits to be gained from environmental challenges. Since sustainable development strategies are not being implemented in many firms, implementing them is a rare resource (e.g., Hart, 1995). It is also probable that the above-mentioned benefits derived from this implementation can easily be appropriated by the first-implementer firm (Amit and Schoemaker, 1993). We believe that the development of this capability is difficult to imitate for the following reasons. First, the implementation of this strategy requires the presence of other resources acquired due to a unique path through history (Barney, 1991). Second, this capability is people-intensive, decentralized and it depends on tacit skill development through employee involvement. The decentralized and tacit nature of this capability makes it difficult to observe in practice (causally ambiguous) and hard to duplicate quickly (e.g., Hart, 1995). We also believe that this capability has low substitutability and cannot be traded. Finally, as a dynamic capability, it will enable the firm to sustain the competitive advantage when operating in volatile environments (e.g., Aragon-Correa and Sharma, 2003). In this sense, previous research on organizations and the natural environment has also found that implementing this strategy generates business benefits (e.g., Russo and Fouts, 1997). We therefore hypothesize the following:

Hypothesis 1 (H1): A proactive corporate ES has a positive effect on firm performance.

IT Capability and Proactive Corporate ES

Many prior studies that use resource-based theory in IS research conceptualize and classify IT resources (e.g., Santhanam and Hartono, 2003). In this study, we focus on the construct IT capability, which is defined as the firm's ability to mobilize, deploy and use IT-based resources such as IT infrastructure or human IT resources to improve the firm's business processes (e.g., Bharadwaj, 2000). Thus, this construct is conceptually multidimensional. We believe that this IT capability is a key enabler of the development of capabilities associated with an ES. In a general sense, our argument draws on both the IT-enabled capabilities perspective (e.g., Rai et al., 2006) and the natural-resource-based theory of the firm (e.g., Hart, 1995). The theoretical notion of higher-order capabilities and a hierarchy of capabilities have been used in recent research on business value of IT (e.g., Pavlou and El Sawy, 2006). This body of research has argued that there is a hierarchy among the various capabilities that a firm may possess and that IT capability seems to behave more as an enabler of higher-order capabilities in the firm than as a higher-order capability in itself. Thus, if proactive ES has been considered as a dynamic capability (e.g., Aragon-Correa and Sharma, 2003) and prior IS research has found that IT capability is a key enabler of other types of higher-order capabilities (e.g., Sambamurthy et al., 2003), it seems plausible to propose that IT capability could also act as a key enabler of the implementation of EESS. This rationale is also supported by prior literature on organizations and the natural environment, which notes that proactive ES will implement more easily if the firm possesses other enabler capabilities (Aragon-Correa and Sharma, 2003).

Several specific arguments suggest that IT capability could act as a key predictor of proactive ES. First, the greater the firm's degree of innovativeness, the greater its environmental proactivity (e.g., Aragon-Correa, 1998) and its level of IT investment (Benitez-Amado et al., 2010). It is thus rational to expect some connection between the level of technological IT effort and the implementation of eco-friendly approaches in the firm. Prospector and innovative firms usually implement advanced management techniques and styles in most functional areas, such that advanced approaches in IT and environmental management could coexist in the same firm. Second, firms interested in adopting proactive postures in advance of environmental and social trends can use IT-enabled market intelligence to anticipate future regulations and trends and respond in a timely way by designing products and processes. Agile firms could leverage IT to develop new products or enhance business processes (Sambamurthy et al., 2003) in order to implement such advanced sustainable approaches. Third, prior research on organizations and the natural environment has argued that investing in environmental technologies will be necessary in order to develop a more proactive approach to ES (Shrivastava, 1995). These technologies are also highly dependent on IT technology and advancements. Fourth, cross-functional capabilities and high involvement of human resources (e.g., Sarkis et al., 2010) are two resources that will help firms to develop proactive EESS more easily. Thus, firms with IT capability will develop this kind of strategy more easily due to their greater ability to manage both the relationships between the IT department and other functional areas (e.g. Ray et al., 2005) and the firm's IT human resources in this implementation (Melville et al., 2004).

Fifth, prior IS literature on IT-business alignment has argued that IT is a key enabler of the implementation of corporate strategies (e.g., Tavakolian, 1989). It thus seems rational to suggest that IT capability could also be important to implementing a corporate ES. Finally, firms with proactive EESS have a great need for information processing, such that

firms that leverage their IT infrastructure properly will implement this kind of strategy more easily. Consistently with the above arguments, we hypothesize the following:

Hypothesis 2 (H2): IT capability has a positive effect on the development of a proactive corporate ES.

