Limits to Value in Electronic Commerce-Related IT Investments

Alina M. Chircu
Doctoral Program in Information and Decision Sciences, Carlson School of Management, University of Minnesota, Minneapolis, MN 55455
Phone: (612) 624-1684, Fax: (612) 626-1316
Email: achircu@csom.umn.edu

Robert J. Kauffman
Associate Professor of Information and Decision Sciences, Carlson School of Management, University of Minnesota, Minneapolis, MN 55455
Phone: (612) 624-8562, Fax: (612) 626-1316
Email: rkauffman@csom.umn.edu

Abstract
This paper extends the limits to value model of Davern and Kauffman [16] to explore market and process-level factors that impact value flows to firms for their information technology (IT) investments. We characterize IT value in terms of potential value and realized value, and show how each is subject to different effects - limits to value - that diminish the benefits of the investment. Our typology identifies barriers specific to the valuation process (industry and organizational barriers), and to the conversion process (resource, knowledge and usage barriers). Following the development of our analytical framework from existing economic and organizational theories of IT valuation and technology adoption and diffusion, we analyze a series of case studies of Internet-based travel reservation systems in electronic commerce (EC). These cases provide evidence in support of the usefulness of the framework, and illustrate the extent of the difficulties faced by travel industry firms in making their investments in EC systems pay off.

1. Introduction
Electronic commerce (EC) technologies have received very much attention from both academia and practice in the last few years. Of significant importance to our understanding of EC technologies is the analysis of the benefits they confer upon adopting firms. In this paper, we suggest that these technologies should be studied in the context of a more general sub-field of Information Systems (IS) research - research on the business value of information technology (IT).

Prior IT value research on the design of firm business processes and the value of decision support systems (DSS) provides a useful starting point for us to conceptualize how much value from an investment can be appropriated by the firm [15, 16]. In addition, our understanding of theory that conditions expectations of value in a competitive marketplace is also important, especially the role of technological standards. Related research on IT value emphasizes the extent to which customer and firm adoption of an IT innovation in the marketplace is a major determinant of its success for the firm [20, 29]. Other related research [32, 50] points out the importance of organizational factors and the capabilities of management.

In the EC context, the issues become even more interesting because they span multiple levels of analysis that all must be understood to make sense of value accrual and investment performance. These include the level of the individual user and the experience she has with the qualities of the human-computer interface of an EC-related technological innovation. But the analysis must also consider the level of impact of the innovation in the marketplace, where it may alter the fundamental ways in which firms and individuals interact. At this level, the issues of interest are business process designs, technological standards, firm-to-firm competition and alternative organizational strategies. Understanding them, along with the extent to which the marketplace is prepared to adopt new innovations, and whether users of a new technology are prepared to buy in, are all crucial.

2. Literature Review
We next discuss two referent literatures for this research: technology valuation, and adoption and diffusion of innovation.

2.1. Technology Valuation
Bakos and Kemerer [4] making the case for economics as a referent discipline for IS research, review a number of IT business value studies that employ economic theories and analytic and econometric methodologies. They discuss how the IT and Organizational Performance perspective can be used to determine the impacts of IT on efficiency and profitability. They also point out that the Industrial Organization perspective informs our
understanding of the strategic impacts of IT investments for competing firms. Finally, they discuss the Information Economics perspective, which considers three different kinds of IT value: normative value (based on expected values), realist value (based on observed outcomes) and perceived value (based on subjective user evaluations).

Motivated in part by Bakos and Kemerer's perspective, Davern and Kauffman [16] analyze the value of DSSs, and distinguish between two types of IT value. They include: (1) potential value, which represents the maximum value opportunity available to the investor if the IT is implemented successfully; and (2) realized value, which is the measurable value that can be identified after the implementation ensues. Realizing the potential value depends on conversion contingencies [50] (i.e., on the extent to which the IT implementation goes as planned), which determine how much of the potential value from the investment can be appropriated.

