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EVALUATING ELECTRONIC COMMERCE INITIATIVES WITH BENCHMARKS: INSIGHTS FROM THREE CASE STUDIES

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Abstract

This research uses ethnography, a literature review, and focused interviews to discuss benchmarks for evaluating organizational electronic commerce (EC) initiatives. Several authors (Straub and Watson, 2001; Tabor, 2001) have noted that because EC initiatives are, in many cases, uncharted territory, traditional project evaluation techniques (profit, return on assets) are not appropriate as they take a short-term view. Our findings indicate that EC initiatives go through three stages: project idea, research and development, and use. Different evaluation criteria should be used for each stage.

Keywords: Electronic commerce, metric, evaluation, benchmark

Problem Statement

In the past five years, firms embarking on EC endeavors have been on a roller coaster ride. At first, we were enamored with EC and how the Internet could change shopping. As organizations designed and implemented EC web sites, everyone was anxious to try this new way of doing things, leading to the success of the Internet in terms of web site visits, purchases, and funding. At this time, organizations with EC initiatives could obtain funding, both from outside investors and within the organization, even though traditional evaluation techniques (e.g. profit, reduced cost, increased sales) were not showing positive results. This left us wondering if new criteria should be used to evaluate EC projects.

Since the time of unyielding support for EC projects that were not measuring up to traditional evaluation techniques, we have seen more cautious investors and increased emphasis on traditional evaluation techniques. This leaves those sponsoring and managing EC projects wondering how to evaluate their project's success. On one hand, EC is an uncharted area and classic evaluation techniques (e.g. profit) are short-sighted as new projects are unlikely to achieve an organization's financial objectives while still developing. However, investors and organizations must evaluate EC investments to see if the investment is moving the right direction. The purpose of this paper is to determine what benchmarks should be used to evaluate EC initiatives.

Our paper has four remaining sections. We begin with an overview of EC evaluation literature. Next, we discuss our research method including organizations participating in the project. Our findings are presented in the third section. Finally, we present our conclusion including contributions and limitations.

Literature Review

Before discussing benchmarking EC literature. We will define benchmarking and EC. A benchmark is a standard against which to measure and compare performance (Codling, 1992, 1996; Codling, 1998). Three types of benchmarks exist: internal, external, and process (Besterfield, et al., 1999; Codling, 1992, 1996). EC is "doing business electronically" (Timmers, 1999, p.4). EC connects business constituents (customers, employees, vendors, suppliers, business partners, channels, and influencers) in order to share information, maintain relationships, coordinate supply chains, and conduct transactions using telecommunication networks (Zwass, 1996).

Table 1. Existing Research on Benchmarking EC

Authors	Project Stage	Focus	Theoretical Approach	Research Method
(Barnes and Vigden, 2000a; Barnes and Vigden, 2000b; Barnes and Vigden, 2000c; Barnes and Vigden, 2001)	Design	User interface issues	Web site usability, information quality, interaction quality	Survey
(Li, et al., 2001)	Design	Web site efficiency in terms of fit between site richness and product complexity	Media richness theory	Survey and math modeling
(Tarasewich, 2000)	Design	Site usability	Interface design	Literature Review
(Johnson and Rubin, 2001)	Design/Use	Compare business statistics before and after EC implementation and user interface metrics	None	Case study
(Rubin, 2001)	Design/Use	Measure business value, information technology, and customer activity	None	None
(Marr, 2001)	Idea/Design	Look at strategy and processes and compare what e-businesses are measuring to what traditional companies are measuring	Performance prism	Survey
(Rubin, 2000)	Implementation	Measure activity, cohesion, value, and balance	None	None
(Agrawal, et al., 2001; Kemmler, et al., 2001; Varianini and Vaturi, 2001)	Use	Measure customer attraction, conversion, and retention	None	Sampling
(Alexander, 2000)	Use	Metrics to assess the business effectiveness of a web site	None	None
(Chappuis, et al., 2001)	Use	Measure acquisition, penetration, and monetization	None	None
(Dugan, 1999)	Use	How customers shop and customer retention rate	None	None
(Heijden, 2000)	Use	Determines the metrics included in information technology strategies and motivations for inclusion	Decision making theory	Survey
(Metrix, 2001a)	Use	Assess actual business performance compared to targets in responsiveness and effectiveness	None	None
(Metrix, 2001a; webtomorrow, 2001)	Use	Measure no. of web site visitors and site stickiness	None	None
(Research, 2001)	Use	Measure percent of total purchasing dollars spent through EDI, e-markets, and reverse auctions	None	None
(Rubin, 2001)	Use	Track revenue from different types of EC relationships	None	None

Table 1 reviews existing research in benchmarking EC and sorts existing EC benchmarking research based on EC initiative stage. Table 1 includes the research focus, theoretical approach, and method. Our model identifies 3 stages of EC initiatives: project idea; research and development, consisting of system design and implementation; and use. The majority of the research focuses

on benchmarks for later stages, design and use. The majority of the design research has a theoretical base and research method, whereas the majority of the use research does not.