IT Impact on Firm Performance through Proactive Corporate ES

We are also interested in testing whether proactive ES acts as a mediator in the interface between IT capability and firm performance. This mediation seems rational for three reasons. First, the rationales presented above link IT capability to the development of an ES (H2) and support a positive predictive relationship between this strategy and firm performance (H1). Second, our proposal is logically consistent with prior IS research on the IT-enabled capabilities perspective. Drawing on this perspective, first, IS researchers have argued that IT is too far removed from firm performance for a direct effect to be detected and thus does not support positive direct effects between IT and the firm's competitiveness. From a resource-based analysis, IT resources have generally been characterized as valuable (e.g., Wade and Hulland, 2004) and relatively rare (Benitez-Amado et al., 2010). While it is generally difficult to determine the exact degree of appropriability of benefits generated by IT resources, Wade and Hulland (2004) argue that this degree varies and find it to be high, low-medium and medium for IT infrastructure, IT managerial skills and IT technical skills, respectively. IT resources such as IT infrastructure are easy to imitate (e.g., Mata et al., 1995). In the case of human IT resources, debate continues, although it is generally accepted that these IT resources are relatively ease to imitate by hiring relevant IT expertise via existing labour markets or by interacting with external consultants (e.g., Melville et al., 2004). Finally, since IT resources are relatively substitutable and marketable, it will be difficult for a firm to generate long-term business gains only by possessing them.

Third, the stream of research outlined above assumes the theoretical notion advanced by Grant (1996) of the existence of a hierarchy of capabilities in the firm, in which IT capability is considered a "lower-order" capability that impacts the generation of business value positively and indirectly through the development of higher-order process capabilities. Thus, it seems rational to expect that developing ES capability could act as a mediator in the generation of business value of IT for the firm and to test whether this is true or not. The following hypothesis is derived from these arguments:

Hypothesis 3 (H3): A proactive corporate ES mediates the link between IT capability and firm performance.

METHODOLOGY, EMPIRICAL ANALYSIS AND RESULTS

Data

In this study, we combine data from several primary sources. First, for IT capability, ES, firm size, and talent development practices implementation, we use the 2007 edition of the database "Top performers for working in Spain" (CRF Spain, 2007). CRF Spain is the subsidiary of an international consulting firm, CRF. This dataset includes an evaluation on a scale from 0 to 10 of an interesting set of business practices (e.g., talent development, environmental management) in a group of Spanish firms. The evaluation is performed based on a questionnaire composed of 75 questions, as well as visits to firms carried out by journalists specialized in management. Well-known academic departments and the prestigious consulting firm Accenture also participated. Similar assessments developed by external consultants have been used previously in IS research and have been shown to be valid (e.g., Tallon, 2007). We therefore believe that our decision to test our hypotheses using this set of measurements is appropriate.

Second, we collected the data for measuring firm performance from the database Actualidad Económica (2007, 2008 and 2009). Actualidad Económica is a Spanish business magazine that develops an annual ranking of the most prestigious firms in different activity sectors based on revenue obtained in the past year. The Actualidad Económica database has been used before in the literature on IT value (e.g., Benitez-Amado et al., 2010). Finally, we measured the variable quality management practices implementation through the information gathered from the Spanish Association for Standardisation and Certification database. The database used contains detailed information on firms that have implemented a management system according to different standards (e.g., ISO 9001).

Measures

The study sample includes 63 firms representing a total of 22 industries that reflect the most important industries in the Spanish economy. In particular, 12 firms (19.048%) came from the banking and insurance sectors, 10 (15.873%) from electronics and IT, 7 (11.111%) from chemicals and pharmaceuticals, 6 (9.524%) from consulting and outsourcing, 6 from telecommunications, and 3 (4.762%) from the food and beverage industries. Finally, 19 firms (30.158%) belonged to other industries (e.g., aerospace, apparel, construction, hotels). Taking into account our proposed research model, in which the

maximum number of latent constructs leading to a given latent construct (i.e., firm performance) is five and our assumption of reflective constructs, the minimum sample size would be 50 (Gefen et al., 2000). Our sample size thus permits us to estimate the proposed model.

