

A STRATEGIC ANALYSIS OF E-BUSINESS ADOPTION AND ENERGY COMPANIES' PERFORMANCE

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Acum articol prezintă o nouă concepție asupra nivelului de adoptare a Internetului în realizarea afacerilor, se demonstrează astfel că utilizarea acestei facilități în derularea proceselor organizaționale poate conduce la o abordare distinctă și oferă metrică necesară pentru măsurarea și dezvoltarea performanțelor companiilor din domeniul energiei. Aplicațiile de e-business pot fi utile în special în colectarea și transmiterea de informații atunci când incertitudinea pieței este mare. Constatările autorilor oferă un cadru pentru un studiu mai riguros al performanțelor companiilor din domeniul energie și e-business. Realizarea de achiziții electronice necesită generarea datelor și schimbul lor prin medii electronice compatibile pentru afaceri.

This article presents a new conceptualization of e-business adoption intensity, demonstrates how e-business adoption across processes can be empirically distinguished, and provides the corresponding scales for measurement and to develop energy companies' performance. E-business applications may be particularly useful in collecting and transmitting marketplace information when market uncertainty is high. The authors' findings provide the foundation for a more rigorous study of e-business and energy companies' performance. E-procurement can call for compatible electronic data generation and exchange interfaces across businesses.

Key words: e-business; technology adoption; radical innovation; innovation adoption; IT business value; marketing strategy, energy companies,

1. Introduction

The power industry is experiencing unprecedented changes as a result of deregulation mergers and acquisitions, formation of exchanges for material, energy, and transmission, and convergence with other industries such as telecommunication. To thrive in this dynamic market place today's power company must reduce costs, speed time-to-market of new products and services, and adapt business processes to the changing environment. Additionally, the

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company must outperform its competitors in attracting new customers while retaining existing ones. To stay competitive, companies are moving quickly to capitalize on Internet to conduct e-business in real-time.

E-business can potentially transform a firm into a networked entity with integrate supply chains and value creation processes [9]. It has a pervasive impact across the entire span of the organization's structure (from the procurement department to the field sales force) and across a range of its business processes (from internal administration to supply-chain coordination). The adoption of e-business is of a continuous nature in the sense that the extent of its adoption across business processes may change with time. We conceptualize e-business adoption intensity along dual dimensions - the *process domains* within which e-business is adopted and the *degree of implementation* of e-business within specific process domains.

Certain e-business initiatives are easy to adopt, whereas others may require substantial resources and/or organizational restructuring. For example, e-procurement can call for compatible electronic data generation and exchange interfaces across businesses, substantial systems redesign and integration within those businesses, personnel training, and significant commitment from top management.

E-business strategies are enabling power companies to operate cost-effectively, communicate more efficiently, and create innovative business practices. Meanwhile, the advantages of effective e-business strategies are becoming increasingly important, as power companies are forced to compete in a deregulated environment. For example, e-procurement systems – utility companies are joining together to take advantage of the efficiencies of online procurement of utility supplier (oil, gas, coal) [3].

We will presents in this paper a new conceptualization of e-business adoption intensity, demonstrates how e-business adoption across processes can be empirically distinguished, and provides the corresponding scales for measurement and to develop energy companies' performance.

2. Intensity of e-business adoption

Knowledge and capital are particularly important resources for new companies that use or produce e-business application. They can promote innovation and diffusion of e-business technologies through establishing and supporting related stakeholders networks.

From a theoretical perspective, Porter's (1985) value chain framework suggests that value creation within a business unit can be traced through distinct stages – beginning with the inbound interface where supplier – related processes

are concentrated, through the business itself, and finishing at the outbound interface where customer – related processes are concentrated [8].

Businesses frequently adopt innovations to gain competitive advantages or capabilities [2]. The literature on the organizational adoption of innovations has delineated specific business characteristics and conditions that facilitate such adoption. The adoption of innovations includes top management support, the catalyzing role of operational crises, and information and organizational architectures.

Companies are using e-business approaches to compete electronically, sell service and products - including energy efficiency - to new and existing customers, strengthen relationships with suppliers, contractors, and customers, and provide better customer service.

Competitor orientation refers to the ability and the will to identify, analyze, and respond to competitors' actions. Business engaged in continuous environmental scanning and adaptation are therefore more likely to lead the industry in terms of adopting and implementing e-business initiatives and will exhibit a higher overall intensity of e-business adoption.

The powerful customers and suppliers may demand the adoption of innovative processes that they perceive will either reduce their costs of, or increase their benefits from, dealing with the local organization. We think that very important for our study are the antecedents and implications of technological opportunism, defined as an organization's ability to sense and respond to new technologies, in the context of e-business adoption. From theoretical and practical perspectives, it is interesting to study whether aspects of e-business adoption that were driven more by normative pressures had weaker implications for business performance.