Method

In developing a model positing benchmarks for evaluating EC initiatives, we used ethnography and case study research (Emerson, 1983, Yin, 1994) to work with three organizations. Because of differences in organizations and in our relationship with each organization, our involvement with each EC initiative varied. In some cases, we gathered information using a combination of focused interviews, participant observation (e.g. attending meetings, observing informal conversations), and reviewing internal and external documentation. In other instances, we were limited to focused interviews and reviewing external documentation.

The paragraphs below discuss each EC case including: company description, EC business model and value proposition (Timmers, 1998; Timmers, 1999), our research involvement with the organization, and the organization's current EC metrics. Fictitious names are used for each organization.

Austin Utilities serves energy needs of a significant portion of the United States. While traditionally an electric company, holdings of Austin Utilities include gas, coal, nuclear energy, and telecommunications. Although Austin Utilities is involved in several EC initiatives, we are discussing their involvement in Energy Exchange. Energy Exchange is a consortium formed by the majority of United States utilities, attempting to link all buyers, sellers, and distributors in the industry. Energy Exchange's business model includes a central web site where manufacturers can list their catalogues and customers (utility companies) can visit the web site and place orders. The vision is to have all orders flow through the web site. The business model requires customers pay an annual fee for access; customers and vendors are assessed transaction fees on every purchase order executed through Energy Exchange. Energy Exchange's value proposition for manufacturers includes increasing reach and increasing ordering efficiency. Value propositions for customers include: enhancing price comparison shopping and auctioning excess inventory.

We have been involved with Austin Utilities since they were preparing to execute their first transaction on Energy Exchange in December of 2000. We visited Austin Utilities eight times, visits spanned between three and six hours. We talked to and met nearly everyone involved in Energy Exchange at Austin Utilities.

Austin Utilities has several ways of evaluating their investment in Energy Exchange. In evaluating whether to get involved in Energy Exchange, Austin Utilities did not use formal quantitative methods but rather a hunch that they should get involved in EC since everyone else was. However, before implementing the different programs Energy Exchange offers (supply chain evaluation, asset management, electronic settlement, print management, human capital management, and auctions), Austin Utilities evaluates each program by assigning a process team to compare what Austin Utilities is currently doing to what the program provides. The comparison is both quantitative in terms of savings and qualitative in terms of strategic advantage. Once the exchange was implemented, user satisfaction surveys were used to evaluate customer satisfaction with the exchange. In the use stage of the initiative, Austin Utilities looks at dollars spent purchasing products through Energy Exchange to evaluate their use of the exchange. Throughout the endeavor, Austin Utilities informally evaluates their efforts in EC by discussing their progress with other organizations pursuing similar endeavors, and academics and consultants who see a wider range of EC initiatives.

Lowell Lubricants manufactures motor oil and was formed as joint venture between two energy companies. Given these circumstances and the economic climate of mergers, acquisitions, and divestitures, Lowell Lubricants is constantly concerned about how their parents' decisions will affect their longevity. The business model for Lowell Lubricants' Distributor E-initiative is allowing their distributors to purchase products over the Internet. This catalogue links to Lowell Lubricants' enterprise resource planning and other back-end systems to provide customer specific data (e.g. pricing and inventory availability). Their business model also includes providing technology infrastructure that will allow their customers, the distributors, to build EC web sites allowing end customers to purchase products over the Internet. Lowell Lubricant's value proposition is to develop one standard system for their entire distributor network so they will not have to interact with multiple EC systems that otherwise could be implemented by the numerous firms in their distribution network. In addition, Lowell Lubricants expects that their EC initiative will increase revenue, communication, and customer service levels.

Our involvement with Lowell Lubricants consisted of several in depth discussions with the EC project leader and an extended visit with the marketing and EC project leader, a sales representative, the supply chain vice president, and a manufacturing plant manager.