IT Capability

We measured IT capability through the single-measure-based evaluation on a scale from 0 to 10 of so-called *technological IT effort*, as reflected in the 2007 CRF Spain database. This evaluation refers to each firm's investment in IT infrastructure and to the management practices developed in the IT department in order to improve operations efficiency. We believe that this measurement is a good proxy of IT capability for two reasons. First, there is good conceptual alignment between the construct and the measurement used. IT capability refers to the firm's ability to leverage IT resources. Similarly, technological IT effort refers to the firm's investment in both IT infrastructure and IT management practices to enhance operations efficiency. These practices could certainly include abilities to deploy and use the IT infrastructure. Second, the literature on IT business value shows that it can be appropriate to measure the IT construct using both single measures and secondary data (e.g., Bharadwaj, 2000).

Proactive Corporate ES

We measured ES through the evaluation on a scale from 0 to 10 of the term *implementation of environmental management practices* with the information extracted from the 2007 CRF Spain database. This measurement refers to the firm's implementation of management practices to contribute actively to preserving the natural environment, such as controlling consumption, managing recycling appropriately, increasing the environmental sensitivity of employees, etc. Due to their strong conceptual proximity, the data used are a good proxy to assess the level of proactivity of each firm's ES. In particular, both the evaluation and the construct refer to how the firm manages the interface between its business activities and the natural environment to reduce environmental impact. Both also lead explicitly to the implementation of sustainable practices. Finally, prior research on organizations and the natural environment has focused on the implementation of best environmental management practices to assess the firm's environmental proactivity (e.g., Christmann, 2000).

Firm Performance

According to Benitez-Amado et al. (2010), firm performance can be assessed in terms of sectoral excellence. Sectoral excellence refers to the degree to which a firm is better than its competition in terms of sectoral positioning or performance. Sectoral excellence can be measured from secondary data contained in any known ranking of firms by calculating a rate of sectoral excellence (RSE) in the following way: RSE = 1 - (Ranking position of firm in the business sector in the database analyzed/Total number of firms in the business sector in the database analyzed). In all cases, RSE will have a value between 0 and a value very close to 1 (termed the sector's maximum value). The closer the RSE is to the maximum value for the sector, the greater the firm's competitiveness (Benitez-Amado et al., 2010). We calculated the RSE for all firms in our sample for the years 2007, 2008, and 2009, using the information contained in the 2007-2009 editions of the Actualidad Económica database. The final score of RSE measurement was estimated by averaging over this three-year period to create a more balanced view of performance (e.g., Tallon, 2007). We believe that this measurement is a good proxy of firm performance for several reasons. First, Wade and Hulland (2004) suggest that any dependent variable used in a resource-based study must exhibit three key attributes: (a) It should provide an assessment of performance, (b) it should incorporate a competitive assessment element, and (c) it should address the notion of performance over time. Our dependent variable clearly exhibits these attributes, as it evaluates firm performance relative to key competitors. RSE enables assessment of whether a firm is better than its competition in terms of sales-focused sectoral positioning. Furthermore, this measurement focuses on the long term. In general, prior research holds that, to evaluate the sustainability of superior performance and competitive advantage, it is advisable to analyze periods of two to four years (e.g., Bharadwaj, 2000). We have estimated the RSE for a three-year period, making it reasonable to believe that our measurement is a good reflection of the sustainability of each firm's performance.

Second, prior literature has assessed the variable firm performance in terms of firm growth in general (e.g., Bergeron et al. 2004), sales volume and sales growth (e.g., Bharadwaj, 2000; Chan et al., 1997), market share (e.g., Bharadwaj, 2000; Sarkar et al. 2001), and revenues growth (e.g., Rai et al., 2006). RSE is estimated from the information contained in known rankings that use revenues and sales as the main criteria for classifying the firms. This measurement is thus clearly related to the measurements used previously in the literature cited above. Finally, RSE is a measure of firm performance in commercial terms, and a relevant body of research claims the assessment of superior performance using market-focused measurements (e.g., Malhotra et al., 2005). Specifically, prior research has found that results obtained using RSE and survey-based market

performance are similar and that these two ways of assessing marketing performance are positively correlated (Benitez-Amado et al., 2010).

