MANAGEMENT SCIENCE

Managing the Integration of Information Systems: An Overview

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ABSTRACT

Managers engaged in net-enabled business planning seek metrics to help them analyze the success of their e-business investments. Likewise, researchers require metrics to build analytical models and conduct empirical research on the impact of e-business strategies on firm performance. In this paper, we develop a comprehensive E-Valuation Framework for identifying net-enabled applications and their resulting user-based functionalities for activities across the value chain. We propose that the real value from net-enabled applications can be found in functionality interactions where one application enables or enhances functionality in another application. The comprehensive framework can be used to generate three types of metrics managers can use to evaluate their net-enabled strategic initiatives. Further, a classification of net-enabled organizations provides the basis for selecting applications critical to a firm’s strategic thrusts. We make use of the resource-based view of the firm and real options analysis to discuss how successful application deployment is based on the resources and assets the firm possesses as well as managing the rollout of an applications portfolio over time. The framework allows managers to map their organization’s net-enabled initiatives into a coherent, easily understood visual representation and provides direction for researchers evaluating the efficacy of net-enabled business strategies.

Keywords: E-Valuation Framework, net-enabled business strategy, e-metrics, functionality interaction, resource-based view, real options analysis

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1. INTRODUCTION

The management functions of planning, organizing, leading, and controlling are based on a preconception that executives can measure what they are attempting to manage and take corrective action when necessary. The traditional management saying, “You cannot manage what you do not measure,” has motivated the development of metrics in the fields of accounting, finance, human resources, manufacturing, marketing, and management information systems [Measuring Business Value of Information Technology, 1988; Kaplan and Norton, 1992; Hauser and Katz, 1998; Straub et al., 2002]. Managers rely on established metrics to validate assumptions about their business environment and judge the results of managerial practice. Researchers rely on accepted metrics to build analytical models of the impact of managerial strategy on firm performance and to validate empirical field research on specific managerial tactics. The importance of metrics in any field of study can hardly be argued.

Practitioners have often approached the emerging and fast-paced field of net-enabled businesses with ad hoc metrics of firm success [Straub et al., 2002; Novak and Hoffman, 1997]. Today, corporations operate in a complicated electronic environment, competing simultaneously against online start-ups seeking to survive in the post dot-com era and established companies seeking to transform their organizations into lean net-enabled businesses. As the early days of frantic Internet technology investments give way to a more disciplined approach to net-enabled business strategic planning, managers are seeking metrics that will help them analyze the success of their online initiatives. A report by NetGenesis [2000] stated an addendum to the traditional saying; “You cannot measure what you do not define.”

In this paper, we provide an overall framework for developing net-enabled business metrics, also referred to here as e-metrics. Four important features of the E-Valuation Framework can be highlighted at this stage. First, it provides a categorization of net-enabled organization types that drives what types of applications are necessary to compete within the firm’s competitive domain. Second, it provides a comprehensive categorization of net-enabled applications and resulting functionalities that considers both back-end and front-end activities. The framework allows existing and future net-enabled functionalities to be mapped within this categorization. A third element of the framework is that it incorporates the functionality interactions that occur when a net-enabled application is enabled or enhanced by the functionality of other applications within the framework. For example, an online delivery
schedule tracking application may require back-end integration of ERP systems with that of third party logistic providers. Finally, the mapping of these functionality interactions provides a useful lens to define three different levels of e-metrics where each level is successively more complicated and potentially more valuable than lower levels. The framework hypothesizes that the specific net-enabled applications and subsequent e-metrics important to a particular firm will depend on the firm’s net-enabled organization category and the resources the firm brings to bear in the execution of its net-enabled business strategy. The overall methodology provides a mechanism for linking net-enabled business activities to corporate strategy, a linkage that is viewed as an essential component of success in today’s IT environment [Broadbent and Weill, 1993; Konsynski, 1993; Chan et al., 1997].

The framework presented in this paper has several implications for managers and researchers. For the IT manager planning the firm’s net-enabled business strategy, the framework provides four benefits. First, by making use of the resource-based view of the firm the framework enables the firm to choose applications and metrics that are consistent with its net-enabled organization type, particular strategic thrusts, and existing resources and assets. Second, it allows the mapping of the organization’s net-enabled application functionalities into a coherent, easily understood visual representation that highlights the inter-relationships between these functionalities. Third, by employing real options analysis, the identification of functionality interactions guides the manager in developing a phased rollout of an applications portfolio over time. Finally, the framework’s comprehensive nature aids in the definition of precise metrics that capture all aspects of the firm’s net-enabled business endeavors. In summary, the framework provides managers with a valuable mental model for coherent thinking about e-metrics and their net-enabled applications portfolio.

For the MIS researcher, the framework also provides several benefits. First, it categorizes e-metrics that have been used in the literature, provides a lens to identify new metrics, and clarifies the inter-relationships between these categories. Second, the framework provides a more detailed level of analysis in the investigation of the linkage between firm resources and the generation of net-enabled business value than has been developed previously. Third, for empirical analysis the framework provides a theoretical model that can be the basis for developing testable hypotheses and propositions, helps clarify the precise definition of these hypotheses, and provides a lens to identify specific metrics for analysis.
The paper is organized as follows. In §2, we provide the background for the framework and describe a classification grid to categorize eight different types of net-enabled businesses. In §3, we describe the various functionalities that make up an overall net-enabled business strategy using a new classification grid for back-end functionalities that complements an existing grid that highlights the various front-end functionalities. We then introduce the notion of functionality interaction between the different functionality categories in §4 and define how these functionality interactions can be measured using three different types of e-metrics. We apply the framework from both the practitioner’s perspective and the researcher’s perspective in §5. We conclude the paper by summarizing the major contributions of the framework and suggesting how it might be enhanced with subsequent work.

2. BACKGROUND FOR THE BASIC FRAMEWORK

The elements of the basic framework are depicted in Figure 1. It consists of three interrelated grids – one at the organizational level and two at the application level. At the organizational level, the *Net-Enabled Organization Classification Grid* identifies eight types of organizations based on whether they sell directly to end-consumers, whether they are a producer or reseller of goods, and the type of products they sell. This net-enabled organizational typology affects the applications that are valuable to firms in each category. The *E-Commerce Value Grid* identifies fifteen categories of front-end, customer-facing, net-enabled applications that firms typically employ, organized in a 3x5 two-dimensional grid [Riggins, 1999]. The *E-Business Value Grid* identifies fifteen additional categories of back-end net-enabled applications that firms typically employ, organized in a similar 3x5 two-dimensional grid.