Srinivasan, Kekre, and Mukhopadhyay [46] develop a model of electronic data interchange (EDI) technology impacts on just-in-time (JIT) shipments. The authors recognize that stronger support for the analysis of IT impacts on performance would come from measuring performance prior to and after an IT implementation, thus pointing out the importance of longitudinal studies of IT value.

Barua, Kriebel and Mukhopadhyay [5] propose a two-stage analysis for the business value of IT, arguing that the impacts of IT are observable at the strategic business unit level. They analyze intermediate-level variables such as capacity utilization, inventory turnover, quality, price and innovation. This emphasis on process-driven value suggests to us that EC technology investments might be understood and evaluated from a similar perspective, and shows how one might link impacts in a business process to firm outcomes at the market level.

Brynjolfsson and Hitt [8] point out that IT investments require sometimes larger and more time-consuming investments in organizational change. We interpret this perspective as being suggestive of limits to value appropriation for IT investments. Teece [47] argues that in some cases the reason that firms fail to appropriate full value from their investments in technology is because they fail to simultaneously invest in the requisite complementary assets. They include such things as new processes, work routines, organizational knowledge and responsibility structures, without which the benefits of IT cannot be obtained. This perspective supports the idea that while IT may be a substitute for ordinary factors of production such as unskilled labor [19], it is also a complement to more specialized factors of production, such as skilled labor and flexible manufacturing processes [37].

IT investments also have strategic benefits, as pointed out by Clemons [11,12]. A firm can obtain sustainable competitive advantage if it uses IT to exploit specific organizational characteristics [13]. When other firm resources are both specialized and indispensable to a specific IT, they become co-specialized assets [47] and create structural differences [13] among firms. Since these resources may be unique or hard and costly to imitate, other firms may not be able to acquire or build them fast enough. Therefore, they may be unable to appropriate the benefits of IT as well as the firm that possesses them will [21]. Such structural differences often yield intangible benefits for the firm.

Brynjolfsson and Hitt [8] suggest that the value of IT investments should not only be measured by cost savings. Improvements in quality, customer service and new product development must also be considered. Similarly, in a study of IT impacts on the number of suppliers, Bakos and Brynjolfsson [3] point out that IT enhancements will give suppliers the incentive to be more responsive and innovative, in exchange for a fair share of the surplus generated in the IT-enhanced transactions. Clearly, any scorecard that we might use to assess IT investment must be a balanced one.

2.2. Technology Adoption and Diffusion

The Classical Theory of Innovation Diffusion. This perspective [43] focuses on individual adoption and perceptions of innovations with respect to their relative advantage, compatibility, complexity, trialability and observability. Moore and Benbasat [39] show that there are significant differences between perceptions of innovation among adopters and non-adopters regarding these factors. Fichman [23] analyzes eighteen empirical studies of the adoption and diffusion of technological innovation published between 1981 and 1991. He concludes that individual adoption and independent technologies that imply a small knowledge burden on their adopters obtained the most attention. He points out that studies of adoption at the organizational level, where investments are made in more complex technologies (e.g., data warehousing, middleware, new software engineering techniques, etc.), are needed.

Economic Perspectives on Adoption. Adopter interdependencies, such as network externalities and interactions with organizational routines, also impact adoption. Some technologies have positive network externalities that increase the value of adopting as the number of network users increases [27]. For example, the adoption of the Bitnet electronic communications network followed an S-shaped pattern, confirming a positive network externalities effect [24]. Also, network externalities generated by compatibility with the dominant standard helped increase the price of market-leading spreadsheet software packages [10]. Another empirical study shows how banks can reap more benefits from shared networks than from proprietary electronic banking systems [29].
However, network externalities can also stall adoption if the adopting parties are made worse off by participating in a system that increases competition. Subsidies for IT adoption can help solve this problem by counterbalancing the negative network externalities [27, 42].

**Barriers to Adoption.** A number of authors have identified various kinds of barriers to adoption of technological innovations. For example, Lee and Clark [30] examined adoption barriers for electronic markets drawing upon results in transaction cost economics and business process reengineering research. They suggested that the efficiency and effectiveness of market transactions can be limited by transaction risk and perceived lack of market power.