Control Measures

Firm size, implementation of talent development practices, and quality management practices implementation are proposed as control variables. Firm size has traditionally been used as a control variable when firm performance is used as a dependent variable (e.g., Benitez-Amado et al., 2010). Large firms may be in a better position to achieve superior firm performance due to their ability to garner efficiencies of scale (e.g., Rai et al., 2006). Further, large firms can develop higher-order capabilities such as proactive environmental strategy to a greater extent due to the extra resources at their command (Russo and Fouts, 1997). This variable was measured as the natural logarithm of the total number of a firm's employees (e.g., Benitez-Amado et al., 2010), using information extracted from the 2007 CRF Spain database. The implementation of talent development practices can influence the impact of corporate ES on firm performance. Thus, scholars in the field of organizations and the natural environment have indicated the importance that human resource management practices have in high-performance corporate environmental behaviour and their impact on the firm's competitiveness (e.g., Andersson and Bateman, 2000; Hart, 1995; Russo and Fouts, 1997; Sarkis et al., 2010). This variable has been modeled through the evaluation from 0 to 10 of *talent development practices implementation* in each firm through information collected from the 2007 CRF Spain database. Finally, since the implementation of quality management practices has been suggested as an important enabler of firm performance (e.g., Zhu and Sarkis, 2004), this variable was also included as control variable. To estimate it, we created a dummy variable to indicate the presence or absence of implementation of a quality management system according to the ISO 9001 standard. This information was gathered from the Spanish Association for Standardisation and Certification database.

Empirical Analysis and Results

Data analysis was conducted with partial least squares (PLS), a SEM technique commonly used in the IS literature that uses a component-based approach to estimation. The analysis was performed using the software SmartPLS 2.0.M3 (Ringle et al., 2005). Because of the small size of the sample and the study's predictive and exploratory nature, PLS is more appropriate than other SEM techniques such as EQS (e.g., Chin, 1998). The estimated path effects and the associated t-values were calculated using the bootstrapping routine with 500 subsamples in SmartPLS 2.0.M3. Although we did not have access to either the survey items used to compute the consultant's evaluations or to their validity analyses, the CRF managers assured us that these items had content validity, convergent validity and discriminant validity. To test H1 and H2, we estimate a research model (labelled as full mediation model) in which we link IT capability to ES and the latter to firm performance. The results of path analysis for this model are presented in Figure 2.

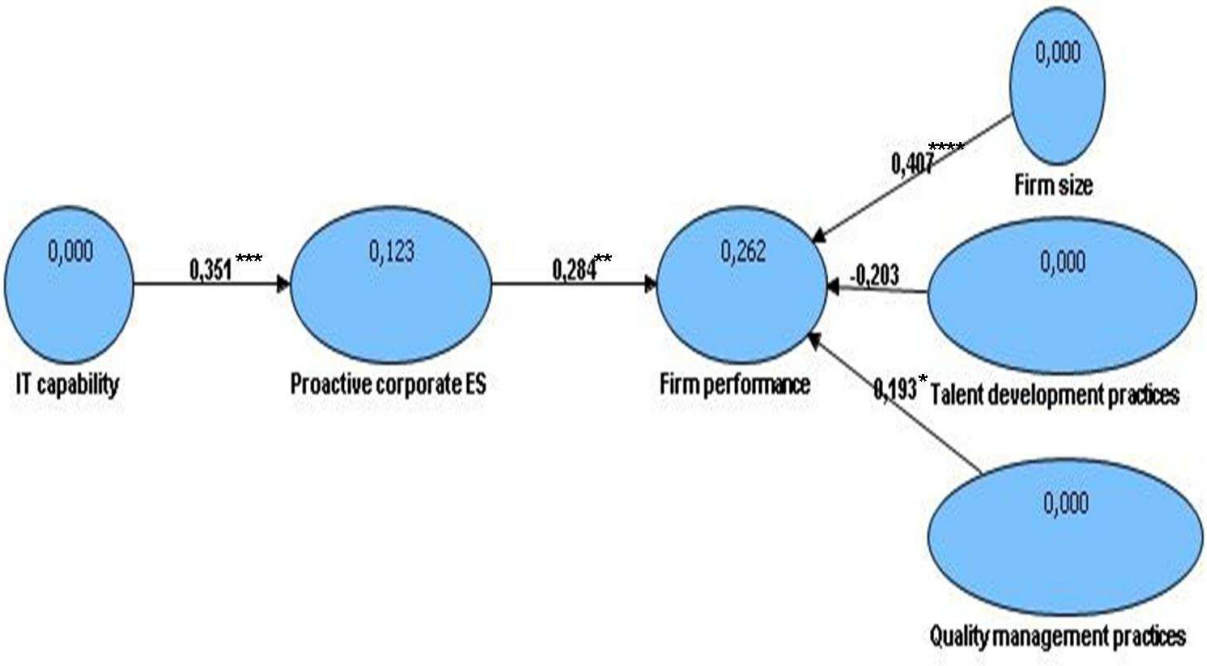

Figure 2. Results of Path Analysis for the Full Mediation Model[1]