Front-end customer-facing applications are often enabled through the functionality of the back-end e-business applications. For example, the ability to provide an instantaneous delivery promise date to the customer (a front-end activity) is enabled by having access to detailed inventory, production and vendor data (a back-end activity). In addition, many of the back-end applications are enabled by front-end functionality, for example when the Web interface is used to collect data that populates the back-end data warehouse. Such dependencies are captured in the model through the *functionality interactions* depicted in Figure 1. The three grids along with the functionality interactions give rise to three levels of *metrics* that are described later in the paper. Each level is more complex, but potentially more valuable than the previous levels.
Together the functionalities and their interactions produce the value of the firm’s application portfolio, while the metrics capture the value created by the organization’s online offerings.

The grids and the metrics can be viewed through two separate lenses. The Practice View describes the process that managers can use to select the appropriate applications and metrics that are aligned with their net-enabled organization type, their particular strategic thrusts, and the resources and assets of the organization. The Research View describes a model that links the organization’s resources to net-enabled business value and firm performance via the various capabilities and functionalities the organization implements, and provides direction in identifying the metrics to measure net-enabled business strategy performance. We believe that during the early stages of research in this important and emerging area, a cogent and comprehensive framework will foster a cumulative tradition of research that can ultimately influence practice. We will describe the Practice and Research Views later in the paper. First, we will describe each element of the framework in more detail beginning with the net-enabled business classification, followed by the value grids in §3.

2.1 The Net-Enabled Organization Classification Grid

We categorize net-enabled organizations along three high-level dimensions. The most generic classification of net-enabled organizations is whether they are primarily B2B versus B2C in terms of their customer focus [Applegate et al., 1996; Riggins and Rhee, 1998; Kauffman and
Wang, 2003]. For our purposes, B2B companies are those whose primary customers are other businesses. These organizations have little, if any, contact with end consumers, often deal in industrial manufacturing and more traditional settings, and provide the infrastructure that allows other companies to serve end consumers. These companies may focus on nurturing tightly coupled relationships with a limited number of customers, such as airplane manufacturers or computer microprocessor chip makers, or may produce and create brand awareness for products aimed at end consumers, but choose to allow other companies to sell and distribute their products, such as household consumable manufacturers or consumer software developers. These companies are normally more concerned with back-end e-business issues such as new product development and back-end supply chain management. On the other hand, B2C companies are typically more end-customer focused and will invest in developing user-friendly online storefronts, providing personalized pre-purchase and post-purchase customer service, maximizing web site traffic, and entertaining their users.

While the first dimension is related to customer focus, the second dimension is based on the company’s relative position within the value chain. Specifically, firms can be primarily producers of goods and services or resellers of the same. Producers are typically higher up the value chain, and can often have a B2B customer focus such as first- and second-tier automotive suppliers, management consulting companies, and suppliers of office and industrial supplies. However, the Web allows producers of goods to bypass intermediaries and sell directly to end consumers creating a B2C customer focus such as that employed by several major airlines, personal computer manufacturers, and many news organizations. Producers have a greater need to generate output from knowledge workers for new product development, integration of components into system solutions, and generation of new ideas, patents, and copyrights. Resellers are usually in a more competitive selling environment requiring customer service differentiation and sophisticated customer relationship management efforts such as decision support systems, personalized service, brand creation, and superior delivery logistics.

Finally, companies vary widely in the type of product or service they provide. Peterson, et al. [1997] characterize product type along three dimensions: frequency and expense of purchase, differentiation potential, and physical versus informational goods. While all three characterizations are useful, the distinction between information/digital goods versus physical goods is particularly important in the net-enabled business environment and forms the third
dimension in our classification. In particular, many products in the online environment are information goods that often end up being provided for free, thereby forcing the organization to seek revenues from other business models. Shapiro and Varian [1998] have outlined several important economic aspects associated with selling information goods. For example, information goods can be easily modified or bundled to create a variety of versions of the product; information goods often exhibit strong network effects; and the vast majority of the costs associated with information goods are in development, while additional copies can be made at almost no marginal cost. On the other hand, producers of unique proprietary information goods, such as a market research firm producing highly analytical market analysis reports, may find themselves in a strong position by leveraging their knowledge management capabilities. Kauffman and Wang [2003] show that sellers of digital goods have survived the dot-com shakeout better than online sellers of physical goods. Therefore, in the online setting, an important product characteristic is whether the good is physical or informational in nature.

Although these three dimensions are actually continuous, we treat them as dichotomous to derive the eight different categories of net-enabled organizations shown in Figure 2. The figure also includes examples of each organization type, their primary focus based on the discussion in this section, and the resulting critical applications for each category. The eight categories are briefly described below.

- **Traditional Manufacturers** produce physical goods that are generally sold to other corporate customers. While we use the term “manufacturer”, we do not necessarily limit ourselves to industrial settings. Controlling development and manufacturing costs, developing new innovative products, and providing strong customer service are key focus areas for these companies.

- **Knowledge Experts** produce information goods and may include management consulting services, corporate educational services, and online database and news services targeted at corporate clients. These companies produce products and services that are a direct result of the intellectual capital in the organization. Therefore, retaining employees and empowering them for collaborative knowledge creation are critical focus areas.

- **Value Added Procurement Partners** act as intermediaries to sell products and services to other businesses. These organizations find innovative ways to integrate products and services to create value, such as travel agents and office solutions companies. Critical focus areas include creating and maintaining customer loyalty and efficient order fulfillment to minimize time and cost for their clients.
### Figure 2. Net-Enabled Organization Classification Grid