At the time of our research, Lowell Lubricants was in the idea and the research and development stages. Our data indicated that part of the criteria Lowell Lubricants used to evaluate whether to get involved in Distributor E-initiative was qualitative—a feeling they should do something about EC. This was brought on by the popularity of the Internet and stakeholders’ desire for their business partners to be in EC. Our field notes did not indicate formal method for evaluating the project.

Salado Distributors is a wholesale grocery and restaurant distributor, with an extensive warehouse and trucking operations spanning the United States and abroad. While Salado Distributors holds a significant market share, the environment is competitive with several other distributors. Salado Distributor’s EC initiative, C-Store.com, is an exchange for the entire convenience store industry. C-Store.com’s business model involves a monthly subscription fee for organizations that want to be part of a web site linking the entire convenience store industry. C-Store.com’s value proposition involves increased information and buying power for retailers, increased control for retail storeowners, and increased information and reach for manufacturers.

Our involvement with C-Store.com began in August 2000. We conducted eight interviews each about ninety minutes long. We interviewed an information systems vice president, a financial vice president, and a national sales manager. We also observed two meetings relating to the project.

Before getting involved in new lines of business Salado Distributors requires that the project’s anticipated return on investment meet or exceed a specific return on investment. However, Salado Distributors did not use this formal evaluation technique when they decided to get involved in C-Store.com. The decision was tacit partially influenced by external pressure such as inquiries from business partners regarding what the company’s EC strategy was going to be and the general mood in the business environment that those who weren’t in e-business were going to be out of business. Now that the project is under way, Salado Distributors is using tacit indicators to evaluate C-Store.com. These include: marketplace receptivity; potential to add value; and consideration of the investment in relation to anticipated benefits.

Findings

The main difficulty in implementing benchmarking to evaluate EC initiatives is determining what to benchmark. This section uses insights from the literature and our case studies to develop a research model, Table 2. Table 2 posits that EC initiatives go through a life cycle consisting of: idea origination; research and development, including implementation and design; and use. Given the existence of different stages, we propose different benchmarks for each stage. In the following sections, we discuss Table 2 by defining each stage and its’ proposed benchmarks.

Table 2. Benchmarks by Stage

PROJECT STAGE	BENCHMARKS
Project Idea	Benchmark business model and value propositions against: <ul style="list-style-type: none"> • the organization’s existing processes • other companies both within and outside the industry
Research & Development	
<i>Implementation</i>	Benchmark the no. of: large companies, small companies, and central network companies (e.g. distributors, trade associations) interested in joining the EC initiative. Consider: initial composition of successful industry EC projects, nature of the industry, benefits, and use motivators
<i>Design</i>	Benchmark: <ul style="list-style-type: none"> • design time and cost • user interface qualities • system processes and costs against existing processes and costs
Use	Benchmark: <ul style="list-style-type: none"> • Seller: sales, new customers and markets, profit margins, customer support costs, web site statistics • Buyer: amount and percent of spend via EC, cost savings • All participants: customer satisfaction, inventory levels, marketing costs, timeliness of valuable information

In the **idea stage**, organizations first conceive of the EC project and begin developing the business model. While Table 1 indicates only one paper (Marr, 2001) dealing with benchmarking this stage, data from our case studies reveal that it is “benchmarking” that led all three companies in our study to conceive of their EC initiative. In all three case studies, our respondents explained that the idea of getting into EC was conceived in sessions where management was evaluating their information technology initiatives and that their organization got into EC because leading companies were implementing EC. While this process may not be a “formal benchmarking process” benchmarking is what was occurring.

Given the high failure rate of EC initiatives, success rates could be improved by evaluating the initiative at this early stage. In all of our case studies, once the organizations decided to initiate EC, they felt behind and that they needed “to rush” their offering to market. In this rush, organizations did not have reflection time to evaluate their business models and value propositions. Given this situation, we suggest that organizations not rush EC initiatives but take time to benchmark against internal processes by reflecting upon their proposed EC business model and value proposition and comparing it to their organization’s current practices; adopting only EC models that improve business. While this sounds rational, in most of our case studies the organizations did not take the time to reflect and evaluate the business model and assumed, or were told, that the EC initiative would improve existing business practices. Often, once an organization tried to implement EC, it was not as practical, efficient, or advanced as the organization’s existing business systems.

Organizations should also consider benchmarking business models and value propositions against other companies both within and outside their industry. Because of the lack of successful EC initiatives (Westling, 2001), benchmarking against others will provide ideas of both what to do and what not to do.