ES has a significant direct impact on firm performance (beta = 0.284, $p < 0.05$), supporting H1. Moreover, IT capability has a significant impact on ES (beta = 0.351, $p < 0.01$), supporting H2. In a PLS analysis, R^2 and the significance of the relationships among constructs are measures of how well a model is performing (e.g., Chin, 1998). R^2 is 0.123 and 0.262 for the variables ES and firm performance respectively. All of the main structural paths were statistically significant. The cross-validated redundancy index (Q^2) has been proposed as a good index for evaluating the predictive capacity of models estimated using PLS analysis. The Q^2 measures the goodness of fit with which the values observed are reconstructed by the model and its parameters (e.g., Chin, 1998). It is generally accepted that a model has predictive relevance when the $Q^2 > 0$ for its dependent variables. Using the blindfolding procedure, we estimated Q^2 for firm performance ($Q^2 = 0.147$), which was greater than zero, as is recommended. These values show a satisfactory predictive power for our model.

We test H3 in two ways. First, we performed the causal steps procedure for testing the mediation hypothesis proposed by Baron and Kenny (1986). Thus, we tested stepwise (1) the significant effect of IT capability (IV) on performance (DV) without ES (MV) (beta = 0.109, not significant); (2) the significant effect of IV on MV (beta = 0.351, $p < 0.01$); (3) the significant effect of MV on DV (beta = 0.284, $p < 0.05$) and (4) the insignificant effect of IV on DV in the co-presence of MV (beta = 0.062, not significant). Steps (2), (3) and (4) are supported, but step (1) not. However, although Baron and Kenny (1986) claim that this step should be satisfied for mediation to exist, an important body of subsequent literature on organizational research methodology (e.g., Preacher and Hayes, 2008) argues that this step is not necessary for mediation to occur. If we accept that step (1) is not necessary for mediation to occur, our empirical analysis also supports H3. Second, we also compared the research model that proposes full mediation [research model of step (3)] to a competing model that proposes both direct and mediated effects or partial mediation model [research model of step (4)]. Since the models are nested, they can be compared statistically using PLS results (e.g., Rai et al., 2006). The R^2 for firm performance in the partially mediated model was 0.265, as compared to 0.262 in the fully mediated research model. The effect of the extra path in the partially mediated model is assessed using a procedure similar to that used to test competing models in stepwise linear regression. Accordingly, the f^2 statistic, which is based on the difference in R^2 between the two models, was first computed and then used to compute the pseudo F statistic. Based on the results of the two competing models for our sample, f^2 was 0.004082, and the pseudo F (3, 60) statistic was 0.240838, which was insignificant ($p = 0.868$, not significant). The analysis suggests that the additional variance explained by introducing the direct path from IT capability to firm performance does not significantly add to the variance explained in the dependent variable. The data are definitely consistent with our hypothesis:

[1] $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$, $^{****}p < 0.001$ (all tests are two-tailed).

IT capability impacts firm performance through the capability of ES. Figure 3 presents the results of path analysis for the partial mediation model [step (4)].