<table>
<thead>
<tr>
<th>Market Target</th>
<th>Value Chain Position</th>
<th>Type of Good</th>
<th>Organization Type</th>
<th>Examples</th>
<th>Strategic Thrusts</th>
<th>Critical Applications/Functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2B</td>
<td>Producer</td>
<td>Physical</td>
<td>Traditional Manufacturer</td>
<td>Dow Chemical, Boeing, Millipore, Air Products</td>
<td>Cost control, product innovation, customer service</td>
<td>CAD/CAM, ERP systems, flexible manufacturing systems, factory automation, online brochureware, online decision support tools, online after-sale service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge Expert</td>
<td>McKinsey, Accenture, Forrester, Razorfish</td>
<td>Employee retention, Knowledge creation</td>
<td>Intranet for collaboration and knowledge management, executive information systems, access to external databases, branding/image site, online delivery to clients</td>
</tr>
<tr>
<td>Reseller</td>
<td>Physical</td>
<td>Value Added Procurement Partner</td>
<td>OfficeDepot, Grainger, American Express, Ingram Micro</td>
<td>Customer loyalty, Efficient fulfillment</td>
<td>Systems integration, online service support, integrated logistic systems, company-specific storefront</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online Hub</td>
<td>Orbitz, Newview, Covisint, VerticalNet</td>
<td>Maximize site traffic, Efficiency as market-maker</td>
<td>B2B exchange, auctions, industry-specific information portal, industry/topic-specific discussion forums</td>
</tr>
<tr>
<td>B2C</td>
<td>Producer</td>
<td>Physical</td>
<td>Direct Sales Manufacturer</td>
<td>Dell, L.L.Bean, Delta Air Lines, Avon</td>
<td>Supply chain management, Differentiation</td>
<td>Online storefront, decision support tools, integrated build-to-order inter-ERP system, online after-sales service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Information Service</td>
<td>CNN.com, BusinessWeek, WSJ Interactive, Fuqua School</td>
<td>Personalization, differentiation, fast global delivery</td>
<td>Personalized front-end, fast user navigation, global presence, multimedia presentations, portal to affiliated storefronts, intranet for collaboration</td>
</tr>
<tr>
<td>Reseller</td>
<td>Physical</td>
<td>Online Reseller</td>
<td>Amazon, HotHotHot, Walmart.com, ToyRUs.com</td>
<td>Personalization, order fulfillment, customer service</td>
<td>Personalization marketing, global fulfillment capabilities, decision support tools, intelligent agents</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Portal Community</td>
<td>TimeWarner, Yahoo, eBay, Quicken.com</td>
<td>Personalization, Network effect Differentiation, Customer loyalty</td>
<td>Personalized front-end, wide assortment of user services (email, financial services), multimedia applications, chat, discussions</td>
</tr>
</tbody>
</table>
**Online Hubs** as discussed by Kaplan and Sawhney [2000] are industry-specific, vertical portals that generate revenues via B2B exchanges. While some online hubs are created by new entrants in an industry, others have been created by a consortium of major industry participants, resulting in close scrutiny by the Justice Department [FTC, 2000]. Online hubs need to focus on maximizing traffic by aggregating useful content, and creating loyalty using community features.

**Direct Sales Manufacturers** are similar to traditional manufacturers except that they utilize the unique features of the Web to bypass intermediaries and sell direct to end consumers. By carefully combining supply chain management and highly differentiated customer service via the online storefront, several of these manufacturers have been very successful online.

**Online Information Services** provide unique information to end users that is either original in its development or provides a unique editorial perspective. Also included in this category are online educational offerings such as the Fuqua School of Business at Duke University that has been a leader in developing original, high quality online educational courses. Personalized customer service, differentiation through content originality, and timely online delivery are critical.

**Online Retailers** can include online retailer start-ups and more traditional retailers moving into the net-enabled commerce space. Gulati and Garino [2000] discuss the challenges associated with integrating the online offering with the traditional brick-and-mortar stores versus separating the online storefront into a separate brand identity. Important focus areas include personalization, order fulfillment and delivery, and pre-purchase and post-purchase customer service.

**Portal Communities** are those that seek to aggregate many different online information services into an integrated customer experience. These portals typically provide services such as aggregation of personalized news stories, e-mail services, links to shopping sites, online bill presentment and payment, and a wide range of community discussion features. The goal is to create lock-in often fueled by network effects as the size of the community grows past critical mass.

### 3. IDENTIFYING NET-ENABLED FUNCTIONALITY

#### 3.1 The E-Commerce Value Grid

In an effort to categorize different net-enabled applications, Riggins [1999] developed the Electronic Commerce Value Grid. The grid is based on the concept that businesses compete along five dimensions of commerce. By using various modes of interaction, firms compete over both time and distance in order to provide some product or service through a chain of relationships eventually ending with the end customer. Hammer and Mangurian [1987] focused on the use of communications technology to impact time, geography, and relationships. Riggins
[1999] expands on this to include the impact of altering the nature of the interaction, the potential to offer entirely new products and services, and the application of the framework to a Web-based net-enabled commerce environment. A refinement of the original E-Commerce Value grid in Riggins [1999] is shown in Figure 3.

Each row in the grid is based on the five different dimension of the firm’s competitive environment described above. The columns in the grid are based on the three ways in which IT investments are traditionally justified: efficiency benefits, effectiveness benefits, and strategic benefits [Hammer and Mangurian, 1987; Gorry and Scott-Morton, 1971]. Improving efficiency has traditionally been the primary use of information technology. Even before the Internet, companies engaged in electronic commerce using electronic data interchange (EDI) to improve the efficiency of coordinating with external trading partners [Riggins et al., 1994]. The opportunity to improve the effectiveness of decision-makers by getting the right information, to the right person, in the right format, at the right time forms the basis for management information systems and decision support systems. Finally, the Web can be used for strategic purposes if it results in increased revenues by opening up new markets, new products and services, or if it allows firms to gain an advantage over competitors by developing customer loyalty.

By combining the three types of justification or value creation with the five dimensions of commerce, the grid identifies fifteen different areas where managers can use Web-based electronic storefronts to add value to their customers to create a unique online buying experience. In particular, the grid can be applied to many Web-based applications where the browser acts as the main interface device. The slightly modified version of the original grid shown in Figure 3 incorporates more generic terminology that can represent a complete portfolio of Intranet applications, a B2C portal/community site, a Web-based information news site, and an online storefront selling physical or information goods. In this way, the E-Commerce Value Grid can be used to describe the scope of both internally focused Web sites as well as externally oriented sites.

### 3.2 The E-Business Value Grid

While many net-enabled applications are Web-based in their interface design, others utilize the Internet to transmit server-to-server information to support process oriented tasks such as inventory flow or logistics coordination, or are based on back-end database technologies
linked to the browser front-end. Therefore, for many net-enabled applications, particularly many B2B applications, the E-Commerce Value Grid is insufficient to represent a comprehensive net-enabled business strategy. Consider some of the traditional activities of the firm’s value chain: inbound logistics, operations, outbound logistics, marketing and sales, and service [Porter and Millar, 1985]. The E-Commerce Value Grid is useful for defining marketing/sales and service applications because it is primarily concerned with functionality using the browser interface, however it does not address issues related to the activities further up the value chain. In this section, we introduce a complementary E-Business Value Grid that takes into account these upstream activities.