Barriers to adoption of new technologies are suggested by a number of organizational learning theories as well. For example, the more complex a technology, the harder it is for untrained users to adopt [1]. Organizations and individuals alike have an absorptive capacity, developed over time, which helps them internalize new knowledge and use it effectively [14]. Lack or underdevelopment of this capacity will create knowledge barriers that hinder the adoption of new technologies, even where there is a willingness to adopt. The technology acceptance model (TAM) of Davis [17] provides another useful interpretative perspective on adoption intentions from the viewpoint of perceived usefulness and ease of use.

### 3. Research Framework

In this section, we propose a framework based on the concepts of potential and realized value, and of limits to value which we identified in Section 2. (See Figure 1.)

#### 3.1. Value Flows, Potential Value and Realized Value

The conceptual approach to the assessment of IT value that we propose begins with an attempt to identify a number of industry-independent sources of value, or value flows, which can occur at two levels, the process level and the market level:

- **Process-Driven Value.** At the process level, IT investments create value through increased productivity and process efficiencies [30, 46]. IT generates cost savings due to fewer errors and better utilization of resources [5], and supports higher product quality, more competitive pricing, and research and development for new products [5, 8]. IT also can increase organizational responsiveness in solving problems or providing customized service [3], as well as in information exchange and trade settlement [30].

- **Market-Driven Value.** At the market level, IT supports the creation of sustainable competitive advantage [11] by exploiting unique firm characteristics [13] and providing a basis for co-specialized assets that can leverage a firm’s strategic position [47]. IT also creates benefits through positive network externalities [27, 29]. Finally, a firm can use IT to support and enhance relationships with its partners in the market [3, 8, 46].

The two value flows each contain a blend of operational effectiveness and strategic positioning elements, which, as pointed out by Porter [41], lead to superior performance. These value flows are not the same as Porter’s concepts, since they describe how firms can benefit from IT to both improve their activities (resulting in efficiency at the process level and externalities at the market level) and perform activities in new ways (resulting in new solutions at the process level and exploitation of unique firm resources at the market level).

The value flows we have identified in this paper are general, and can be applied to any company, in any industry. In order to determine the IT value potential for a specific industry and a specific organization, the contribution of all these value flows needs to be assessed during the IT valuation process. Valuation specifies what the potential value will be in a given industry and organizational setting. Potential value emphasizes the idea that this is the maximum value that can be appropriated by the firm, in view of the overall environment in which the investment is made. This pre-implementation analysis is followed by a conversion process that transforms potential value into realized value that can be assessed after implementation.

While we recognize that the assessment of value is subject to bounded rationality [45], we focus in our framework on a firm’s ability to appropriate value, and not its capacity to evaluate correctly the corresponding value flows.

![Figure 1. Limits to value for IT investments](image-url)
3.2. Limits to Value

Our framework enables us to explain why not all value flows can be realized after the implementation of IT. We propose that the valuation and conversion processes are impacted by a series of specific value-discounting factors which we call limits to value. The double arrows in Figure 1 suggest that firms can be proactive and identify what these barriers are and then take steps to overcome them. Our framework points out that if such decisions are taken during valuation, their cost should be included in the assessment of the benefits during conversion.

3.2.1. Valuation Barriers. When firms start assessing the value potential of a specific technology, they have to consider the impacts of the characteristics of their own organization and of the industry on the IT value flows. We identify two classes of limits to value for the IT valuation process: industry barriers and organizational barriers.

Industry Barriers. The value potential of a specific IT investment is often limited by scarcity, cost and path-dependency of co-specialized assets [11, 47]. Other barriers are generated by the industry structure, which may favor technologies that “plug in” to the existing systems to the detriment of other, non-standard, but innovative technologies [10]. Similarly, adoption of new technology depends on the standardization of technologies that are complementary to them [28]. The industry structure might also generate negative externalities limiting the potential value of IT [3, 42].

