ANALYZING COLLABORATION TECHNOLOGIES EFFECT ON PERFORMANCE THROUGH INTRANET USE ORIENTATIONS

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Abstract

This paper focuses on analyzing the impact of collaborative technologies on firm performance. Nonetheless, the methodology used analyzes the influence of collaborative technologies not directly but through an intermediary variable. This variable represents different intranet use orientations (e-information, e-communication and e-transaction). To achieve these objectives, a sample comprising 310 Spanish firms was employed. The results show different e-collaboration tools are associated with different Intranet use orientations and demonstrate there is a positive relationship between e-information and organizational performance. That is, the use of collaborative technologies with an informational orientation contributes to increase organizational performance. In addition, the existence of complementarities between e-information and e-communication were found. Thus, firms using their Intranet for e-information in conjunction with e-communication achieve better performance.

Keywords: E-collaboration, Collaboration technologies, Intranet, Organizational performance.

1 INTRODUCTION

Information technologies (ITs) enable companies to obtain, process, stock and share information and knowledge. The emerging powerful systems, such as intranet, allow people to collaborate and share their complementary knowledge (Bhatt et al., 2005). Current developments of Internet technologies and e-business models have provided workable infrastructures for group communication and information processing (Cai, 2005). Put it simply, e-collaboration is collaboration among individuals engaged in a common task using electronic technologies (Dasgupta et al., 2002). E-collaboration and collaborative tools bring geographically dispersed teams together for virtual meetings across great distances. This results in tremendous time and cost saving, greatly decreased travel requirements, faster and better decision-making and improved communication flows throughout the organization (Bafoutsou and Mentzas, 2002), thus improving productivity, quality, and efficiency of group work (Cooper, 2003). Most e-collaboration tools are usually hosted on the corporate intranet (Damsgaard and Scheepers, 2000). As an intranet evolves, it increases in sophistication and complexity and can be used for

advanced applications such as collaborative design, concurrent engineering, and workflow support (Duane and Finnegan, 2003). The intranet overcomes organizational hierarchies, formal communication policies, physical barriers and social groupings to make knowledge available to everyone (Begbie and Chudry, 2002). Mainly, corporate intranet may be oriented to different, but compatible, uses. These are related to the offering of information online, communications and exchange of information, and the automation of internal business processes.

The present research examines the impact of intranet collaborative technologies on organizational performance. Main contribution is the use of an intermediary variable between collaborative technologies and organizational performance. This variable represents different intranet use orientations (e-information, e-communication and e-transaction). Then, the impact of each orientation on organizational performance is evaluated. Under this approach lies the idea that the simple presence of collaborative technologies is not enough to know their true influence on organizational performance.

The paper begins with a detailed explanation of different e-collaboration tools. Then, a framework differentiating three intranet use orientations is presented. In section 3, the theoretical model is proposed and hypotheses are stated. Following that, the methodology used for sample selection and data collection are discussed. Then, data analysis and results are examined. Finally, the paper concludes with a discussion of research findings.

2 LITERATURE REVIEW

2.1 E-collaboration tools

E-collaboration tools are applications where ITs are used to help people coordinate their work with others by sharing information or knowledge (Doll and Deng, 2001). They are critical in KM programs (Alavi and Leidner, 2001; Marvick, 2001; Skyrme, 1998). Different technologies are used in e-collaborations (Dasgupta et al., 2002). Table 1 shows a classification of them, based on Nunamaker et al. (1997), DeSanctis and Gallupe (1987), and Pinsonneault and Kraemer (1990). E-collaboration tools may be grouped in two: (1) electronic communication systems (ECS), whose purpose is to facilitate information exchange, and (2) teamwork systems (TS), where teamwork (processes and decision making) is structured and done. ECS aim at enabling relationships among individuals or institutions, employees or customers, while TS' objective is to integrate information and predefined work processes, as it is the case of workflow tools.

Specifically, according to the frequency of use, the present study focuses on four e-collaboration tools (two for each category), namely, discussion forum, shared databases, repositories and workflow.

	Electronic communication systems (ECS)	**Teamwork systems (TS)**
Concept	They support the exchange of information, documents, opinions.	Work is done through them.
Aim	Relationship	Integration
Tools	Email; Discussion forum; Repositories; Yellow pages (experts directories)	Workflow/ Document management; Project management; Shared databases; Group decision support systems

Table 1. E-collaboration tools classification.

- Discussion forums. Due to their simplicity, discussion forums have been one of the earliest technologies for collaborative knowledge creation and knowledge sharing (Wagner and Bolloju, 2005). The subject is set and the discussion is carried on, either with all participants online, or over time, where anyone can share his or her opinion at any time (Bafoutsou and Mentzas, 2002).