3. A conceptual framework and hypotheses

We propose a conceptual framework that links the antecedents of e-business adoption, adoption intensity, and performance outcomes. Nevertheless, we recognized the e-business adoption differed from the adoption of most other innovations in terms of the potential impact on business processes. The business processes are not exhaustive in terms of the potential e-business application domains. The frame work that represents our conceptualization of e-business adoption is presented in Figure 1.

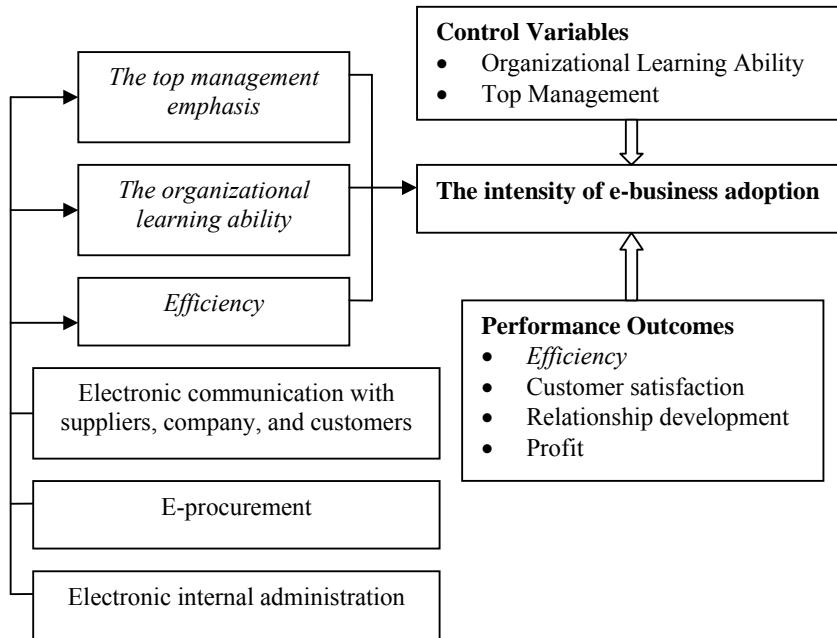


Fig. 1 - Intensity of E-business adoption

We define e-business as “the use of Internet technologies to link customers, suppliers, business partners, and employees using at least one of the following: (a) e-commerce websites that offer sales transactions, (b) customer-service websites, (c) intranets and enterprise information portals, (d) extranets and supply chains, and (e) IP electronic data interchange”. This definition is broadly consistent with that of Sawhney and Zabin [9]: “the use of electronic networks and associated technologies to enable, improve, enhance, transform or invent a business process or business system to create superior value for current or potential customers”. The main goals of e-business are to make critical business processes faster, more effective, more dependable, and more responsive to changing conditions.

Issues related to e-business adoption and performance outcomes can be broadly viewed from the perspective of the consumer and of the business itself. The antecedents of innovation adoption can be classified as relating to either (a) the economic motivations or characteristics of the business or (b) to its external environment.

Energy efficiency services offered via the Web include home energy audits, estimation of energy costs, aggregated purchasing of energy efficiency products, and building benchmarking. There is a low cost marketing platform which enables customers to interact with the company, such as on-line bill

payment or purchase of energy-efficient products such as compact fluorescent lamps. The company can redefine completely their existing business processes around the e-business model [6].

Customer orientation has been defined as an organization's ability to sufficiently understand target buyers in order to continuously create superior value for them. An important component of customer orientation is sensitivity to and foresight regarding the underlying forces that shape a market and industry. A customer-oriented business is more likely to anticipate future customer needs and have a long-term vision. Likewise, such a business would seek to coordinate and communicate better with suppliers toward developing a supply chain that is responsive in all parts to feedback from the marketplace

a) *Top management emphasis on e-business.* E-business initiatives now constitute a core component of the strategic planning process in energy businesses because the top management plays a central role in shaping organizational strategies. Building on these arguments, we hypothesize the following:

Hypothesis 1: The greater the top management emphasis on e-business, the greater the overall intensity of e-business adoption.

The knowledge is power and managers both within and across departments tends to hoard rather than share information. In this context, top management has the ability to reduce interdepartmental conflict and resistance to inform sharing, both in terms of information-sharing networks and other organizational arrangements.

b) *Organizational learning ability.* The organization's learning ability (or absorptive capacity) describes its ability to evaluate, adopt, and exploit external knowledge. A high learning ability can facilitate e-business adoption in multiple ways. First, it represents an ongoing process of assimilation and transformation. Second, an important component of learning is the organization-wide dissemination of information. An organization's absorptive capacity does not simply depend on its direct interface with the external environment. It depends on transfers of knowledge [5].

