Examining e-business impact on firm performance through website analysis

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Abstract: This paper develops a framework differentiating three dimensions in e-business: e-information, e-communication and e-workflow. The methodology employed (web content analysis on the company’s website) allows evaluation of these e-business dimensions. The main research objective is directed to an examination of the relationship between e-business and firm performance. Additionally, differences in the adoption of e-business according to business size are evaluated. To achieve these objectives, a sample comprising 288 firms from the Region of Murcia, Spain was employed. The results show a positive relationship between e-business and firm performance. In contrast, the results confirm that e-business is not related to business size.

Keywords: e-business; websites; web content; technology adoption; firm performance.


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1 Introduction

In today's global business environment, organisational web presence is no longer exclusive to large companies or highly innovative firms. This statement is supported by the high rates of internet adoption among firms. For example, in Spain, 82% of organisations with more than ten employees are already connected to the internet (INE, 2002). The literature on web adoption recognises the adoption of an e-mail account as the minimum web adoption level (Teo and Pian, 2004; Teo et al., 1998). Companies at this stage do not have independent domain names and websites. These firms are normally connected to the internet and have e-mail accounts that they use to establish links with customers and business partners. Nonetheless, creating a website is the starting point for a firm to achieve the benefits derived from using the internet. The web can potentially be used for a variety of purposes, such as (Pflughoeft et al., 2003; Schneider and Perry, 2001; Turban et al., 2002):

- communicating internally and externally and sharing data
- searching for information on customers, suppliers and competitors
- providing customer service and sales support
- purchasing and selling products and services
- collaborative working.

In this way, e-business represents the conduct of business activities over the internet.

In recent years, research into the area of e-business has experienced a tremendous growth within the field of information systems. Thus, much research has been conducted on different e-business subjects, for instance, the adoption of the internet (e.g., Goode and Stevens, 2000; Mehrtens et al., 2001; Tan and Teo, 1998; Vadapalli and Ramamurthy, 1998). Nonetheless, in spite of this growth, there is a need to investigate further how businesses use the website as a means of interaction with internal and external business agents. In this sense, this study develops a methodology that allows an evaluation of e-business through website analysis and its impact on firm performance. In addition, the paper analyses e-business adoption according to one contingency factor: business size.

To test the proposed framework and hypotheses, a sample comprising 288 Spanish firms is employed. Recent studies (e.g., E-business Watch, 2004) suggest that Spanish companies have similar infrastructures concerning Information and Communications Technologies (ICTs) as other European Union (EU) member states, such as France and Italy. This report also indicated that the geographic divide in e-business activity within the EU, was smaller than initially expected, with Spanish firms having e-business figures close to those of French and higher than those of Italian companies.

Considering the above-mentioned points, the key research questions that motivated our work are:

- Is it possible to draw up a framework capable of evaluating the different dimensions that comprise e-business?
- Does e-business have a significant impact on firms’ financial performance?
- Is there any significant difference in e-business adoption according to business size?
This paper consists of six sections and is structured as follows: The next section presents the study’s theoretical foundation. Then, the methodology used for the sample selection and the data collection is discussed. Following this, the data analysis and the empirical results are examined. Finally, the paper concludes with a discussion of research findings, limitations and contributions from both research and managerial perspectives.

2 Research framework

E-business can be defined as the management of relationships, electronic data interchange, collaboration, communication and the establishment of workflow processes with business partners, customers, employees, government and other business agents, as long as these tasks or processes are performed by electronic means. This definition is broadly consistent with e-business definitions found in the literature (e.g., Fahey et al., 2001; Flurry and Vicknair, 2001; Kalakota and Robinson, 2000; Rodgers et al., 2002; Sawhney and Zabin, 2001; Tapscott, 2001; Wu et al., 2003). E-business can potentially transform a firm into a networked entity with seamless supply chains and value creation processes (Sawhney and Zabin, 2001). It provides the electronic means to enable connections among and between processes to take place in fundamentally new ways and at such speeds that it literally opens up the ability to radically reconfigure each core operating process. Organisations today frequently integrate internet technology to redesign processes in ways that strengthen their competitive advantages (Phan, 2003). Consequently, e-business has a pervasive impact across the entire span of the organisation’s structure (from the purchasing department to the field sales force) and across a range of its business processes (from internal administration to supply-chain coordination) (Wu et al., 2003).