Organizational Barriers. The unique characteristics of firms, such as its organizational routines and norms, market and product expertise, customer and supplier relationships, and human capital can lead to different potential value estimates for the same investment in IT [8, 9, 13]. Unfortunately, in many organizations “the past” levies a big tax on “the future”, as in the case of sunk costs in existing technology and human capital [16]. Effective implementation of IT may require extensive redesign of current business processes around IT’s new capabilities [8, 9, 11, 30]. These changes can create inefficiencies and tradeoffs that end up embedded in organizational routines [31, 41, 48] and reduce the benefits of current as well as future IT investments. In this context, organizational characteristics can limit the potential value of IT [8, 9, 13, 18, 40].

3.2.2. Conversion Barriers. When organizations implement systems, they aim to convert the potential value of the IT in which they have invested into realized value [16]. However, this process is fraught with conversion contingencies [50], which influence the amount of potential value that the organization can appropriate from implementation. With these perspectives in mind, we next identify three limits to value in the conversion process: resource, knowledge and usage barriers.

Resource Barriers. IT requires additional investments in co-specialized resources, such as new organizational processes and human capital [8, 9]. These resources are probably the single most important limit to value of IT, but they do not ensure that the firm will realize potential value. This viewpoint is underscored in the “productivity paradox” work of Brynjolfsson and Hitt [8], and other authors, who remind us that success with IT implementation and appropriation of value requires far more than just sophisticated managerial visions about how technology can be leveraged for strategic and operational advantage. Training and other efforts to increase “organizational awareness” of how to appropriate value from IT investments are often hamstrung by insufficient resources.

Knowledge Barriers. The redesign of organizational processes requires employees to learn new skills and the organization to develop new routines, and thus creates knowledge barriers [1]. New technologies require complex understanding and mental representations [49] that may be hard to manipulate due to limited information processing capabilities of human employees [38, 45]. Knowledge barriers also stem from a lack of absorptive capacity, which is developed over time by acquiring related knowledge and expertise in diverse areas [14]. Building and retaining human capital through training and human resources policies helps firms eliminate such barriers [26]. However, these activities require significant investments, which, in turn, will create a resource barrier for the implementation of IT.

Usage Barriers. Even if the organization can overcome the resource and knowledge barriers in IT implementation, the success of the investment still is highly dependent on how well the IT is adopted by its intended users. Ultimately, it is through consistently high levels of IT usage that potential value is realized. Usage barriers are often related to user perceptions regarding the technology and the responsibilities that must be shouldered when it is used. (Email forces us to read and manage our own correspondence more now than ever before, for example.) Unfavorable perceptions will result in users choosing not to adopt [17, 39, 43], even if they can acquire the requisite knowledge for using the IT. Each of these usage barriers prevents the potential value of an IT investment from being realized by the firm.

4. Electronic Commerce Technologies in the Corporate Travel Industry

We next discuss the methodology we used to test the efficacy of our evaluative framework. We also provide background on the travel industry. We then present
overviews of the three firms that we will analyze later in
the paper.

4.1. Methodology

The current paper is the result of a research effort that
started with a comprehensive overview of the changes
occurring in the corporate travel industry since the
(See Figure 2.) Along the way, we have witnessed
companies communicating high hopes about the benefits
of these systems, only to discover that the current systems
do not deliver up to their expectations. This prompted us
to search for relevant theory and propose an IT value
framework that would explain why the potential value is
not being fully realized. Our extensive industry analyses
also show that the IT value conversion is a complex
process that occurs over several years, and thus it is
suitable for case study analysis [6, 16, 22].

We studied three companies that were implementing
online reservation systems. The primary data sources
were phone and email interviews conducted from January
1999 to April 1999 with key informants who were able to
offer useful insights about their firms’ online reservation
system implementation processes. To increase the validity
of the findings, multiple data sources [22] and multiple
informants were used whenever possible. In addition,
secondary data were collected from research reports,
formal and informal discussions with industry experts,
and leading practitioner journals in the field such as
Business Travel News (www.btnonline.com), whose
articles cover most aspects of the corporate travel
industry. Table 1 provides an example of the richness of
the secondary data collection. (See Table 1.)