In developing the E-Business Value Grid, we adopt the same three columns used in the E-Commerce Value Grid to identify the type of value created by the application. As before, efficiency benefits accrue when firms use electronic means to perform the same tasks more efficiently. Effectiveness benefits refer to the provision of online information to enable managers to be more effective in their jobs. Strategic benefits accrue when the electronic infrastructure enables new business models and completely new ways of doing business. However, where the

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Efficiency</th>
<th>Effectiveness</th>
<th>Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Accelerate User Tasks</td>
<td>Eliminate Information Float</td>
<td>Establish 24/7 Integrated Service</td>
</tr>
<tr>
<td>Distance</td>
<td>Improve Scale to Look Large</td>
<td>Present Single Gateway Access</td>
<td>Achieve Global Presence</td>
</tr>
<tr>
<td>Relationships</td>
<td>Alter Role of Intermediaries</td>
<td>Engage in Personalization to Look Small</td>
<td>Create Dependency to Lock-in User</td>
</tr>
<tr>
<td>Interaction</td>
<td>Make Use of Extensive User Feedback</td>
<td>User Controls Detail of Information Accessed</td>
<td>Users Interact via Online Community</td>
</tr>
<tr>
<td>Product</td>
<td>Automate Tasks Using Software Agents</td>
<td>Provide Online Decision Support Tools</td>
<td>Bundle Diverse Content with Rich Multimedia</td>
</tr>
</tbody>
</table>

**Figure 3. E-Commerce Value Grid (adapted [10])**
E-Commerce Value Grid incorporates activities down the value chain, we now introduce five additional dimensions associated with activities further up the value chain. The upstream activities normally associated with the value chain are inbound logistics, internal production systems, and outbound logistics [Porter and Millar, 1985]. However, even before considering these activities, two preliminary support activities include planning the overall value chain activities and technology development through R&D. Planning the value chain involves analyzing market conditions to determine market potential, putting the right team of knowledge workers together to plan and execute strategy, and converting intellectual capital into concrete product plans. Technology development involves basic research, product design, prototype development, product commercialization, and finding sources of supply. Using the three types of justification and the five upstream supply chain activities, we can identify fifteen additional back-end Internet application categories as shown in the E-Business Value Grid in Figure 4. We now address each of these applications briefly.

1) Planning the Overall Value Chain Strategy:

- **Implement Rich Media for Company Wide Interaction.** In formulating an overall value chain strategy, managers need to be able to communicate across functional boundaries in real time and use rich media such as videoconferencing, white-boarding, and on-demand presentation Web-casting. E-business efficiency benefits are derived when Internet technology provides a backbone on which to automate tasks and quickly exchange high bandwidth information across functional areas within the organization.

- **Provide Online Executive Information Systems.** In the overall value chain planning process, executives in the organization need to have Web-enabled access to executive information and decision support systems that integrate internal and external data on industry trends, competitors, market analysis, and industry forecasts from multiple sources.

- **Facilitate Knowledge Management Between Partners.** In today’s environment, a consortium of cooperative business partners, or a “learning network,” is best suited to assemble creative ideas necessary to develop complex new products, achieve manufacturing agility, and maintain a long-term customer focus [Moore, 1997; Riggins and Rhee, 1999]. By using e-business extranet applications, advantage can be gained when an innovative, learning culture is fostered across the entire consortium, to facilitate the joint planning of new product launches with partners, to achieve time-to-market benefits and to achieve seamless integration across the virtual enterprise.
2) Developing New Products Concurrently Across the Virtual Organization:

- **Standardize Platform for Cross-Functional Design.** Globalization, increased competition, and shorter product life cycles have made product development more complex and demanding. Efficiency benefits are achieved in new product development when the Web is used as a standardized, universally accessible platform to support geographically dispersed, cross-functional teams.

- **Share Detailed Requirements Between Partners.** Designers often make component choices for technical and engineering reasons that can have a negative impact on the supply chain [Huang and Mak, 1999]. Effectiveness benefits occur when the designer has Web-enabled access to supply chain information while making critical design choices, or can communicate with potential suppliers to exchange complex product definitions and technical specifications at the time of design.

- **Enable Concurrent Design Across the Virtual Organization.** As companies concentrate on their core competencies, they rely more on their value chain partners to perform critical tasks. For example, in the electronics manufacturing industry many companies rely on offshore manufacturing facilities that are owned and operated by third party contract manufacturers. Strategic benefits are obtained when the company uses Web technology to jointly design the product with the contract manufacturer, which enables them to optimize total cost and features of the product. Concurrent design by partners also reduces time-to-market, identifies

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### Figure 4. E-Business Value Grid

<table>
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<th>Efficiency</th>
<th>Effectiveness</th>
<th>Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning</strong></td>
<td>Implement Rich Media for Company Wide Interaction</td>
<td>Provide Online Executive Information Systems</td>
<td>Facilitate Knowledge Management Between Partners</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>Standardize Platform for Cross-Functional Design</td>
<td>Share Detailed Requirements Between Partners</td>
<td>Enable Concurrent Design Across Virtual Organization</td>
</tr>
<tr>
<td><strong>Inbound</strong></td>
<td>Support Electronic Transactions with Supply Partners</td>
<td>Generate Supply Flexibility through E-Hub Communities</td>
<td>Offload Replenishment Responsibility to Supply Partners</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>Integrate Internal Systems</td>
<td>Exchange Production Data Between Partners</td>
<td>Optimize Utilization of Global Capacity</td>
</tr>
<tr>
<td><strong>Outbound</strong></td>
<td>Support Electronic Transactions with Customers</td>
<td>Furnish Customized Instantaneous Order Status</td>
<td>Institute Direct Fulfillment via Logistics Partners</td>
</tr>
</tbody>
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integration problems early in the design and creates a powerful multi-organization virtual product design environment.

3) Managing Inbound Logistics:

- **Support Electronic Transactions with Supply Partners.** Efficiency benefits are realized when companies use the Web to facilitate electronic transactions with their suppliers. Early inter-organizational systems such as EDI, and more recent Internet technologies such as eXtensible Markup Language (XML) and Radio Frequency Identification (RFID), have allowed manufacturers to significantly streamline their inbound logistics operations.

- **Generate Supply Flexibility Through E-Hub Communities.** E-Hubs are vertical portals and B2B exchanges that bring together players from within and outside the industry. E-Hubs allow a company to optimize its sourcing arrangements through better information by posting requirements and technical specifications on-line, setting up alternate suppliers, switching easily between suppliers to obtain supply flexibility, and selling obsolete inventory to other members of the business consortium [Kaplan and Sawhney, 2000].