A high organizational learning ability will facilitate the capture and interpretation of information flows both within and across the boundaries of the business once e-business initiatives are implemented in its communication processes. Implementing e-business initiatives in order-taking and procurement processes calls for technologically complex systems that link multiple parts of the business unit to each other and with outside entities. Building on these arguments, we hypothesize the following:

Hypothesis 2: The higher the organizational learning ability of a businesses, the greater the overall intensity of e-business adoption.

c) *Impact of e-business on business performance.* Online communication can enhance efficiency in many ways. During the interviews, respondents frequently claimed that electronic communications reduced the time to reach customers and speeded up responses to customer inquiries. In addition, respondents also indicated that e-business processes helped reduce the cost of material and personnel involved in paper-based communications both within and outside the business unit. The business can also enhance customer satisfaction by providing information about products, troubleshooting, and service online.

An organization may adopt an innovation because it fears being left behind by other organizations that do so [5]. During innovation diffusion, early adopters are more likely to seek efficiency and profit gains, whereas later adoptions may reflect the pursuit of legitimacy. Such adoption may yield few benefits to the adopting organization, at least in the short run. The tension between the organization's economic motivations and normative pressures to adopt innovations is particularly relevant in the context of e-business.

E-business adoption can impart greater scalability to business process. That is, the ability to increase output without corresponding increase in the variable costs of achieving that output. When market uncertainty is high, businesses tend to gather more information from the marketplace in order to better predict future market trends and to better coordinate their supply chain in anticipation of these trends. Superior prediction and coordination would enable the business to react quickly and efficiently to changes in demand [4].

E-procurement refers to processes associated with online supplier search and qualification online order placement and monitoring and online bid submission by suppliers. It can be expected to increase efficiency by enabling a tighter balancing of demand and supply and by reducing the costs of both finding the right suppliers and transacting with them. An important precursor to e-procurement is the commitment of resources by the business and its suppliers to ensure that their business process and systems are mutually compatible. Building on these arguments, we hypothesize the following:

Hypothesis 3: The intensity of e-business adoption in the area of procurement is positively associated with increased efficiency.

E-business initiatives can help a business build stronger relationships with its partners and suppliers by sharing information on a continuous basis. Its

adoption in order taking can influence multiple performance outcomes. First, it can enhance efficiency by reducing transaction costs and other intermediary-related costs. Second, it can improve sales performance by allowing customers to easily access offered products and services in an intermediary-free environment [7].

4. Research design and methodology

Research context

The research context for this study is the power companies and their intensity of e-business adoption. To test these hypotheses, we collected data from a sample of 16 respondents (students) by combined qualitative and quantitative approaches. The students from Master Program were interviewed for the qualitative components. Data from a sample of students was obtained directly in the classroom. Additionally, based on qualitative interviews, and published case studies, the key informant for the survey was identified as a person who was closest to the management of power companies. The main sources were in-depth individual interviews and annual reports of power companies. These interviews helped to confirm the variables of importance, and provide a practical perspective on e-business adoption.

Model estimation

We used multiple regression to test the hypotheses [1]. In this case, we consider the following multivariate model:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon_i \quad (1)$$

where: Y_i , the intensity of e-business adoption (dependent variable)

X_{1i} , the top management emphasis on e-business (independent variable)

X_{2i} , the organizational learning ability (independent variable)

X_{3i} , efficiency (independent variable)

ε_i , represents the error term

Measures

Measures of the *intensity of e-business adoption* use the internal communications, outbound communications (customers), inbound communications (suppliers),

internal administration, order taking (online ordering), and procurement (e-procurement).

The scale items of *the efficiency* are the following: the cost of production and transaction; the cost of management has been substantially reduced; the costs of coordinating with suppliers, customers, and business partners have been substantially reduced, the cost of marketing the product have been substantially reduced; and the costs of acquiring new customers have been substantially reduced.

For *the top management emphasis* the scale items of the management emphasis are the following: top managers in power companies continuously emphasize to adapt to the Internet applications; they often advise employees to be sensitive to competitors' initiatives with regard to e-business; top managers insist that their employees must bring more of their business practices online in order to meet customers' future needs; they are willing to try to provide the necessary resources for implementing e-business practices; they often advise employees to keep track of the latest developments in Internet technology and Internet – related business practices, and incorporating e-business practices in company.

The organizational learning ability used a scale form from the following items: the company is quick to learn about new technologies; various departments and employees exchange information freely and frequently, the company invests substantially in advanced business and technical training for its personnel, and the company invests substantially in R&D and knowledge acquisition. All items are measured using 7-point Likert – type scale with 1 – strongly disagree and 7 – strongly agree.