E-business has the potential for generating revenues from e-commerce applications but its main contribution may come from its ability to reduce costs, including both fixed and variable costs. For example, using internet technologies in conjunction with office automation software and Enterprise Resource Planning (ERP) may help reduce fixed and overhead costs, while internet Electronic Data Interchange (EDI), Business to Business (B2B), and Business to Consumer (B2C) applications may reduce the variable cost of the manufacturing and distribution processes of the product (Quan et al., 2003). These benefits in turn improve efficiency and boost productivity. The above argument is consistent with Thatcher and Oliver (2001) who classified efficiency-enhancing Information Technology (IT) investments into three categories: those that reduce fixed and overhead costs, those that reduce product design and development costs, and those that reduce operational (manufacturing, distribution and services, etc.) variable costs.

2.1 E-business dimensions

In this section, to further analyse e-business, a framework which determines the existence of three e-business dimensions is introduced. The dimensions identified are e-information, e-communication and e-workflow.
2.1.1 E-information

Web technologies, normally the corporate website and also intranets and extranets, can be employed to provide corporate or commercial information to customers, business partners or other stakeholders (shareholders, employees, the public, etc.) (Huzingh, 2000). Corporate information can provide insight into the background of the company (financial statements, employment offers, quality certificates, etc.) and commercial information implies providing product-related information, such as prices, specifications, terms of delivery, etc. Therefore, e-information is considered as an e-business dimension that consists of one-way company electronic information directed to one or more stakeholders. This information is of corporate or commercial nature and goes beyond basic business information such as contact details. For instance, e-information could be the display on the internet of product information to potential customers or financial information to shareholders.

2.1.2 E-communication

Internet communications, besides reducing costs normally incurred in traditional communication tools, offer a unique and integrated opportunity for interacting with several business agents (both internal and external to the organisation). 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. In this respect, web technologies are the great unifier, offering a way to integrate text, graphics, sound and video (Bernard, 1996). Thus, e-communication is recognised as an e-business dimension that permits two-way information exchange. This exchange of information can vary from more structured tools, such as the feedback form, to more open and interactive forms, such as the online chat feature.

2.1.3 E-workflow

Over the past 20 years, the economy has rapidly transformed from its traditional base to a new, information-based economy. In this new environment, 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 the development of workflow processes have played a fundamental role in this transition. According to the Workflow Management Coalition (WFMC, 2004), a workflow is ‘the automation of a business process, in whole or in part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules’. Internet technology differs from traditional information systems such as inventory management systems, logistic systems, etc. Traditional information systems perform previously defined tasks and the interchange among various information systems is troublesome and limited to relatively simple input and output operations. Alternatively, e-business provides great opportunity for automation of processes. Thus, e-workflow is considered as an e-business dimension that involves the establishment of predefined electronic processes. As many workflow type technologies (product data management, e-procurement, supply chain management systems) may not use the website as a means to communicate with suppliers or customers, in this research we focus only on analysing the automation of the sales process through the corporate website.
2.2 Hypotheses development

In this section, the hypotheses of the study are developed according to the existing information systems and e-business literature.

2.2.1 E-business and business size

Business size has been consistently supported as an important organisational factor for technology adoption (Damanpour, 2002; Lind et al., 1989; Raymond, 1985). This has also been confirmed in the information systems literature. For example, Brynjolfsson et al. (1994) found that firm size is strongly associated with IT investment. With regard to e-business adoption, Zhu et al. (2003) showed that larger size firms are more likely to adopt e-business. Similarly, more recent studies suggest that there are several levels of website adoption and also find that firm size is relevant to web adoption level (Teo and Pian, 2004). Therefore, as larger businesses can allocate greater financial, technological and personnel resources to the development of e-business initiative, larger firms might be expected to have greater e-business adoption. Thus, the following hypotheses are proposed:

Hypothesis 1 E-business adoption is positively related to business size.

Hypothesis 1a The presence of the e-information dimension is positively related to business size.

Hypothesis 1b The presence of the e-communication dimension is positively related to business size.

Hypothesis 1c The presence of the e-workflow dimension is positively related to business size.