- Shared databases. They are databases whose data may be consulted and modified by different authorised users within a company or a team. Shared databases are necessary to reduce or prevent the repeated typing of data, but in addition they supplement the system with a wealth of update information, thus building the organizational memory (Gunnlaugsdottir, 2003).

- Repositories. Valuable knowledge can be collected and placed into repositories for use by others (Gunnlaugsdottir, 2003). Document repositories are a collection of relevant documents that lists tacit and articulated knowledge from the experts about the project using textual, pictures and diagrammatic forms (Fernandes et al., 2005).

- Workflow. It may defined as the automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules (Workflow Management Coalition, 2004). Using Web-based workflow technology, business processes, part of which are initiated or performed by users via a Web browser, are automated (Bafoutsou and Mentzas, 2002).

2.2 Intranet use orientations

In this section, to further analyze intranet use, a framework which determines the existence of three Intranet use orientations is introduced. The orientations identified are e-information, e-communication, and e-transaction.

E-information: Web technologies can be employed to provide corporate or commercial information to diverse stakeholders (Huzingh, 2000). Therefore, e-information consists of one-way company electronic information directed to one or more stakeholders. This information may be accessible via distinct e-collaboration tools, which can be hosted on corporate intranets - for instance, discussion forums, shared databases or repositories.

E-communication: Intranet communications, besides allowing cost reduction in comparison to traditional communication tools, offer a unique and integrated opportunity for interacting with several business agents (both internal and external to the organization). In this way, all these technologies facilitate the exchange of information, collaboration and the possibility of establishing close relationships based on trust and mutual commitment. Thus, e-communication permits two-way information exchange. This exchange of information can vary from more structured e-collaboration tools such as workflows to more open and interactive forms such as discussion forums.

E-transaction: In the new economy, work has shifted from the creation of tangible goods to the flow of information through the value chain (Basu and Kumar, 2002). The establishment and development of workflow processes has played a fundamental role in this transition. Web technologies provide great opportunity for automation of processes. Thus, e-transaction involves the establishment of predefined electronic processes through the intranet. E-collaboration tools, through the intranet, can be employed to the automation of internal business processes. Here, initially workflows seem to be the best e-collaboration tool.

As mentioned in the introduction, the present study focuses on analysing the impact of collaborative technologies on firm performance. However, this is evaluated not from the simple presence of IT, but through the variables that mediate in their use.

Figure 1. Research model

3 MODEL

3.1 E-collaboration tools and Intranet use orientations

From the wide variety of collaborative technologies uses, the more predominant intranet uses will be examined. It is expected that ECS are more oriented to e-information and e-communication, while TS may be more frequently used to e-information and e-transaction. Thus, the following hypothesis is formulated:

Hypothesis 1: Different e-collaboration tools are associated to different Intranet use orientations.

3.2 Intranet use and performance

The intranet can potentially provide distinct value propositions to the firm. These come from the offering and sharing of real time corporate information, the possibility of establishing electronic communications (e-communication) and exchange of information (e-information), and the automation of internal business processes (e-transaction). The Internet presents high reach and richness of information (Evans and Wurster, 1999), features that may be translated to intranets. Intranets have been used to unify geographically dispersed work forces. As a consequence, organizations with a global presence have been among the first to implement intranets (Kalsbjerg et al, 2003). Thus, intranets, as a corporate channel for information dissemination, are of great value to the firm as they allow real-time corporate information sharing and data access across functional boundaries and organizational levels. Intranets reduce the cost and efforts associate with corporate information searches.

The intranet can also be a source of value creation to the firm through communications. With an intranet's ability to provide intraorganizational communication at reduced cost, employees can distribute and communicate their ideas more readily, enabling them to be more involved in the decision-making process (Lai, 2001). Other alternatives come from the possibility of hosting discussion forums, where employees can create and share knowledge, which may be used for group learning. Intranets therefore facilitate communication at reduced cost, the creation of group learning and the possibility of establishing close relationships.

Fully automated processes can be conducted through the integrated enterprise portal, whether it's signing up for the company's retirement savings plan or registering for and taking an online training course (Hansen and Deimeler, 2001). As the corporate intranet is the portal through which most of internal business processes are automated, another value proposition to the firm results from the automation of internal business processes through Intranets. This process

automation allows staff to focus on more complex tasks or on exceptions instead of routine tasks.