- **Offload Replenishment Responsibility to Supply Partners.** Companies have achieved significant strategic benefits by offloading the responsibility for inventory management directly to their suppliers. In just-in-time manufacturing environments, suppliers are responsible for their parts until the point of assembly. When suppliers have an incentive to deliver goods only at the last minute, inventory levels are dramatically lowered for the manufacturer and quality improves because the supplier maintains control of the item until it is required on the factory floor.

4) Operations Management for the Production of Goods and Services:

- **Integrate Internal Systems.** Companies can achieve significant efficiency benefits by integrating their internal systems. Seamless integration of several business systems (accounting, order management, warehouse management, production planning, integrated ERP, shop floor management systems) will enable more streamlined operations by eliminating redundant data entry.

- **Exchange Production Data Between Partners.** By gaining real time access to production plans and operations scheduling data, suppliers can better plan their production and delivery schedules. Further, real-time data from partners can be used to control the production process as well. For example, consider a manufacturer that has implemented a system where the power company sends real-time pricing information to the manufacturer’s automated system. When the price of power reaches a certain high threshold, perhaps due to excessive home consumption during a heat wave, manufacturing operations can be automatically shut down temporarily.

- **Optimize Utilization of Global Capacity.** While manufacturers have been moving in this direction for well over a decade, the emergence of secure Internet technology makes this proposition much more cost effective, particularly when linking multiple manufacturing
facilities dispersed around the globe. By combining the public Internet infrastructure with secure tunneling protocols, companies can link their manufacturing operations regardless of location. This provides a seamless global manufacturing capacity planning system, thereby allowing for optimal use of resources and load balancing.

5) Managing Outbound Logistics:

- **Support Electronic Transactions with Customers.** Electronic transactions with customers through new Internet technologies such as XML and RFID will result in significantly lower transaction costs, reduced order fulfillment times and better on-time delivery performance, as the customer order fulfillment process is automated and streamlined.

- **Furnish Customized Instantaneous Order Status.** An important part of personalization of the Web is the ability to provide current order and delivery status information to customers. Through the seamless integration with fulfillment partners and the linking of their information database with the front-end Web site, companies can provide instantaneous order status via the Web browser.

- **Institute Direct Fulfillment via Logistic Partners.** Package delivery carriers such as UPS and FedEx are capitalizing on new opportunities to deliver items to customers’ homes when ordered online. E-commerce companies that have invested heavily in regional warehouse facilities, such as Amazon.com, are moving toward using these facilities to act as third party logistic providers for other e-commerce companies. Companies that seamlessly integrate their front-end ordering system with their fulfilling partner’s back-end inventory and logistics systems will be in a position to gain significant strategic benefits as each partner focuses on their core competency. Further, an important strategic role that these third party logistic providers play is in the delivery coordination of multiple system components originating at multiple facilities [Dell Online, 1998].

4. PRIORITIZATION AND MEASUREMENT OF THE APPLICATIONS PORTFOLIO

4.1 Functionality Interaction

Implementing any application from either the E-Commerce Value Grid or the E-Business Value Grid in isolation will meet with limited success. This is because each application outlined in these frameworks is enabled and/or enhanced by functionality in other cells. For example, eliminating information float requires the establishment of 24/7 integrated service with linkages to back-end databases, continuous updates from data provided by applications that accelerate user tasks, innovative knowledge creation between multiple trading partners, and the provision of instantaneous order status information. In other words, *functionality interaction* increases the
value proposition for a given application because information generated from functionality in one cell flows into the applications in other cells.

We can identify information sources and information sinks to illustrate how the flow of information creates functionality interaction. Suppose managers of an information news site desire to increase switching costs through innovation in order to create dependency on its Web site and thereby lock-in users. Figure 5 illustrates this strategy of creating dependency to lock-in users via five information sources and one information sink. When information on the news site is updated in real time to eliminate information float, users find that they can gather news information faster on this site than they could anywhere else. The site engages in personalization by allowing users to customize their own news home pages and by making suggestions about other related news stories. Using proprietary intelligent software agents, the site e-mails registered users when breaking news occur that would be of interest to the users. Breaking financial news is fed into online decision support tools that advise individual users about investment options they should consider. Finally, by making use of its highly rated cable television news channel, the news site makes use of rich multimedia capabilities by providing live video streaming feeds of news reports, live press conferences, and archives of interviews with today’s news makers.

If one of the five information sources in Figure 5 is determined to be a prerequisite for bringing the sink functionality into existence, then that source functionality is an enabling functionality. On the other hand, if the source functionality is useful for making the sink functionality more valuable to the user, but is not necessarily a prerequisite for bringing the sink functionalities into existence, then it is an enhancing functionality. Of course, many of the information sources in Figure 5 are also enabled or enhanced by the functionality in other cells. This creates a cascading effect whereby a particular functionality could simultaneously be an information sink and source. By using this graphical notation within and across the grids, an entire e-business strategy can be mapped.

By labeling each functionality as a source or a sink, and as either enabling or enhancing, the value grids can be a useful tool for determining the prioritization of functionality rollout for the net-enabled business strategy. Taking into account the future functionalities that will be enabled or enhanced by a particular functionality under consideration can be particularly useful when developing the economic justification for a specific functionality. This type of real options
analysis for evaluating IT investments has been discussed by Tallon, et al. [2002]. Dos Santos [1991] first applied the technique in an IT setting to evaluate investments in network services. Benaroch and Kauffman [2000] also show the value of applying the real options approach to aid executives’ IT investment decisions. Bardhan, et al. [2004] apply this methodology to prioritize an IT project portfolio at a major utility company.

Suppose an analysis of the E-Commerce Value Grid indicates that four applications need to be rolled out to achieve the desired net-enabled strategy. Identification of the functionality interactions indicates that a customer data collection application is an enhancing functionality for a proposed personalization application and a streaming multimedia application. Further, it is an enabling functionality for a sophisticated product demand forecasting tool. This analysis helps prioritize the rollout schedule for the four applications and provides further economic justification for the customer data collection application that makes the forecasting tool possible.

Let’s consider a more far-reaching example of functionality interaction. Dell has been one of the most innovative established companies to take advantage of the unique features of Web-based commerce [Dell Online, 1998; Dell and Fredman, 2000; Dell New Horizons, 2002]. Outlining all of the Web-based applications available on Dell.com is certainly beyond the scope of this paper. Instead, let’s consider one important aspect of their Web-based strategy – their

![E-Commerce Value Grid](image-url)
ability to take advantage of the continuous price drops inherent in the personal computer industry. By incorporating a unique build-to-order manufacturing process and their strategy of allowing end consumers to order directly off their Dell.com Web site, Dell is able to pass on price drops to their customers much faster than their competitors. This ability to eliminate information float by continuously updating their prices is illustrated in Figure 6.