2.2.2 E-business and firms’ financial performance

In the literature on information systems, it is widely argued that e-business-related IT, such as EDI, can enhance organisational efficiency. Mukhopadhyay et al. (1995) found that EDI enabled the effective coordination of material movements between manufacturers and suppliers, which resulted in significant cost savings and inventory reduction. Today, internet-based EDI is replacing EDI as a relatively small investment is needed, which means using cheaper technology to enable small- and medium-sized businesses to participate in the electronic marketplace (Angeles and Nath, 2000). Alternatively, some researchers indicate that e-business applications can generate internal efficiency and external coordination through changes in intra or interorganisational integrative processes (Kambil et al., 1999), whereas others have pointed to transaction efficiency as one of the four primary value drivers for e-business (Amit and Zott, 2001). The other three sources of value creation in e-business identified by Amit and Zott (2001) were complementarities (between online and offline assets, technologies and activities), novelty (innovations in the structuring of transactions: new business models) and lock-in. The latter represents the extent to which strategic partners and customers have incentives to maintain and improve their associations.
Complementarities among IT resources and other resources have been proposed as critical to superior performance (Bharadwaj, 2000; Kivijärvi and Saarinen, 1995; Li and Ye, 1999). Therefore, taking into consideration the above arguments that suggest e-business enhances organisational efficiency and complementarities, as well as the other two sources of value creation in e-business (lock-in and novelty), e-business should improve intermediate operational performance, which in turn may give higher levels of financial result.

**Hypothesis 2** There is a positive relationship between e-business adoption and firms’ financial performance.

**Hypothesis 2a** There is a positive relationship between the presence of the e-information dimension and firms’ financial performance.

**Hypothesis 2b** There is a positive relationship between the presence of the e-communication dimension and firms’ financial performance.

**Hypothesis 2c** There is a positive relationship between the presence of the e-workflow dimension and firms’ financial performance.

### 3 Methodology

This study used a detailed content analysis of the company’s website to determine the presence of e-business dimensions for interacting with stakeholders. Website content analysis has previously been applied in few empirically based investigations relating to the e-business topic in the literature (e.g., Huzingh, 2000; Robbins and Stylianou, 2003; Teo and Pian, 2004; Zhu and Kraemer, 2002). The main contribution of this technique comes from the possibility of objectively measuring a significant number of content features (Huzingh, 2000). Each element is measured using a binary variable, representing whether or not a website has the particular feature.

#### 3.1 Sample

Internet literature presents two main approaches for gathering businesses’ website addresses. The first approach is based on web addresses obtained from a business directory that contains lists of businesses and their URLs and has been frequently applied in literature (e.g., Abell and Lim, 1996; Auger and Gallaugher, 1997; Goode and Stevens, 2000; Pardue and Chatterjee, 1997). This approach is comparatively easy to undertake, as website addresses are available in a single location (Goode and Stevens, 2000). To apply this technique, firstly, a listing must be available and, secondly, must be comprehensive and up to date. The second approach involves searching for websites using the internet itself. For this technique, search engines are used to build up a database of businesses with websites. Keywords are entered into search engines in order to find business names, or pages containing links to businesses. Liu et al. (1997) make use of this approach to develop their sample. This approach is particularly useful when directory listings are not available or out of date.
This study is based on the first approach, although it is complemented by the second. Firstly, an online listing of businesses with websites from the Region of Murcia (Spain) was used. Secondly, this directory was completed with the URLs of other businesses operating in the same region; the URLs were obtained from other sources, mainly, search engines and link pages. In both cases, the selected businesses were firms compelled to present financial statements and had at least one employee. Finally, organisations pertaining to certain activities within the service industry (NACE groups 80, 85, 90–93) as well as agricultural and fishing companies (NACE groups 1–9) were excluded as these firms do not conform to the traditional concept of business. In this way, the number of businesses in the directory with websites rose to 443, from which 370 companies’ websites were content-analysed (to select the companies, a simple random sampling procedure was applied). Not all selected websites could be analysed and after eliminating the companies with erroneous URLs and those with websites under construction, the final sample was down to 288 firms. Taking into account that in the Region of Murcia there exist 33 753 companies with at least one employee, excluding agricultural firms and those related to certain activities within the service industry, and considering that several sources (e.g., INE, 2002) predict that in the Murcia region only 28.9% of the companies with more than ten employees have a corporate website, p = 30 was applied. Finally, the sample error estimated was 5.27% at the 95.5% confidence interval.

