A framework for performance measurement in the e-business environment

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Abstract

The advent of networked economy calls for new understanding of business, and it is evidenced by the visible trend of traditional businesses either migrating to e-business or expanding to embrace electronic commerce. Constant change in the environment means continually evolving strategies, new products, new processes and new technologies to adopt. E-business metrics are needed to measure performance with the firm’s strategic focus in mind, and they must go beyond the Web metrics that are discussed in the usual electronic commerce context. The basic objective of this paper is to present a framework for developing performance measurement metrics in the e-business environment. The proposed framework, designed by incorporating the balanced scorecard methodology with existing taxonomies of e-business models and the theories behind them, is intended to enable firms to develop new metrics that are needed to implement e-business strategies and tactics.

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1. Introduction

The advent of networked economy calls for new understanding of business. Based on three dimensions of business (product, process, and delivery agent), three categories of business can be identified, as shown in Fig. 1 – namely, traditional business, partial e-business, and pure e-business [76]. There is a visible trend of traditional businesses either migrating to e-business or expanding to incorporate e-business. To compete in a rapidly changing environment, many firms have adopted organizational designs, such as networked incuba-
tors, which provide for quick response, innovation and entrepreneurial behavior.

Constant change in the e-business environment means continually evolving strategies, new products, new processes and new technologies to adopt. In this environment there is a need for integration of information and organizational design to provide for strategy implementation and organizational learning. The information system must promote cooperation among managers and empowered employees to move the organization toward achieving strategic goals. In a collaborative environment, an important component of an information system is the reporting of performance metrics. As more firms have ventured into e-business, management accountants have worked with finance, information technology, and other professionals to incorporate new metrics into performance measurement systems. Metrics are used to implement strategy, manage operations and track performance over time.

The basic objective of this paper is to present a framework for developing performance measurement metrics in the e-business environment. Our e-business metrics framework is based on the well-known Balanced Scorecard methodology and the existing taxonomies of e-business models found in the literature, and the theories behind the e-business models. The proposed framework is intended to provide a structure and contents for firms to develop new metrics that are needed to implement e-business strategies and tactics.

2. E-business models, performance measurement, and strategy

Performance measurement is a topic of keen interests in the e-business literatures. There are practitioner articles on e-business models, common metrics in use, and even recommended metrics. The literature contains some examples of how companies developed new non-financial metrics for e-commerce and the effectiveness of their Web sites such as stickiness, click-through rates, and conversion rates. A recent work by Straub et al. [68] provides a fairly comprehensive summary of Web metrics that were presented in a special issue of *Information Systems Research*.

Currently, e-commerce is one of the fields where strategic thinking is ardently at work, and at the same time, it owes much of its functionality to
the enabling information technologies. As such, the rich IS strategy literature serves as valuable guidelines for establishing a framework of Web performance metrics. From the perspective of traditional strategic information systems, IS planning and IT alignment with the corporate strategy consistently stood out as major thrusts of research and practice. The traditional IS planning paradigms [20,31,32,46] are being extended to the new and more volatile e-business environment [25,33]. We consider the IS/IT planning literature valuable and relevant to our research for the e-business performance measurement framework because it played a prominent role in making the connection between IT and corporate strategy, and also because of its contribution to the recent studies of e-business strategy.

There are controversies over the usefulness of Web metrics. E-business metrics are typically strategy-focused, and should encompass a wider range of metrics than those pertaining simply to the effectiveness of Web sites. A survey study of measuring e-business performance measurement reported that 96 percent of the firms wanted to improve their measurement systems [1]. However, a well-developed framework for incorporating e-business metrics with corporate strategies is still unavailable in the literature.

Strategy-focused performance measurement metrics should be suited to the e-business model and the organizational design. At the strategy implementation level, the metrics tend to be stable when compared to tactical level measures. For example, strategic themes such as attracting and retaining highly profitable customers, and reducing the cost to serve customers are likely to endure for many years. In contrast, tactical level measures will change frequently due to the fast pace of technology changes and changes in the market. Consequently, performance measures at the tactical level are expected to change more frequently.

2.1. Taxonomy of e-business models

Currently there are numerous ways to classify e-business models. Some are based on parties involved (B2B, B2C, etc.), while others are based on the position within the value chain, and yet others with higher emphasis on economic control and value integration. Tapscott et al. [70] studied innovative firms that pioneered business webs. Based upon over 200 case studies, they developed a model based upon two primary parameters – economic control and value integration. The model specifies five business web types – Agora, Aggregation, Value Chain, Alliance, and Distributive Network. The model presents five key features of the five types of business webs according to main theme, value proposition, customer role, knowledge focus, and key process.

Applegate and Collura [4] also present taxonomy of e-business models. They present a value chain model with two basic classifications, which are digital businesses (focused distributors, portals, and producers) and infrastructure providers. The value chain participants are creators, producers, distributors, and customers.

Clicks-and-mortar businesses are largest category of e-business entities with clearly identified needs. They are under increasing pressure to break away from the Industrial Age mentality and operational norms. Strategies for clicks-and-mortar can be formulated on a linear spectrum, as suggested by Gulati and Garino [36], which spreads between the separation emphasis and the integration emphasis. Four categories are identified on this clicks-and-mortar spectrum: spin-off, strategic partnership, joint venture, and in-house division. Some firms are moving toward a spin-off strategy, while others keep the e-business entities within the firm as a fully-controlled division.