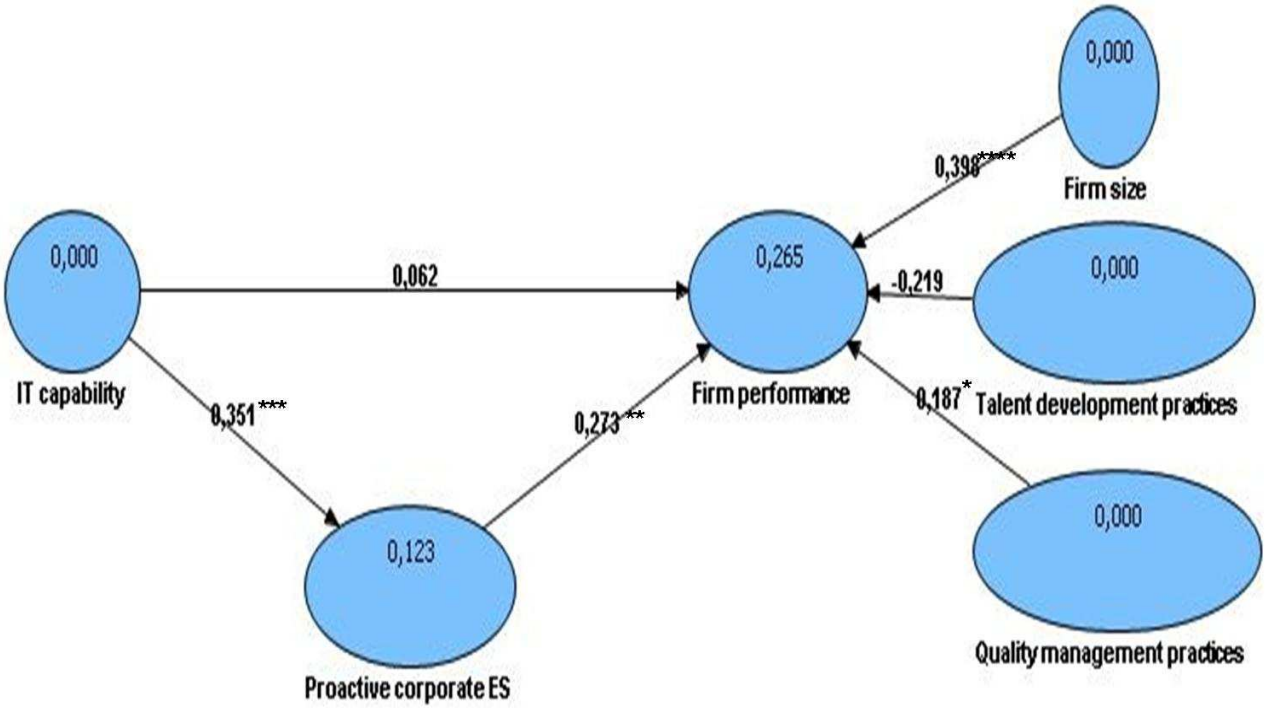

Figure 3. Results of Path Analysis for the Partial Mediation Model

DISCUSSION AND CONCLUSIONS

Drawing on the perspective of IT-enabled capabilities and the prior literature on organizations and the natural environment, we find that IT capability enables the development of the capability of proactive ES. Moreover, the results indicate that IT increases firm performance indirectly by means of the capability of ES. These findings have important implications for IS scholars.

Our study introduces the IS community to the construct *organizational capability of proactive corporate ES*. Our research also shows that IT capability is an enabler of the development of capabilities associated with the implementation of a proactive ES in the firm. This result is consistent with prior research on organizations and the natural environment (e.g., Aragon-Correa and Sharma, 2003) that argues that the generation of the capability of ES is developed through other resources. We find that IT capability is an important specific determinant of the implementation of proactive EESS. In our opinion, this result is fundamental for the IS community for several reasons. First, one of the major challenges largely untackled in IS research is to study the role of IT resources that can be leveraged to implement environmentally sustainable business practices (Watson et al., 2010b). To the best of our knowledge, this is the first study analyzing the relationship between IT and environmental proactivity in the firm. Second, this result has important implications for theory of the IT-enabled capabilities perspective. Past IS research has found that IT construct is a key enabler of several examples of higher-order process capabilities. We find that proactive ES is another higher-order capability enabled by IT. We thus respond to the call for research analyzing the role of IT in shaping sustainability in the firm (e.g., Melville, 2010).

Last, our study shows that IT-enabled proactive ES leads to a superior firm performance. Our results show that this strategy fully mediates the impact of IT on firm performance. These results are consistent with the perspective on IT-enabled capabilities, which argues that IT do not lead directly to superior firm performance but do lead to it indirectly through the development of higher-order capabilities (e.g., Pavlou and El Sawy, 2006). We find that the capability of proactive ES is an important intermediate capability through which the benefits of IT are converted into performance effects at firm level. This research also makes practical contributions by providing a better understanding of how practitioners can shape business value of IT by implementing EESS.

Although we have tried to conduct our research as thoroughly as possible, there are still limitations. For instance, our results are only generalizable to 22 business sectors of Spanish firms. Subsequent research could test the validity of these results with samples of firms in different countries (e.g., U.S. and Asian firms), where the level of IT investment and the emphasis on environmental issues may differ. Also, while we introduce a rigorous and consistent new way to assess firm performance, this measurement is only associated with an evaluation in commercial terms. Further research should revalidate whether the results are also robust when employing other ways to assess firm performance (e.g., financial performance). We will discuss other research limitations and suggestions for further analysis at the conference if the paper is accepted. This paper provides a preliminary understanding of how IT can be leveraged to implement sustainable business practices in order to improve competitiveness in an organizational analysis context.

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