3.2 Data collection

To analyse each company’s website, an electronic questionnaire was developed in order to facilitate the data introduction process, making it easier, faster and more accurate (required fields were used). The questionnaire consisted of 18 items evaluating different content characteristics. These items were introduced taking into consideration previous studies within the literature (Huzingh, 2000; Meroño-Cerdan and Sabater-Sanchez, 2003; Robbins and Stylianou, 2003; Teo and Pian, 2004). A panel of academic experts was also consulted to ensure all variables broadly measured the website’s content. The questionnaire was initially pretested on ten companies. This process resulted in 18 variables that were used to measure a firm’s website content. Each variable represented a different content feature and was coded using a binary variable, where 1 was ‘yes’ and 0 was ‘no’. Websites were analysed by a research team composed of final-year students in Computer Engineering at the University of Murcia (Spain) who were attending an E-business Management course. The research team was previously trained and a website containing detailed explanation of each item in the questionnaire was at the students’ disposal. To ensure the validity of the data collected, re-evaluations were performed. Data on financial performance for the selected businesses was obtained from secondary information sources. More specifically, this information was collected from the Amadeus 2003 Database.
4 Analysis and results

To begin the data analysis, a bivariate correlation analysis (Spearman’s rho) that included all the content variables in our study (see Table 1) was performed. High correlations among many of these items were found, suggesting that the data reduction techniques were highly appropriate. To reduce this set to a handful of meaningful continuous constructs, an exploratory factorial analysis was used. Principal components analysis followed by varimax rotation was used for factor extraction. The rule used to determine the number of factors was eigenvalue greater than one criterion (Kaiser, 1979). The Kaiser criterion has been recommended in situations where the number of variables is fewer than 30 or when the number of respondents is greater than 250 and where the mean communality is > 0.6 (Stevens, 1996). To test the appropriateness of the data set for using factorial analysis, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity were used. Hair et al. (1999) recommended a KMO index of > 0.6 and Bartlett’s p < 0.5 as suitable for factor analysis.

The final results of the factorial analysis are presented in Table 2. A total of three factors were extracted. As shown in Table 2, each item loaded strongly (> 0.5) on only one of the three factors, which indicates high convergent validity, while all other factor loadings for these items remained below the 0.34 criteria recommended by Churchill (1979) as an indication of strong discriminant validity. In addition, to ensure the consistency of the factors obtained, reliability analysis was carried out to eliminate items that were not strongly related to other items in the construct.

A closer examination of the interpretability of these results showed that two of the resulting factors (Factors 1 and 2) appeared to clearly reflect the e-information and e-communication dimensions originally identified in Section 2, with the other factor (Factor 3) representing the intention of the business to accomplish online sales. Furthermore, the variables grouped in Factor 3 (online ordering, electronic payment, shopping cart, and products/services price) genuinely represent the automation of the sales processes through the internet, in whole or in part, depending on the organisation, which is consistent with the e-workflow dimension previously observed. Therefore, the constructs obtained allow us to measure the e-business dimension introduced.
Table 1
Bivariate correlation coefficients for web content variables