By altering the role of intermediaries and going directly to consumers, Dell has disintermediated the marketplace, allowing them to pass price cuts immediately to customers. Dell provides a type of online decision support tool where users can configure their own PC. Also, by providing a fast, convenient online storefront, Dell accelerates other user tasks such as receiving price quotes related computer equipment. By tracking the user activities and changes in considered configuration, Dell is able to amass considerable detail about user price sensitivity. This information is used to determine what prices should be updated as soon as possible. Also, Dell achieves a legitimate global presence by making the Dell.com Web site available in country-specific versions taking into account local language, currency, and delivery capabilities.

However, Dell’s success is not simply due to its successful front-end Web site. The company’s primary competitive advantage is found in the smooth integration of its back-end manufacturing system with its front-end ordering storefront. By integrating the back-end with the Dell.com front-end, Dell has created a fully integrated 24/7 customer service site that is able to deliver on quickly discounted merchandise. In terms of process integration, Dell has achieved virtual integration by linking their manufacturing facilities with suppliers, which minimizes on-hand inventory [Magretta, 1998]. Also, suppliers have complete visibility of Dell’s customer order status and are responsible for inventory management up to the point of assembly. In terms of manufacturing the PC, build-to-order systems integrate the order process directly to the factory floor. In addition, computer accessories, such as monitors, are shipped directly from the trading partner’s facility, whereby the logistics carrier is responsible for assembling the entire order at the customer’s doorstep regardless of origination point. Customers are able to download up-to-the-minute order status and delivery information. All of these innovations are due to a tightly coupled, Internet-based information system that uses server-to-server linkages on the back-end and the Dell.com storefront on the front-end.
By using the two value grids in tandem and taking into account that they can be applied to external users or internal intranet “customers”, an organization’s overall net-enabled business strategy can be mapped using functionality interaction. This mapping identifies the primary e-business and e-commerce applications for the organization (information sinks), the secondary applications that can enable the primary applications (information sources), and the development prioritization of these applications (enabling versus enhancing). By developing a series of
mappings similar to Figure 6, an organization’s entire net-enabled business strategy can be mapped into an easily understood visual representation.

4.2 Three Types of Metrics

We now turn our attention to how functionality interaction using the two grids can help us to develop specific net-enabled e-metrics. By mapping an organization’s strategy into a series of functionality interaction maps as shown in Figure 6, we can consider three different types of metrics. Type I metrics are those that measure the success of a single cell application in either grid. Until now, most e-commerce or e-business activities have been considered in isolation. For example, managers might inquire, “How successful are we at establishing an online community among our users?” or “To what extent have we achieved a global presence using our Web-based interface?” Each cell the organization chooses to focus on represents a specific functionality that can be measured for success. For example, for an online retailer focusing on personalization, specific metrics could include the number of times a cross-promoted item based on predicted interest is inquired about and/or purchased, or the number of registered users who customize the company home page for their personal use.

Type II metrics measure the functionality interaction between two cells within the same grid. Specifically, Type II metrics measure the degree to which an information source succeeds in enabling an information sink within the same grid. For example, in Figure 5, five applications in the E-Commerce Value Grid are information sources feeding into an information sink to create a dependency. Each of the five arrows represents an information flow that can be measured using specific metrics. Continuing with the example in Figure 5, eliminating information float to create a dependency could be measured by the frequency with which information is updated on the Web site relative to competitors, or the frequency with which pricing is updated on the Web site relative to competitors. Creating dependency by engaging in personalization could be measured by the number of times a customer makes a repeat purchase due to a cross-promoted item, or the frequency of registered customers’ visits due to click-throughs of e-mail reminders versus visits due to other mechanisms. Dependency via software agents or online decision support tools could be measured by the number of unique, proprietary software agents or DSS tools available on the Web site, relative to competitors, or the frequency with which a customer employs a software agent or DSS tool on the Web site.
Type III metrics measure the degree to which an information source succeeds in enabling an information sink in another grid. For example, in Figure 6, five applications in the E-Business Value Grid are information sources feeding into an information sink in the E-Commerce Value Grid to eliminate information float. As with Type II metrics, each of these five arrows represents an information flow that should be measured using specific metrics. Metrics for the elimination of information float through the support of electronic transactions with suppliers and offloading replenishment responsibilities to suppliers could include the reduction in inventory. This then allows supplier price cuts to be passed on quickly. Eliminating information float using information from the integrated shop floor and ERP systems could include the speed with which new product configurations can be made available to customers due to flexible manufacturing systems. The ability to eliminate information float using a customized order status page could include the percentage of user inquiries about order delivery status answered via the Web interface with and without employee intervention, versus those answered via the phone center. Finally, the impact on float by instituting direct fulfillment via a logistics partner could be measured by the reduction in average delivery time due to shipments originating at trading partner facilities going directly to customers.

Because Type I metrics involve a single functionality they are typically limited in scope in terms of implementation complexity and realized value. Type II and III metrics involve multiple functionalities likely reaching across multiple applications. The complexity of implementation increases due to issues of compatibility of applications, compatibility of infrastructure platforms, multiple users, different vendors, and multiple development and implementation teams. Because Type III metrics involve linking front-end activities with back-end activities they are more involved than Type II metrics, but may reveal more important information in terms of delivering user value. Therefore, we propose that Type I, II, and III metrics are increasingly more complex than lower type metrics and are more valuable to fine-tuning the net-enabled business strategy to deliver user value.

5. APPLICATION OF THE E-VALUATION FRAMEWORK

5.1 The Practice View

Managers and IS practitioners can benefit from the framework in three ways. First, the framework can be used as a strategic planning tool that provides the essential linkage between
the firm’s net-enabled application portfolio to its organization type, strategic thrusts, and existing resources and assets. Second, the E-Commerce and E-Business Value Grids can be used in isolation or together to create a visual representation of the firm’s net-enabled applications and the way in which the functionalities from these applications are inter-dependent. Third, real options analysis allows for a more accurate picture of the overall value of a given application by taking into account its role as enabling or enhancing other functionality that may be introduced later, and also provides a way to develop a phased rollout plan for the overall applications portfolio over time. Fourth, the framework provides a way to generate a comprehensive set of e-metrics that measure the performance of the firm’s net-enabled applications that can be used for planning and benchmarking purposes.