The first step to use the t-test consists of set up null and alternative hypotheses. From equation (regression model) the one-sided hypotheses are set up as:

$$1. H_0 : \beta_1 \leq 0 \quad H_A : \beta_1 > 0 \quad 2. H_0 : \beta_2 \leq 0 \quad H_A : \beta_2 > 0; \quad 3. H_0 : \beta_3 \leq 0 \quad H_A : \beta_3 > 0$$

Further on we choose a level of significance and therefore a critical t-value about 5 percent as the level of significance with which we want to test. There are 16 observations in the data set that is going to be used to test these hypotheses, and so there are $16-3-1=12$ degrees of freedom (df =12). At a 5 percent level of significance, the critical t-value is $t_c = 1.782$. We consider that the level of significance is the same for all the coefficients in the same regression equation.

Now we must run the regression by using a computer package and obtain an estimated t-value. Results of the regression model are reported in Table 1.

Table 1
Regression results

| <i>Independent variable</i> | <i>Estimated coefficients</i> | <i>Estimated standard errors</i> | <i>t-value</i> |
|---|-------------------------------|----------------------------------|----------------|
| The top management emphasis on e-business | 29.312 | 8.12 | 3.6 |
| The organizational learning ability of a business | 8.85 | 4.1 | 2.158 |
| Increased efficiency | 14.54 | 3.9 | 3.73 |

The results show support for our H_1 ($\beta=29.312$ and $t=3.6$), because $3.6 > 1.782$ and the sign of the coefficient β_1 is positive then we reject the null hypothesis. The higher a firm's the top management emphasis on e-business, the greater its intensity of e-business adoption.

In the case of the organizational learning ability of a business, we reject the null hypothesis that $\beta_2 \leq 0$ since 2,158 is indeed greater than 1.782. The result (that is, $H_A: \beta_2 > 0$) is as we expected on the basis of theory since the more learning ability of a business, the more intensity of e-business adoption.

For the increased efficiency, as expected, we find that t-value calculated ($t=3.73$) is greater in absolute value than the critical t-value ($t_c=1.782$) and the calculated t-value has the sign implied by β_3 . Thus, we can reject the null hypothesis.

The larger in absolute value this t-value is, the greater the likelihood that the estimated regression coefficient is significantly different from zero.

Results and discussion

In this study research we sought to explore the role of Internet, intranet, and extranet in an energy company to enhance the intensity of e-business adoption. Specifically, we argued that the top management emphasis on e-business, the organizational learning ability, and the increased efficiency would facilitate performance gains from e-business adoption.

We know that e-business applications in the energy services industry affect wholesales, retail, trading, energy efficiency, and management. The convergence of technology and deregulation has created completely new business opportunities. However, with new opportunity comes new risk. As technology continues its advance the only thing that is certain is that there will be continued change in the way we both use and transact for energy services, including energy efficiency services and products.

This study has several limitations that need to be outlined. One limitation is the probable lack of consistency in the data collection process. Other limitations of this study include the fact that the data used were collected from respondents utilizing self-report survey, which could produce some common bias.

6. Conclusions

We checked whether e-business adoption intensity mediated the effects of the antecedents on performance outcomes. The results indicated that these effects were largely mediated by the intensity of e-business adoption.

Electric power companies are becoming more reliant on robust, expansive, and open information systems. Information networks have controlled electric power company core operations since before industry deregulation. The energy markets deregulate, suppliers and distributions must have the ability to balance loads on the system and reach financial settlement on the differences between load supplied and load actually delivered to customers. The businesses effectively act as a broker. It brings together buyers and sellers over the Internet.

B I B L I O G R A P H Y

- [1] *L. Aiken*, Multiple Regression: Testing and Interpreting Interactions, Newbury Park, CA: Sage, 1996;
- [2] *R. Dewar, J. Dutoon*, "The Adoption of Radical and Incremental Innovations: An Incremental Analysis", in Management Science, vol. 4, no. 32, November, 1986, pp. 1400-1430;
- [3] *W. Fang, V. Mahajan, S. Balasubramanian*, "An Analysis of E-Business Adoption and Its Impact on Business Performance", in Journal of the Academy of Marketing Science, vol. 31, no. 4, 2006, pp. 425-447;
- [4] *D. Hoffman, N. Thomas*, "Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations", in Journal of Marketing, vol. 60, no. 3, July, 1996, pp. 50-80;
- [5] *R. Keeney*, "The Value of Internet Commerce to the Customer", in Management Science, vol 4, no. 45, 1999, pp. 520-550;
- [6] *Gh. Militaru*, Sisteme informatici pentru management, Editura All, Bucureşti, 2005;
- [7] *M. O'Brien*, Enterprise Information System, McGraw Hill, New York, 2006;
- [8] *M. Porter*, Competitive Advantage: Creating and Sustaining Superior Performance, Free Press, New York: 1985;
- [9] *M. Sawhney, J. Zabin*, The Seven Steps to Nirvana, McGraw-Hill, New York, 2001.