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<tr>
<th>Item</th>
<th>Mean</th>
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<tbody>
<tr>
<td>1. Search on firm’s website</td>
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<td>2. Site map</td>
<td>0.25</td>
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<td>0.17</td>
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<tr>
<td>3. Products/Services catalogue</td>
<td>0.76</td>
<td>0.42</td>
<td>0.06</td>
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<tr>
<td>4. Products/Services prices</td>
<td>0.12</td>
<td>0.33</td>
<td>0.24</td>
<td>0.05</td>
<td>0.18</td>
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<td>5. Online ordering</td>
<td>0.16</td>
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<td>0.20</td>
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<td>6. Electronic payment</td>
<td>0.03</td>
<td>0.19</td>
<td>0.31</td>
<td>0.01</td>
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<td>0.36</td>
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<td>7. Shopping cart</td>
<td>0.03</td>
<td>0.19</td>
<td>0.31</td>
<td>0.05</td>
<td>0.11</td>
<td>0.44</td>
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<td>8. Mission statement</td>
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<td>0.45</td>
<td>0.03</td>
<td>0.20</td>
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<td>-0.01</td>
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<td>9. Message from CEO</td>
<td>0.11</td>
<td>0.31</td>
<td>0.13</td>
<td>0.14</td>
<td>-0.01</td>
<td>0.12</td>
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<td>10. Financial information</td>
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<td>0.20</td>
<td>0.26</td>
<td>-0.02</td>
<td>0.14</td>
<td>0.02</td>
<td>0.20</td>
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<td>11. Employment opportunities</td>
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<td>0.11</td>
<td>0.20</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.09</td>
<td>0.09</td>
<td>0.08</td>
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<td>12. Request for information</td>
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<td>13. Registration for newsletters</td>
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<td>0.32</td>
<td>0.35</td>
<td>0.18</td>
<td>0.13</td>
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<td>14. Web forum</td>
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<td>15. Polls</td>
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<td>16. Reserved areas</td>
<td>0.18</td>
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<td>0.20</td>
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<td>17. List of important customers</td>
<td>0.08</td>
<td>0.27</td>
<td>0.16</td>
<td>0.06</td>
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<td>18. Quality certificates</td>
<td>0.32</td>
<td>0.46</td>
<td>0.02</td>
<td>0.13</td>
<td>0.05</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.10</td>
<td>0.07</td>
<td>0.11</td>
<td>0.13</td>
<td>0.08</td>
<td>0.17</td>
<td>0.17</td>
<td>0.09</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Notes: Significance levels:  c p ≤ 0.01; b 0.01 < p ≤ 0.05; a 0.05 < p ≤ 0.10
Table 2  Factor analysis for the web content variables

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial information</td>
<td>0.783</td>
<td>0.205</td>
<td>0.113</td>
</tr>
<tr>
<td>Employment opportunities</td>
<td>0.843</td>
<td>0.037</td>
<td>0.007</td>
</tr>
<tr>
<td>Request for information</td>
<td>0.087</td>
<td>0.586</td>
<td>−0.041</td>
</tr>
<tr>
<td>Web forum</td>
<td>0.034</td>
<td>0.635</td>
<td>0.167</td>
</tr>
<tr>
<td>Registration for newsletter</td>
<td>0.128</td>
<td>0.693</td>
<td>0.155</td>
</tr>
<tr>
<td>Customer satisfaction survey</td>
<td>0.034</td>
<td>0.700</td>
<td>−0.050</td>
</tr>
<tr>
<td>Online ordering</td>
<td>−0.115</td>
<td>0.068</td>
<td>0.765</td>
</tr>
<tr>
<td>Electronic payment</td>
<td>0.154</td>
<td>0.077</td>
<td>0.756</td>
</tr>
<tr>
<td>Shopping cart</td>
<td>0.087</td>
<td>0.078</td>
<td>0.785</td>
</tr>
<tr>
<td>Products/Services price</td>
<td>0.043</td>
<td>0.037</td>
<td>0.711</td>
</tr>
</tbody>
</table>

KMO   0.71  
Barlett 0.00  
Variance accounted for by factor (%)  23.5  17.7  14.9

4.1 Results for the first hypothesis

The selection of a statistical method for hypotheses testing was governed by the nature of the data and the population from where the data originated. Parametric statistics are applicable in circumstances where assumptions of population normality, central tendency and sample independence can be made. Nonparametric statistics are distribution-independent and robust to population non-normality (Hair et al., 1999).

In order to test whether business size influences e-business adoption, statistical techniques of group differences were employed. More specifically, the independent sample t-test was applied when parametric assumptions as well as homogeneity of group variances (Levene’s test significance > 0.05) were fulfilled, and the Mann-Whitney test, when they were not. Business size, measured as the number of employees, was introduced as a four-level categorical variable, coded whether the business pertained to Group 1 (between one and ten employees), Group 2 (between 11 and 25 employees), Group 3 (between 26 and 50 employees) or Group 4 (more than 50 employees). This granularity was established after considering the sample characteristics (first quartile = 10; second quartile = 24.5; third quartile = 50.5).

As presented in Table 3, the association between e-business and business size was not significant (p = 0.665; p = 0.083; p = 0.81). Here, support for Hypothesis 1 was not provided by any of the e-business dimensions (e-information, e-communication and e-workflow). Therefore, Hypothesis 1a, 1b and 1c were rejected.