4.2. Corporate Travel and EC

Industry Background. Corporate travel is a $165
billion industry that handles the third largest controllable
expense in an organization: travel and entertainment [25].
In the traditional industry structure, corporations rely on
travel agencies or in-house travel departments to provide
all the services related to reservations, trip information
and ticket issuance, as well as reporting. Travel agencies
obtain price and availability for the desired travel supplier
from databases maintained by computerized reservation
systems (CRSs), which emerged during the airline
industry deregulation of the 1980’s [35]. (See Figure 3.)

All these intermediaries increase the cost of travel
distribution. Corporations have to pay fees to travel
agencies that handle their account [25]. Travel agencies
also receive incentives from the CRSs if they meet certain
productivity thresholds. CRSs’ profits come from the
reservation fees paid by suppliers and penalty fees paid by
agencies not meeting their thresholds. Suppliers, in turn,
offer preferred rates that reflect rebates as large as 36% if
clients consolidate all of their travel through them [54].

EC Promises and Challenges. As travel costs rise,
corporate travel departments are pressured to find ways of
limiting or reducing these costs [25]. The emergence of
EC technology providers that aggregate travel data [2]
and can potentially automate the travel reservation-
making process holds great promise for improving a
corporation’s bottom line [36]. A case in point is Thomson
Corporation’s success in implementing an online
reservation system (See Table 1). EC systems can reduce
distribution costs for suppliers [34] and involvement of
travel agencies [33]. With pressure from their clients,
Travel agencies are implementing tiered pricing schemes [53] which reduce fees paid to the travel agency by the corporations using online reservation systems. However, most companies are not yet seeing the full benefits of online booking [53]. Despite optimistic predictions made by technology vendors, actual adoption levels at the majority of companies are low, between 5% and 20% [7]. Even if many travelers register to use the system, they do not book their travel online very frequently [44], or they require future interaction by phone or email for changes and cancellations [51]. There are also reports that agents can find lower fares than those offered by the online reservation systems [52]. All these factors limit the benefits of EC technologies in the corporate travel industry.

4.3. Case Data

**Overview.** We collected rich descriptions of online reservation systems selection, implementation and usage from three companies that have acquired different, but comparable online reservation systems. The systems are comparable because they include the same core business functions. We promised anonymity to participating companies in this research. Therefore, we refer to them as Alpha Semiconductor Inc., Beta Telecomm Inc., and Gamma Electronics Corporation. (See Table 2.) The example we presented in Table 1 bears no relationship with these case studies, but it is illustrative of the kinds of companies, travel agencies and technology vendors that we will refer to in this section.

**Case 1 -- Alpha Semiconductor Inc.** This major U.S. semiconductor manufacturing company has started to prospect online reservation systems shortly after the introduction of this EC technology in 1995, as part of a bigger effort for travel process reengineering. After a careful evaluation process, Alpha selected 21st Century Technology as its reservation system provider, and worked with it and its travel agency to ensure that the reservation fulfillment process can be automated and generate the desired savings. The system was pilot tested with 100 users for one month, then partially rolled out to 400 users for six months. User training, surveys and focus groups were conducted in order to identify problems. After all major problems were fixed, Alpha rolled out the system to all its 13,000 travelers in 1997, and reported 19.7% usage in 1998.

**Case 2 -- Beta Telecomm Inc.** This large telecommunications services provider started to look into the online reservation systems market in 1996. At the behest of senior management, analyses of Beta's travel processes and of the current online products were conducted in 1997. The decision to implement Global Travel Distributions’ online reservation tool was made at the end of the year. Pilot testing started in the first quarter of 1998 with 20 users, and continued in the third quarter of 1998 with 200 users. At the time of the interview in March 1999, Beta was preparing for full rollout with 1000 users and making plans for customized communication and advertising programs to support the system.