These arguments suggest that the three intranet use orientations (e-information, e-communication, and e-transaction) provide value propositions to the firm in terms of better and/or faster work fulfilment, which in turn may affect higher levels of organizational performance. Thus, the following hypothesis is formulated:

Hypothesis 2: There is a positive relationship between intranet use orientations and organizational performance

> Hypothesis 2a: There is a positive relationship between e-information and organizational performance
> Hypothesis 2b: There is a positive relationship between e-communication and organizational performance
> Hypothesis 2c: There is a positive relationship between e-transaction and organizational performance

The above discussion leads us to believe that complementarities among the distinct intranet value propositions may exist. Consequently, it seems logical to think that the more information-oriented a company's intranet is, the greater the benefits it achieves from online communications. Hence, the third hypothesis posits that e-information exhibits a strong reinforcing interaction effect with e-communication.

Hypothesis 3: Greater e-information orientation, in conjunction with e-communication, is associated with better organizational performance.

4 METHOD

4.1 Sample and data collection

The target population consists of SMEs from the Region of Murcia (Spain), with at least 10 employees. 310 valid responses were obtained from different industries. The study assumes an error of 5.4% for p=q=50 and a confidence level of 95.5%. A structured questionnaire consisting of close-ended questions was developed. Face-to-face surveys with the key informant person in each company were conducted in May 2005. Studied companies are mainly SMEs and most of interviewees were CEOs.

4.2 Measures of variables

E-collaboration tools: Using a dichotomous scale, CEOs have to assess the presence of 4 tools in their firms: discussion forums, shared databases, repositories, and workflow applications.

Organizational performance: a scale with 10 subjective measures have been used since they can be a reasonable substitute for the objective ones (Dess and Robinson, 1984). The scale was based on Quinn and Rohrbaugh (1983), Hoque and James (2000), and Choi and Lee (2002, 2003). Since correctly measuring organizational performance is important, an exploratory factor analysis (EFA), Cronbach's alpha calculation and confirmatory factor analysis (CFA) were carried out in order to improve scale reliability and validity. After dropping 2 items, a global measure of organizational performance was created as the mean of the remaining 10 items:

growth, profitability, efficiency, product quality, customer satisfaction, internal processes quality, delivery time, employee satisfaction, employee qualifications, and employee creativity.

Intranet use orientations: one item (five-point Likert-type scales) was used for measuring each intranet use orientantion (e-information, e-communication, and e-transaction).

Hypothesis 1 is tested through ANOVA analysis, while hierarchical regression analysis is used to examine hypotheses 2 and 3.

5 ANALYSES AND RESULTS

5.1 E-collaboration tools and Intranet use orientations

With regard to e-collaboration tools, 37.1% out of all analysed firms (310) had at least one type of groupware technology within their intranet. Table 2 shows detailed results. Shared databases were the most frequently found technology, with 34.2% of the total number of firms containing it. Also this technology was found in almost all firms that have at least one type of GW technology (92.2%). The second and third technologies in importance were document repositories and workflow systems, respectively. Less than 10% of all analyzed companies presented Discussion forums, while 25.2% of firms containing at least on groupware technology have them.

GW technology	Total % (n=310)	At least one GW technology % (n=115)
Discussion forums	9.4%	25.2%
Shared databases	34.2%	92.2%
Repositories	21.9%	59.1%
Workflow	21.3%	57.4%

Table 2. Presence of groupware (GW).

Table 3 shows that the most predominant orientation is e-transaction, while the least is e-communication. Results (ANOVA) reveal different e-collaboration tools are associated to different Intranet use orientations, thus supporting proposition 1. More specifically, e-information is made operative by implementing all the collaborative technologies with the only exception of shared databases. Also, Intranet may be used as a communication tool through forums and to a lesser extent through workflow systems. Finally, e-transaction use results from creating shared databases accessible via the corporate Intranet. This confirms that ECS are more e-information and e-communication oriented, particularly, when considering forums, whereas TS are more e-transaction oriented.

5.2 Intranet use orientations and performance

The contribution of different Intranet uses to organizational performance will be tested through hierarchical regression analysis. In the first model, independent variables are individual Intranet use orientations, while in the second regression interactions between the 3 orientations are added as predictors of performance (Table 4). As shown in model 1, e-information has a significant positive impact on performance. That is, companies who use Intranet as an informative medium achieve higher organizational results. Conversely, e-communication and e-transaction coefficients are not statistically significant. In model 2, the significant incremental

R^2 was 0.118, meaning an increase of about 12% of explained variance with respect to model 1. In model 2, e-information impact on firm performance is positive and greater than in model 1 by itself. Also, positive interactions between e-information and e-communication were found. Through this analysis, support for Hypotheses 2a and 3 is found.