The empirical results validated that e-business adoption was not related to business size. This result partially counters the findings of recent research (Teo and Pian, 2004) that did find evidence of a positive link between website adoption and firm size. However, these authors analyse web adoption in a different manner, not only from the corporate website, but also taking into consideration the level of internet use within the organisation, as well as the degree of integration of the internet strategy within the overall
Exposing e-business impact on firm performance through websites

business strategy. Therefore, our results could be interpreted as showing that e-business adoption measured through web content analysis is not related to the business size; while when considering it in conjunction with the level of internet use within the organisation and its incorporation within the business strategy, it may be influenced by the business size. Zhu et al. (2003) found that larger size firms are more likely to adopt e-business. Nonetheless, these authors found that the impact of firm size on adoption is significantly lower in countries with high e-business intensity than in countries with low e-business intensity. This implies that in countries with high e-business intensity, e-business is no longer a phenomenon dominated by large firms. Our finding also reinforces the general view that web technology is a low-price technology accessible to companies of any size, allowing competition between small and large businesses. In this sense, numerous websites of small firms appeared to be similar to those of larger firms, a characteristic not usually noticed in traditional shop windows.

### Table 3  E-business and business size

<table>
<thead>
<tr>
<th>E-business dimensions</th>
<th>Mean</th>
<th>Levene (Significance)</th>
<th>F (Significance)</th>
<th>H K-Wallis (Significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1 (1 to 10 employees)</td>
<td>-0.251</td>
<td>0.000</td>
<td>–</td>
<td>0.665</td>
</tr>
<tr>
<td>Group 2 (11 to 25 employees)</td>
<td>-0.166</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3 (26 to 50 employees)</td>
<td>-0.085</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4 (over 50 employees)</td>
<td>0.475</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1 (1 to 10 employees)</td>
<td>-0.215</td>
<td>0.009</td>
<td>–</td>
<td>0.083</td>
</tr>
<tr>
<td>Group 2 (11 to 25 employees)</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3 (26 to 50 employees)</td>
<td>-0.077</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4 (over 50 employees)</td>
<td>0.233</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-workflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1 (1 to 10 employees)</td>
<td>0.067</td>
<td>0.245</td>
<td>0.81</td>
<td>–</td>
</tr>
<tr>
<td>Group 2 (11 to 25 employees)</td>
<td>-0.093</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3 (26 to 50 employees)</td>
<td>0.007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4 (over 50 employees)</td>
<td>-0.007</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Results for the second hypothesis

The second hypothesis suggested a positive relationship between e-business adoption and firm performance. The statistical technique used to test this hypothesis was the hierarchical multiple regression analysis. This analysis was considered appropriate given the variables’ nature and the hypothesis put forth. Moreover, this method also allowed checking whether there was an interaction effect attributable to various independent variables.
A.L. Meroño-Cerdan and P. Soto-Acosta

To assess the value of e-business adoption, ‘added value/annual average number of employees’ was introduced as a financial measure of firms’ performance (dependent variable). A firm’s added value (obtained from the Amadeus 2003 Database) was calculated as gross profit plus depreciation of plant and equipment, financial expenses, and wages and salaries. This indicator has been previously employed in the existing information systems literature (e.g., Bresnahan et al., 2002) and represents an estimate of the total rents generated by an organisation.

Business industry and business size were introduced as control variables in order to avoid unexpected effects on firms’ performance. The former identified whether the business was operating at the manufacturing, services or commercial industry, and was coded as a dummy variable. The latter was measured as the total number of employees and was coded as a continuous variable.

The analysis was performed in three steps. The dependent variable was initially regressed on the control variables in Step 1. Then, in Step 2, the three e-business dimensions were added. Finally, in Step 3, the interactions among e-business dimensions were included.

Regression results are summarised in Table 4. Results in Model 1 confirmed that the control variables employed do not explain the dependent variable. Model 2 showed that the direct effect of the e-business dimensions on firms’ performance was significant as the increment in the squared multiple correlation coefficient (R2) was statistically significant. The effects of e-communication and e-workflow dimensions on firms’ performance were positive and statistically significant (support for Hypotheses 2b and 2c was provided); while the effect of the e-information dimension on the dependent variable was not significant (Hypothesis 2a was rejected). Finally, Model 3 showed no significant interactions among e-business dimensions (the increment in R2 was not significant).