**Case 3 -- Gamma Electronics Corporation.** Gamma Electronics Corporation is a well-known electronics company with more than 1,500 travelers. Gamma started to explore the market in 1997 and chose a product offered by one of the leading IT providers in the industry, Integrated Travel Systems, in February 1998. The first pilot test started 4 months later with 50 users, but few of them actually booked online. A second pilot test also failed, due to low user participation. These tests surfaced a number of major implementation problems. Integrated

<table>
<thead>
<tr>
<th>Company</th>
<th>Travel Volume</th>
<th>Travel Agency</th>
<th>Online Reservation System Vendor</th>
<th>Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Semiconductor Inc.</td>
<td>$62 million/year</td>
<td>ABC Travel</td>
<td>21st Century Technologies (an independent IT provider for the travel industry who was one of the first players in the online market)</td>
<td>Phone interviews with two (former and current) travel managers and an implementation specialist</td>
</tr>
<tr>
<td>Beta Telecomm Inc.</td>
<td>$20 million/year</td>
<td>Star Travel</td>
<td>Global Travel Distribution (a leading CRS which is also an IT provider for travel agencies and their clients)</td>
<td>Email interview (communication and survey) of the account manager (phone option offered, but declined)</td>
</tr>
<tr>
<td>Gamma Electronics Corp.</td>
<td>$8 million/year</td>
<td>Star Travel</td>
<td>Integrated Travel Systems (a leading CRS who has extensive experience in developing travel automation solutions)</td>
<td>Phone interviews with the account manager and an implementation specialist</td>
</tr>
</tbody>
</table>
Travel Solutions was very prompt in responding to all issues raised by Gamma, as was Gamma’s own travel agency, Star Travel. Gamma decided not to move forward with implementation until all the problems were solved. At the time of the interview, Gamma estimated that full rollout would start by the end of 1999.

5. Framework Application

What typical value flow barriers occur in the context of these cases? What are the limits to value for each of the firms’ investments in EC technologies? To answer these questions, we next interpret the cases in light of the evaluative framework proposed in Section 3.

5.1. Potential Value

Before deciding to implement an online reservation system, Alpha conducted surveys that indicated that 75% of its employees were willing to use such a system. This high expected adoption rate convinced Alpha’s management that the online reservation system could capture most of the value flows identified by the reengineering team. These value flows included reduced expenses from using fewer travel agents, improved travel policy enforcement, better reporting data, improved expense tracking and control, price savings, ability to take advantage of preferred suppliers rates, and improved market power in negotiated contracts due to more accurate supporting data on corporate travel patterns. The estimated savings, at only a modest 30% usage level, were over $1 million per year.

Beta’s potential value estimates were based on cost savings from increasing travelers’ awareness of travel costs and flexibility when making travel reservations. Beta was also expecting reduced reservation fees, fewer travel agents required to handle its account, better policy compliance and better traveler monitoring.

Gamma’s expectations for the potential value of the online reservation system were savings of at least $40,000 per year (roughly the equivalent of the cost of one travel agent). In addition, Gamma set a target for usage levels of 30% to 40%, which, in management’s estimation, was easy to achieve due to the firm’s IT-savvy travelers.

5.2. Valuation Barriers

Industry Barriers. The structure of the corporate travel industry creates valuation barriers that limit the potential value to be obtained from online reservation systems. For example, the negotiated fares contracts between companies and their suppliers require reservations to be directed to a certain CRS. Since online reservation systems do not yet fully support all CRSs, this limits a company’s ability to select the best online reservation system that would generate the most savings, as in Beta’s case. Moreover, CRS limitations reduce the number of rates that can be accessed online. As Alpha’s former travel manager pointed out, special rates for meetings and conferences are not available online, and require travel agent intervention. Any intervention, however, creates additional costs, since the travel agent has to query the CRS or call the supplier directly.