There are several characteristics of the framework design that contribute to its usefulness to the IS manager. First, the grids provide a functionality oriented view of the application portfolio which is supplier and platform independent. That is, it views the application portfolio in terms of the value that it delivers to external customers and internal users, and not in terms of the underlying systems and software that the firm may have implemented (e.g. SAP, Siebel, Apache, etc.). Second, the grids are comprehensive in nature in that they attempt to capture various aspects of functionality delivered through a firm’s net-enabled application portfolio. Third, by linking functionality in various cells through the functionality interaction maps discussed earlier, the grids provide a prioritization roadmap for the firm’s applications portfolio investment plan. These three characteristics make the framework an ideal tool to visually map the firm’s net-enabled application portfolio in terms of delivered functionality. By performing competitive benchmarking and metrics-based applications performance, the IS manager can then look for missing, ineffective, or duplicate functionality in implemented software systems and map dependencies across systems. The visual tool can be used as an easily understood communications tool to discuss systems requirements with users and business unit managers.

Figure 7 depicts how the overall framework can be used in practice as a strategic planning tool and to identify the proper set of functionalities and to generate a comprehensive set of e-metrics. There are four basic steps in the process that achieves alignment between a firm’s applications portfolio and corresponding e-metrics with its organizational characteristics and strategic thrusts.
First, the organization determines its firm type and its corresponding strategic thrusts. Figure 2 provides some guidance, but it is important to point out that a firm may find that it fits more than one firm category in Figure 2. Consequently, its strategic thrusts and corresponding critical applications may emanate from multiple categories in Figure 2. While Figure 2 provides some guidance, managerial judgment needs to be exercised to determine the firm’s strategic thrusts. However, we can say that producers of physical goods need design collaboration tools, producers of information goods need intranets and other knowledge management tools, all firms handling physical goods requires supply chain management tools, while information resellers needs to combine community, commerce, and content features.

Second, the firm uses this information to determine the primary applications in the E-Commerce and E-Business Value Grids that are valuable contributors to its strategic thrusts. We provide some guidance in this paper, but a detailed evaluation of the link between specific firm types and the applications portfolio is beyond the scope of this paper. Since the grids take the perspective of value delivered to users, the grid analysis forces the IS manager to think in terms that are relevant to the user. In addition, the manager needs to take into account the organization’s resources and assets in determining what strategic thrusts are feasible. Barua, et al. [2004] make use of the resourced-based view of the firm to note three different types of resources the firm possesses which can be used to generate online information capabilities much like those proposed in the value grids. These include organizational processes, information
technology currently in use, and the environmental conditions which indicate the readiness of customers and suppliers to make use of online resources. Without taking these internal and external resources into account, the firm may attempt to implement functionality that is not feasible.

Third, the firm uses the notion of functionality interactions to determine secondary applications in the E-Commerce and E-Business Value Grids that enable or enhance the primary functionalities identified. By performing a real options analysis of the desired functionality to be delivered over a time horizon, the manager can set investment priorities and take into account future options enabled or enhanced by applications under consideration. At this point, the IS manager can map the functionalities identified to actual software and systems that deliver the functionality. This provides a comprehensive set of applications to be implemented over a timeline trajectory that is required to support the net-enabled strategic thrusts of the enterprise.

Finally, based on the chosen applications in the E-Commerce and E-Business Value Grids, the functionality interactions define the appropriate e-metrics that exist at three levels of complexity, as explained in the previous section.

Over time, monitoring of these metrics can be used to fine tune the overall benefit derived from the applications portfolio and can also be used to benchmark against other firms within the same net-enabled organization type category in an iterative fashion as shown in Figure 7. Evaluative benchmarking can be used to evolve the firm’s overall net-enabled business strategy leading to possible revisions of the firm’s strategy and realignment within the net-enabled organization classification grid. The overall approach creates strategic alignment of the firm’s net-enabled business strategy, the application portfolio that executes the strategy, and the metrics used to measure the execution of the strategy.

5.2 The Research View

A review of the academic literature on net-enabled commerce reveals a wide array of metrics that have been used to measure e-business success [Straub et al., 2002]. These metrics include stock market valuations of net-enabled initiatives [Subramani and Walden, 2001], net-enabled service quality [Devaraj et al., 2002], e-business system features and capabilities [Kim et al., 2002; Zhu and Kraemer, 2002], website usability [Palmer, 2002; Agarwal and Vishwanath, 2002], customer purchasing behavior [Devaraj et al., 2002; Koufaris, 2002], online transaction
cost and efficiency [Devaraj et al., 2002; Yoo et al., 2002], and web information quality [Subrmaniam and Shaw, 2002]. A wide range of research questions have also been addressed through these metrics, such as the impact of e-commerce on firm performance [Zhu and Kraemer, 2002; Subramaniam and Shaw, 2002; Zhuang and Lederer, 2003; Chircu and Kauffman, 2000], the impact of trust on consumer behavior and e-commerce performance [Pavlou, 2003; Suh and Han, 2003; McKnight et al., 2002; Ba and Pavlou, 2002; Gefen et al., 2003; and Bhattacherjee, 2002], and the identification of factors that improve website usability and design [Palmer, 2002; Koufaris, 2002; Griffith et al., 2001; Koufaris et al., 2001; Torkzadeh and Dhillon, 2002]. The wide array of metrics used in net-enabled commerce research is reflective of the broad range of research questions and methodologies, but also makes it difficult to draw conclusions and reconcile findings.

The resource based view (RBV) on the origins of competitive advantage has become one of the standard theories in the strategy literature [Penrose, 1959; Wernerfelt, 1984; Peteraf, 1993; Hoopes et al., 2003]. RBV links firm performance to the tangible and intangible resources that the firm possesses. The theory argues that to create sustainable competitive advantage, firms must possess resources that are economically valuable, relatively scarce, difficult to imitate, and not mobile across firms [Peteraf, 1993; Barney, 1991]. Examples in the literature are varied and include physical machinery, efficient processes, core competencies, patents, research capability, contracts, networks and relationships, and managerial ability [Barney, 1991; Henderson and Cockburn, 1984]. Some authors have argued that resources need not be economically valuable by themselves to be a source of competitive advantage, but can be combined in unique ways to increase their value [Miller, 2003]. In the IS literature, the RBV has been used to explain how firms can create sustainable advantage from IT resources that are available equally to all firms [Barua et al, 2004; Clemons and Row, 1991; Ross et al., 1996; Bharadwaj, 2000].