Table 4 E-business and firm performance

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing industry</td>
<td>−0.030</td>
<td>−0.008</td>
<td>−0.005</td>
</tr>
<tr>
<td>Service industry</td>
<td>−0.063</td>
<td>0.017</td>
<td>0.030</td>
</tr>
<tr>
<td>Number of employees</td>
<td>0.068</td>
<td>0.030</td>
<td>−0.019</td>
</tr>
<tr>
<td>E-information dimension (EI)</td>
<td>0.010</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>E-communication dimension (EC)</td>
<td>0.262c</td>
<td>0.266c</td>
<td></td>
</tr>
<tr>
<td>E-workflow dimension (EW)</td>
<td>0.150b</td>
<td>0.150b</td>
<td></td>
</tr>
<tr>
<td>Interaction (EI)* (EC)</td>
<td></td>
<td></td>
<td>0.049</td>
</tr>
<tr>
<td>Interaction (EI)* (EW)</td>
<td></td>
<td></td>
<td>0.089</td>
</tr>
<tr>
<td>Interaction (EC)* (EW)</td>
<td></td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>F-value</td>
<td>0.439</td>
<td>3.768c</td>
<td>2.675s</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.005</td>
<td>0.063</td>
<td>0.058</td>
</tr>
<tr>
<td>∆ in R²</td>
<td>0.086f</td>
<td>0.006</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Significance levels: c p ≤ 0.01; b 0.01 < p ≤ 0.05; a 0.05 < p ≤ 0.10.
The most important finding of this research stems from the positive relationship found between e-business adoption and firms’ performance. Influences on firms’ performance were observed for two out of the three e-business dimensions: e-communication and e-workflow. The fact that influences were not detected for the e-information dimension could be interpreted in a way that a merely informative presence on the internet does not produce a significant impact on a firm’s performance. In contrast, adopting a more dynamic presence oriented to interact with stakeholders (communicating, selling products, providing customer service, etc.) may be more beneficial. The findings corroborate Amit and Zott’s (2001) research, which pointed to the new opportunities for wealth creation offered by e-business.

5 Implications for managers

Despite the benefits attributed to e-business, firms face a series of obstacles in its adoption, particularly their ability to transcend significant technical, managerial, and cultural issues (Xu et al., 2004). Thus, the high cost and risk of failure associated with e-business projects has made many executives and managers apprehensive of them (Rodgers et al., 2002). Security is another concern when implementing e-business. The chance of being attacked by hackers will increase as corporate information is transmitted electronically. Although these obstacles exist, this study’s findings confirm that executives and management need to be aware of the necessity of implementing e-business in their organisations. They need to recognise that their competitors are doing e-business and, if the firm does not respond, it will result in competitive disadvantage.

This study provides several important implications for managers. The results suggest that e-business is related to business performance. Therefore, managers should avoid a simple/static presence on the internet and instead pursue a more interactive/dynamic presence. Furthermore, e-business is not associated with business size. This means that firms of any size are able to adopt a presence on the internet.

6 Conclusion, limitations and future research

This paper develops a framework differentiating three dimensions in e-business (e-information, e-communication and e-workflow) and examines the influence of e-business on firms’ performance. In addition, differences in the adoption of e-business according to business size are evaluated. To achieve these objectives, a sample comprising 288 firms from the Region of Murcia (Spain) was employed. Broadly, this research offers several contributions:

- It facilitates a framework capable of evaluating the different dimensions that comprise e-business.
- It finds a positive relationship between e-business adoption and firm performance.
- It validates that e-business adoption is not related to business size.
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). Similar studies in different countries are likely to show different results, especially when considering high e-business intensity countries such as the USA, Finland, and Canada. Therefore, 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 e-business adoption measures can be further developed and expanded to capture electronic business with suppliers, employees and business partners. Third, the performance measures could include other financial measures, such as return on e-business investments.

References


Examining e-business impact on firm performance through website


Note

1 NACE is the European Union classification system for economic activities. The acronym NACE means ‘Nommenclature générale des activités économiques dans le ecommunautés européennes’, although today it is known in all Member States simply as ‘NACE’.