Organizational Barriers. Alpha correctly recognized that the potential of online reservation systems is highly dependent on company’s characteristics. As the former travel manager put it, “we started by deciding what is important for our company and established a set of unique criteria and priorities, and assigned weights of importance to them.” The potential cost savings were also limited by the percentage of travel that was not suited for an online reservation. For example, Gamma had 40% international travel for which the online reservation system was not the best choice. Other organizational barriers, such as availability of computers and Internet access, were not an issue in the companies in our sample, since all of them had the appropriate infrastructure resources in place.

5.3. Realized Value

For Alpha, the realized value of the online booking system, measured as utilization rate, was still lower (19.7%) than the potential value (30%) estimated before implementation. Consequently, Alpha did not reach the potential $1 million per year in savings. However, the company reported significant benefits from the online reservation system, including a decrease in the number of travel agents, and a 15% to 20% reduction in average ticket prices. This reduction, Alpha's travel manager pointed out, was generated, unexpectedly, not because the online booking system performed better than a travel agent, but because “travelers do not pay attention on the phone. They are mostly engineers, and make better decisions when presented visual information.”

Beta also reported that not all benefits were realized yet. For example, the initial usage levels were only 2%, too low to observe any significant benefits. The full rollout in April 1999 was expected to increase this figure to 5%. No cost savings measurements were in place at Beta, but plans were under way to start measuring average ticket prices for online and phone reservations.

At the time the interview was conducted, Gamma had seen none of the expected results, and was still struggling to solve implementation problems.

5.4. Conversion Barriers

Resource Barriers. The importance of investing in all the required resources is highlighted by the success of Alpha’s implementation. Tapping into the right organizational resources was crucial for this success. “The IT department helped us to quickly identify viable
products,” the travel manager pointed out. Also, Alpha committed the necessary human and monetary resources for user training. While Beta followed a similar path as Alpha, the implementation for Gamma did not go as smoothly as expected, especially because important resources were not committed or were committed late and only partially. As the account manager put it, “we have discovered that we need to add more staff for the implementation, instead of eliminating jobs.”

All three of the companies we interviewed emphasized the importance of dedicated, “24x7” help desk support. Gamma’s account manager pointed out that “the weak link is the help desk function. If travelers do not receive answers to their problems right away, they lose interest in the system.” The importance of committing resources for support at the company and business unit level was also recognized. As Alpha’s travel manager put it, “the manager of travel technology was a real champion for this project.” But she added that successful adoption also implies “support from managers to include demos of the system after staff meetings” in order to advertise the system.

Resource barriers can also be found at the user level. For example, Gamma’s travelers, who were already exposed to increased work responsibilities in 1998, “had no time to learn” the subtleties of the online system and the travel process itself.

Knowledge Barriers. Our analysis shows that knowledge barriers are related to system functionality and the complexity of the reservation process. Overcoming these barriers requires extensive training. After full rollout, Alpha hired a professional training company to perform this task on an ongoing basis. However, even training cannot overcome some knowledge barriers, as Beta’s account manager reported: “Beta tried a complete day of training – it didn’t go well. Users still called with questions at startup.” Similarly, Gamma complained about its failed efforts to raise users’ familiarity with the online booking system.

Some knowledge barriers might be difficult to overcome, such as in the case of complicated travel arrangements, and especially for international travel. As Gamma’s travel manager pointed out to us: “Reservation making in international markets is very complicated; because of the difficulties we’ve encountered, we might not use the product for international flights.” Alpha already has plans to enable travelers to book “anytime, anywhere in the US and potentially internationally,” but encourages its travelers to book only very simple arrangements, and especially for international travel. As the account manager put it, “we have discovered that we need to add more staff for the implementation, instead of eliminating jobs.”

Knowledge barriers also arise during implementation. At the process level, there is not enough understanding of how to assign responsibilities. Gamma’s account manager reported that “we needed to do more work, because we have experimented with who does what and where, and didn’t have standard implementation processes.” At the market level, the IT vendors have limited implementation experience. For example, embedding negotiated contract information in Alpha’s system was “challenging and time consuming”. Another vendor, Integrated Travel Systems, was also unable to foresee the complexity of implementation and is still working on fixing problems for Gamma.