In moving forward with an EC initiative, organizations **research and develop** their idea. Where as the traditional systems development life cycle (Hoffer, et al., 1999) posits research and development, system design, and system implementation as unique stages data from our case study indicated that implementation and design should be part of research and development. In EC initiatives involving entire industries such as Salado Distributors’ and Austin Utilities’ projects, organization may start with an idea and then design that idea but in implementing the project and getting others involved new ideas surface and a new design emerges. This is partly caused by the need to get industry involvement and partly because EC is uncharted territory. As such, we are grouping system implementation and system design under research and development with the understanding that in EC organization do not pass neatly through stages of the system development life cycle but may cycle up and down the life cycle as well as being in multiple stages simultaneously.

Getting buy-in is a major part of **implementing** EC. Whereas much of the information technology literature takes an organizational perspective, focusing on soliciting buy-in from an organization’s employees; the implementation of business-to-business EC projects requires soliciting buy-in from other organizations, in many cases entire industries.

Because many EC projects fail from not getting critical mass necessary to add value, organizations should evaluate the buy-in of their EC initiative. Benchmarking buy-in has three components: industry nature, types of organizations targeted to join, and motivators to use the system.

Industry nature affects buy-in. Austin Utilities, which was in a regulated, non-competitive industry, was able to band together and form an industry exchange much easier than Salado Distributors, which was in a highly competitive industry. Competitors have a hard time trusting one another and thus joining forces in EC. Solutions may include having an independent ownership structure, getting a distributor involved, and having a trade organization sponsor and promote the initiative. Rubin (2000) proposed four benchmarks (activity, cohesion, value, and balance) to evaluate the performance of a group of organizations embarking on an EC initiative.

Another indicator an EC initiative is moving the right direction is if the initiative has industry leaders involved. Our data indicated that if industry leaders are not involved in the beginning, they are unlikely to see the benefits and are unlikely to participate. In one of our studies, two industry leaders chose not to participate. Because these leaders had monopolies, the EC initiative did not achieve its’ goal of allowing participating organizations to execute all transactions via the exchange. Another advantage of industry leader involvement is that it influences other organizations’ participation. This is in line with resource dependency theory (Pfeffer, 1978).

Another component of system implementation is motivating participant organizations to use the EC system. Benchmarks in this area include: system benefits and rewards for organizations most using the system.

Design involves further considering the business model, assessing what others are doing, and developing system processes, which may include designing or purchasing a software package. Design time and cost, user interface qualities, and system processes must be evaluated to ensure the EC project is moving the right direction. In evaluating the time and cost of designing the system, organizations should compare design time and cost to other systems in and out of the organization.

Benchmarks for evaluating user interface issues include comparing: interfaces in areas such as ease of use, effectiveness of conveying information, and effectiveness of placing orders (Barnes and Vigden, 2000a; Barnes and Vigden, 2000b; Barnes and Vigden, 2000c; Barnes and Vigden, 2001; Johnson and Rubin, 2001); load speed, accuracy, security, and traffic capacity (Alexander, 2000); and fit between product offering and site richness (Li, et al., 2001). While considerable academic work exists in this area, our case studies indicate acceptable user interface as a minimum performance level that must be attained not a major driver insuring success

A final issue in evaluating EC system design is performance of the new EC system with the organization's existing systems providing identical functionality. In our study, Austin Utilities adopted industry EC exchange offerings after evaluating whether the EC system offered benefits beyond their existing systems. The paragraphs below discuss process, efficiency, and cost benchmarks.

In benchmarking the procurement process, organizations should compare time to place an order using the existing system to the EC system. This comparison includes the type of people placing the order (clerks in one method and an engineers in the other) and how long placing an order takes. Austin Utilities' EC initiative was set up like catalogue shopping, whereas many of their existing processes were automated and include existing business knowledge. For example, an engineer could use computer-aided design, draw a picture, and automatically place an order to strategic vendors for all products in the design. The EC system required this same engineer use a computer process similar to shopping a catalogue. A consideration in this scenario is whether the EC initiative encompasses "business knowledge". A common problem is packaged software is often used to implement EC and this software does not have the business knowledge that many of the organizations' existing systems have.