		Intranet use orientations		
E-collaboration tools		**E-information (Mean=3.06)**	**E-communication (Mean=2.54)**	**E-transaction (Mean=4.21)**
Forums	No	2.77	2.24	4.26
	Yes	3.78	3.34	4.09
	F	7.493***	12.142***	0.526
Shared databases	No	2.71	2.43	3.57
	Yes	3.09	2.55	4.27
	F	0.381	0.051	3.509*
Repositories	No	2.61	2.29	4.18
	Yes	3.30	2.68	4.23
	F	3.800**	1.463	0.045
Workflow	No	2.41	2.17	4.10
	Yes	3.42	2.75	4.27
	F	8.624***	3.273*	0.554
p<0.1*; p<0.05**; p<0.01***				

Table 3. E-collaboration tools and Intranet use orientations.

	Model 1	**Model 2**
Independent variables		
E-information	0.357**	0.535***
E-communication	-0.088	-0.391*
E-transaction	-0.125	-0.152
E-information * E-communication		0.303**
E-information * E-transaction		0.163
E-communication * E-transaction		0.069
F	2.513*	3.215***
R^2	0.089	0.207
ΔR^2		0.118**
p<0.1*; p<0.05**; p<0.01***		

Table 4. Hierarchical regression on performance.

6 DISCUSSION AND CONCLUSIONS

E-collaboration is developing into a major vehicle for communication for decision-making within business organizations (Dasgupta et al., 2002). Specifically, collaborative work based on information sharing is becoming a necessity (Bafoutsou and Mentzas, 2002). The present research examines the impact of intranet collaborative technologies on organizational performance. Although there is already literature which covers this research topic, this work presents the peculiarity of analyzing the influence of collaborative technologies not directly but through an intermediary variable. This variable represents different intranet use orientations (e-information, e-communication and e-transaction). Then, the impact of each orientation on organizational performance is evaluated.

First, the most frequently found technology was shared databases. Specifically, the 34.2% of the total number of firms has shared databases. Also, this technology was found in almost all firms that have at least one type of GW technology (92.2%). Besides, our data show that most companies use Intranet with a transaction orientation, mainly by including shared databases in the system. Those results confirm previous researches. For instance, Bafoutsou and Mentzas (2002) found that shared databases are clearly the most common and needed collaboration tools for sharing information. Recently, Meroño-Cerdán (2005) also concluded that shared databases were the most used collaborative technology in companies. On the contrary, discussion forums are common the least. Even when discussion forums have been one of the earliest technologies for collaborative knowledge creation and knowledge sharing (Wagner and Bolloju, 2005), firm's transaction orientation relegate this technology to an anecdotal use.

As hypothesised, certain e-collaboration tools are associated to different intranet orientations (e-information, e-communication and e-transaction). Specifically, it was found that ECS are more e-information and e-communication oriented (particularly, when considering forums), whereas e-transaction use results from creating shared databases accessible via the corporate Intranet. The latter finding is somehow unexpected, since e-transaction Intranet orientation was associated to workflow applications. Instead, automation tools are statistically linked to e-information orientation, supporting the thesis that workflow systems regulate the information flow from person to person, place to place, task to task (Carvalho and Ferreira, 2001).

Third, empirical results demonstrate that e-information improves organizational performance, while e-communication and e-transaction contribution cannot be demonstrated. All e-collaboration tools considered, except for shared databases, explain e-information. Thus, these ITs are expected to have a positive impact on organizational performance. As discussed previously, Intranets reduce the cost and efforts associated with corporate information searches, thus improving organizational efficiency. Companies should take those findings into account when introducing intranet projects, since the impact of Intranet on performance depends on how the Intranet is oriented.

Finally, another important finding is that greater e-information orientation, in conjunction with e-communication, is associated with better organizational performance. In this sense, ECS were found to be more e-information and e-communication oriented, particularly, when considering forums. This technology is the most rare e-collaboration tool and represents the one that has the greatest impact on organizational performance. Firms should bear in mind this finding.

Broadly, this research offers several contributions. First, it shows different e-collaboration tools are associated to different Intranet use orientations (e-information, e-communication, and e-transaction). Second, it demonstrates there is a positive relationship between e-information and organizational performance. Lastly, it indicates the existence of complementarities between e-information and e-communication. Thus, existing e-information in conjunction with e-communication was found to be critical to organizational performance.

While the study's contributions are significant, it has some obvious limitations which can be addressed in future research. First, the sample was obtained from the Region of Murcia (Spain). In this sense, findings may be extrapolated to other Spanish areas and other countries, since economic and technological development in Murcia and Spain is similar to other OECD Member countries. However, in future research, a sampling frame that combines firms from different countries could be used in order to provide a more international perspective to the subject. Second, the sample consisted of SMEs and according to Spanish Statistics National Institute, large companies are more used to implementing intranets (INE, 2006). This segment does worth a special analysis.

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