Usage Barriers. Our case analysis also points out several usage barriers that occurred as the online reservation systems were pilot tested and then rolled out. Usage barriers were created by user expectations about the system, coupled with faulty products and unforeseen performance problems. Alpha and Gamma both reported that their initial user test was met with numerous complaints from the users that the system was too slow and unable to pick up from where it left off after a system crash occurred. Beta’s account manager echoed the same concern when she talked about an initial system error that prevented the company’s preferred suppliers from showing up on the reservation screen.

Usage barriers also arose from users’ perceptions of the online reservation system as requiring too much responsibility in selecting the cheapest travel option. “When they book by phone, the responsibility is with the agent,” Alpha’s travel manager pointed out. This is probably why both Alpha and Gamma reported that travel arrangers, who already are responsible for booking travel for many people, seem to be more comfortable online. Interestingly enough, all the informants we interviewed seemed to agree on one thing: what some users perceive as a downside of the online reservation systems is highly valued by other users, who like to be in control of their own travel plans and enjoy the increased responsibility.

5.5 Interpretation

Our analysis of the cases indicates that even though the value flows for online reservation systems can generate significant savings, a number of industry and organization barriers need to be taken into account in order to determine the true potential value of these systems. With a correct estimation of the valuation barriers, a company will be able to better assess the success of the IT investment, as in Alpha’s case. However, not taking these barriers into account will create the basis for unrealistic estimates. As Gamma’s account manager put it: “The sales people need to build correct expectations with clients; too many things are promised but cannot be delivered.”
Our analysis also reveals that the value obtained from the online reservation systems after implementation depends on the amount of complementary investments that can help overcome resource, knowledge and usage barriers. As Alpha’s case proves, being aware of all the conversion barriers from the beginning improves the chances of a successful implementation. In contrast, Gamma’s case illustrates the negative impacts of the conversion barriers, which led in this extreme case to the failure of the implementation project.

6. Conclusions and Further Research

In this paper, we proposed an evaluative framework that focuses on IT value as a combination of process-driven and market-driven value flows. We also proposed a number of value flow barriers that create limits to value that affect our assessment of the potential value of IT and its conversion into realized value. We showed how this general framework can be applied to a well-known EC technology, Internet-based travel reservation systems, in a segment of the travel industry, managed corporate travel. Through an in-depth analysis of three case studies in this area, we provided evidence that the conversion of potential IT value is a lengthy process, fraught with difficulties that may limit the realized value. More generally, this probably is true for any new and innovative technologies, since the companies that implement them must learn together with their implementation partners how to maximize the realized value of IT.

One implication of our results is that companies interested in investing in new technologies should start with a thorough analysis of their organization and industry, and identify not only IT value flows, but also limits to value in the form of valuation barriers, and especially conversion barriers. This way, they will build realistic expectations about the potential value of the IT and the costs involved in implementation, and will be better able to appropriate this potential value through a successful implementation process.

The limitations of this paper arise from our use of the case study methodology, which does not readily allow for extensions to all companies and all new technologies. However, given the novelty of EC technologies and the increasing evidence from practice that their implementation does not offer the expected value, we consider this research to be a first step in testing our framework. Our work sets up future contributions that will enable managers and IT investors to better understand what conditions need to be satisfied to allow the firm to appropriate maximum value from newly-adopted technologies.

Further research needs to extend the findings of this study through an empirical assessment of the limits to value of IT investments. Such an analysis will enable us to quantify the impact of each value flow barrier factor on the realized value for a specific technology. Case studies and empirical studies in other industries also will provide evidence for the external validity of our framework.

7. References


Acknowledgements. We wish to thank the Carlson Companies, Carlson Wagonlit Travel and BAS Consulting, Inc. in Minneapolis for ongoing sponsorship of our research on EC in the travel industry. Special thanks are due to Nick Dzandzara, Peter Moen and Doug Keskey for their inputs and ideas. Any errors of fact and interpretation are the sole responsibility of the authors.