Barua, et al. [2004] posit that firms deploy three types of resources (organizational, technical and environmental) to create online information processing capabilities (a higher order resource), which in turn leads to superior performance. Further, the notion that resources can be combined in unique ways to increase their value is similar to our view of enabling and enhancing functionality interaction. By combining these two perspectives of the resource-based view of the firm and the framework presented in this paper, we can derive a more detailed view of the model proposed by Barua, et al. [2004] as shown in Figure 8. At the highest level of abstraction, a firm
employs its firm resources to develop its applications portfolio of net-enabled functionalities; which in turn affects the firm performance. However, the firm type will affect the relative importance of various net-enabled applications in its portfolio. The ability to fine-tune these impacts is based on employing the proper metrics to measure these relationships. Achieving a high level of net enabled firm performance requires alignment between the firm type, the applications portfolio employed by the organization over time, and the resources the firm brings to bear on the opportunities. This alignment can only be achieved using appropriate metrics to measure relational impacts. For example, backend integration with major suppliers is of critical importance to manufacturing firms so that they can lower their inventory levels. It is of lesser importance to consulting companies who do not carry physical inventory. On the other hand, knowledge management applications are likely to be more critical for companies (such as consulting firms) that sell knowledge intensive products and services. Thus, in our model, firm type moderates the relationship between a firm’s net enabled application portfolio and firm performance.

The framework outlined in this paper, along with the research view illustrated in Figure 8, can be used to identify future research directions that address current gaps in the evolving literature in this area. We outline a few promising research directions below.
We have made no attempt in this paper to develop a set of specific metrics for each cell in the two value grids. However, the framework provides the basis for developing a set of precise metrics that are comprehensive in nature. Specific metrics developed for the two grids can be used to assess and benchmark a firm’s net-enabled applications portfolio. Research on the design and validation of an instrument based on these metrics would be valuable to managers who need to evaluate their net-enabled applications portfolio and identify gaps in their applications set.

Functionality interactions described in the paper represent a rich area for further research. Net-enabled applications in each grid are enabled by a set of other applications in either of the two grids. Research that uncovers these relationships is important to managers developing a net-enabled applications portfolio. Through a better understanding of the functionality interactions, managers will be able to develop a more comprehensive and robust set of net-enabled applications. Such research will also be useful in justifying infrastructure type of investments which do not generate positive cash flows by themselves, but enable functionality whose benefits are measurable.

Further research to refine the net-enabled organization categories and their strategic thrusts would aid practitioners in understanding their business environment and in focusing resources on the right applications for that environment. Of course firms can be categorized by more than three dimensions, however, increasing the complexity of the model by including additional dimensions requires careful analysis of the efficacy of each dimension. Several extensions are possible in this context. While we have identified the different organization types based on their business environment, the categories can be further refined and empirically validated. Further, we have provided a preliminary list of strategic thrusts for each organization type. Careful research and empirical validation of these strategic thrusts will be valuable for managers who need to link their IT strategy with their firm’s strategic objectives.

Understanding the impact of net-enabled applications in the two value grids on measures of firm performance, especially how that relationship is moderated by a firm’s net-enabled organization category, is valuable knowledge for managers who must allocate scarce resources amongst competing priorities. Further, the notion of functionality interactions may lead to the development of more realistic empirical models that take into account intermediate benefits from net-enabled applications.
The enabling role of firm resources in the creation of an effective net-enabled application portfolio is also an interesting research area. Barua, et al. [2004] have proposed a specific instantiation of the three types of resources, however, other perspectives are possible. As Internet technology becomes a commodity and widely available, firms will obtain differential advantage from the same commodity-like resource based on the other complementary resources. How the firm makes use of resources such as efficient processes, trained personnel, computer-savvy customer base, and the like are important to investigate as firms seek to leverage their particular resource portfolio to create a value added applications portfolio. Understanding the complementary resources required to create an effective net-enabled information processing capability is important for managers and IS practitioners.

6. CONCLUSIONS AND IMPLICATIONS

Managers rely on established metrics to validate assumptions about their business environment and judge the results of managerial practice. The importance of metrics in any field of study can hardly be argued. This paper aids the IT manager in developing a set of e-metrics in several ways. Practitioners have typically approached the emerging and fast-paced field of e-business with ad hoc metrics of firm success. The framework provides a disciplined approach to the development of e-metrics that is comprehensive in nature and focuses on all relevant areas of the firm’s net-enabled value chain. Often, e-metrics are limited to the front-end applications involving the firm’s Web presence, ignoring the back-end applications that enable their functionality. By focusing on the front-end, companies ignore the value obtained from a more efficient, Web-enabled supply chain. The framework emphasizes back-end applications through the E-Business Value Grid and the notion of functionality interactions.

The choice of metrics is often made without establishing a clear link to the overall strategy of the firm. The framework achieves this through a classification of net-enabled organizations and their corresponding strategic thrusts. These strategic thrusts can then be supported through specific applications from the E-Commerce and E-Business Value Grids. The choice of these applications dictates the choice of primary and secondary metrics that measure their efficacy. Thus, the framework establishes a clear and logical sequence of steps that links a firm’s overall strategy to the choice of e-metrics.
The E-Commerce and E-Business Value Grids provide a comprehensive set of Internet-based applications that encompass all aspects of their value chain that managers can systematically consider for their business environment. Separate from the overall framework, these grids can be used in isolation by managers for this purpose. Also, the E-Commerce and E-Business Value Grids, along with the notion of functionality interaction described in the framework, can be used in tandem to visually map the firm’s overall net-enabled business strategy. The grids can also be used to evaluate gaps in the firm’s current strategy and to focus their efforts along key dimensions. In addition, the e-metrics classification scheme ensures that both primary applications and secondary enabling or enhancing applications are carefully considered when evaluating success. Subsequent evaluation of these metrics relative to other firms allows for benchmarking, which can be used for periodic evaluation of the overall net-enabled business strategy. Finally, the graphical nature of the framework facilitates communication between all parties as the firm’s strategy is developed and evolved over time.

The research view of the framework provides a simple model that links the constructs together based on the resource based view of competitive advantage. The model serves several purposes. First, by clarifying the relationships between the constructs, it helps to build a cumulative tradition of research in this emerging area that can ultimately influence practice. Applying the resource-based view in research aimed at measuring and understanding the creation of net-enabled business value is a promising area for further research. An understanding of how resources are combined via functionality interaction provides a useful lens to examine this value creation. Further, as discuss in this paper, the framework presented here helps to identify other directions where this research may proceed. In summary, a framework such as the one presented in this paper is important for cogent thinking in this emerging and important area.

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