Technology processing time and cost of placing an order under the EC system should be benchmarked against existing procedures. Many of the EC intermediaries (e.g. Ariba, Commerce 1) charge a fee to place an order. Data from Austin Utilities' revealed that EDI costs .19 per transaction whereas Commerce 1 assesses a \$2 transaction fee to both the customer and the vendor. In evaluating the **use** stage, organizations should consider how the EC initiative is being used and how its' use affects the business. The benchmarks below apply to selling organizations, buying organizations, or both.

Several benchmarks can help sellers evaluate their use of EC. Sales benchmarks include: EC sales dollars (Agrawal, et al., 2001; Kemmler, et al., 2001; Rubin, 2001; Varianini and Vaturi, 2001); EC sales compared to traditional channel sales; and sales before and after EC implementation. Other financial benchmarks include: profit margin (Baumgartner, et al., 2001; Berryman and Heck, ; Kerrigan, et al., 2001; Marn, 2001; Porter, 2001; Rubin, 2001; Wise and Morrison, 2000) and customer support costs. Consider new customers and markets (Alexander, 2000) and customer satisfaction to evaluate how EC affects customers. Since the web site affects an organization's EC success, organizations should also evaluate these statistics to continuously improve. Benchmarks include: traffic volume to previous months and similar company's (Alexander, 2000; Heijden, 2000; Johnson and Rubin, 2001; Rubin, 2001; Rubin, 2000); length of web site visits (Metrix, 2001a; Metrix, 2001b; webtomorrow, 2001); pages visited (Rosenbaum, 2000); and cart abandonment rates (Alexander, 2000).

Benchmarks useful for organizations entering EC for purchasing include: dollar value and percentage of total spend occurring through EC (Chappuis, et al., 2001; Kemmler, et al., 2001; Research, 2001) and item cost via EC to item cost via traditional channels.

Several benchmarks are useful to buyers and sellers. All participants should consider customer satisfaction benchmarks including: order error rates, delivery, fulfillment, quality, and after sales service (Agrawal, et al., 2001; Alexander, 2000; Metrix, 2001a). Both parties should also evaluate whether EC has lowered inventory levels and marketing costs.

Conclusion

Implementing new things often takes time to work out the kinks, this is certainly true with EC as AMR predicts that it will take ten years to work out EC implementation issues (Memishi, 2001). At the same time, organization need to evaluate their investment; however, traditional benchmarks take a short-term view and may cause the organization to abandon the project.

Based on a literature review and three case studies, this research posits a model for evaluating EC initiatives, Table 2. The model posits benchmarks that differ depending on project stage: (idea, research and development (implementation and design), and use). While the paper put forth a number of benchmarks, organizations should not simultaneously use all these. We presented a variety of possibilities, but leave it to the reader to determine which are most significant in evaluating their EC project. However, we suggest that organizations not “rush to market” and instead consider evaluating their project in the idea stage by benchmarking business models and value propositions. A June 2001 report on EC initiatives indicated that being the first to market only benefited 10% of internet companies and only if certain conditions were present (Bates, et al., 2001).

Our research makes several contributions to academic literature. First, Table 1 provides one of the first syntheses of research on EC evaluation. Second, as Table 1 illustrates very little academic work (e.g. survey, case study, experiment) has been done in evaluating EC initiatives, as such, a contribution of this paper is insight into case studies and benchmarks that are in line with the stages and issues of actual EC initiatives. Third, our research is one of the first emphasizing the importance of benchmarks in the early stages of an EC initiative. The majority of the EC metric research focuses on later stages. Finally, although the system analysis and design life cycle has been around and several researchers (Cavaye and Cragg, 1995; Hope, et al., 2001; Reich and Benbasat, 1990) in interorganizational literature have posited project lifecycles, this is some of the first research to recognize that EC initiatives go through life cycle stages and different benchmarks exist for each stage in the life cycle.

From a practical standpoint, our research helps those struggling with implementing EC initiatives understand that evaluation techniques appropriate for mature endeavors should differ from evaluation techniques for unfamiliar projects. While organizations can succeed continuously executing the same plan, sometimes trying new things is necessary to remain competitive. If an organization relies solely on traditional evaluation techniques to determine whether to enter new lines of business they are likely to reject endeavors which could be lucrative. Especially after the “dot.com” crash, all projects, even those that break new territory must be evaluated. By positing benchmarks for EC initiatives, our research can help organizations evaluate their EC projects as they move through stages.

There is substantial opportunity for future research in evaluating EC. Because this research developed a model using three case studies and thus suffers from shortcomings associated with case research (generalizability and bias), additional empirical and case study research would strengthen our model.

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