2.2. Performance measurement with the balance scorecard model

The balanced scorecard (BSC) [38–42], which is a model for strategy implementation and control developed by Kaplan and Norton, seems to be the most visible performance measurement model. The BSC is the key element of a strategic management system that requires organizations to translate strategic goals into measures of performance. Financial and non-financial measures are indicators used to monitor strategy implementation throughout the organization and whether strategic goals are being achieved. The balanced scorecard
is formulated at the top of the organization, and it is cascaded downward so that measurements are used throughout the organization to implement strategy.

The BSC framework is used to implement strategy from four perspectives. The customer perspective addresses the question, “How should we appear to our customers?” The internal business process perspective addresses the question, “To satisfy our shareholders and customers, what business processes must we excel at?” The learning and growth perspective addresses the question, “To achieve our vision, how will we sustain our ability to change and improve?” The financial perspective addresses the question, “To succeed financially, how should we appear to our shareholders?”

The BSC model strives for integrated strategic performance measures. A key aspect is to view strategy as a combination of hypothesized cause and effect relationships that cut across traditional functional areas. A strategy map can be used to visualize these relationships. A BSC includes leading and lagging indicators to monitor strategy implementation. Leading indicators are performance driver-oriented indicators. If the firm does certain things (cause) a value creating result will occur (effect). For example, a firm may hypothesize a value proposition that the improving order fulfillment cycle time will increase the customer retention rate, which will result in more favorable financial metrics. Order fulfillment cycle time measures would be leading indicators on the balanced scorecard. The balanced scorecard would also include an outcome measure of customer retention. It would also include a financial outcome-based measure such as return on investment.

Many authors have endorsed the BSC model. In valuing the efficacy of the BSC model, Hoffecker and Goldenberg [37] point out the BSC’s extensive scope of performance measurement that goes beyond financial concerns. Chow, Haddad, and Williamson [14] advocate the BSC model to be adopted by small firms for their unique situations. Clinton and Hsu [15] show that a BSC implementation with a heavy emphasis on the internal business process perspective can enhance the effectiveness of just-in-time (JIT) manufacturing. Epstein and Manzoni [21] envision great synergy between the BSC framework, which was originated in America, and the century-old French performance measurement system Tableau de Bord. According to Meyer and Markiewicz [53], the BSC model provides an excellent system for performance measurement in the commercial banking industry.

An Institute of Management Accountants Cost Management Group study reported that forty percent of the firms surveyed planned to use a scorecard measurement system within the next two years [30]. Investors are using available non-financial information. According to a recent report, investors give non-financial measures, on average, a one-third weight in decisions to buy or sell any given stock [22]. The study reported a statistical correlation between investors’ use of non-financial information and investor earnings forecast accuracy.

Neely and Adams [56] observe that the interest in performance measurement has resulted in the creation of numerous performance measurement frameworks and methodologies. Neely and Adams take the position that a common fallacy is that performance measures should be derived from strategy. The BSC and other models take this approach. The measures track whether the people and processes are moving the firm in the right direction and are they going to reach the destination. Neely and Adams argue that strategy is not about destination but about how to reach the destination.

2.3. Strategy and control systems

Firms use metrics in their attempts to develop control systems for strategy implementation. These metrics tend to be financial and internally focused. The fundamental limitation of most of the control systems is that they tend to focus on continuous improvement and cost containment. The ‘Levers of Control’ model proposed by Simmons recognizes the importance of incorporating strategic intent into the firm’s control systems [64]. Accordingly, as firms move from capital-intensive to knowledge-reliant businesses, great variation arises in the way in which these firms created, disseminated and utilized information. For example, financial services firms seek competitive
advantage based on their innovative capabilities while traditional manufacturers focus on the productivity capacity capital investments.

The Levers of Control model provides a general framework to link control with strategy in a wide spectrum of operating environments [65]. The Levers of Control model utilizes four types of controls: belief systems, boundary systems, diagnostic control systems and interactive control systems. Belief and boundary systems aim to proactively guide employee actions. Diagnostic and interactive control systems provide measurement and feedback and prompt decision-making.

Firms that are adopting a clicks-and-mortar e-business strategy will need to apply the levers of control in the 'clicks' segment in a manner different than the 'mortar' segment. In the e-business segment, boundary systems would be emphasized to prescribe the limits of risk taking. The bounds need to be translated into specific controls that enable the organization to avoid undesirable risk. Belief systems may require some interpretation of mission statements to provide guidance and direction for e-business innovation and to promote an ethical creative culture. It is noteworthy that the Levers of Control model is internally focused.

3. Strategy and e-business performance

Our view of the metrics and balanced scorecard literature is that it is for the most part internally focused. A metrics framework should help the firm look outside for leading indicators that question whether the current strategies should be changed. To illustrate the point, we start with the basic notions of corporate strategy. According to Porter, strategy is 'positioning,' and operational effectiveness is not enough to be considered 'strategy' [59]. In making such 'positioning' moves, especially to make a move that produces a sustainable advantage, a firm faces trade-offs, or has to make a choice. Naturally, making such choices involves careful analysis of its core competencies and its environments. A well-known methodology for strategic analysis, the SWOT framework can illustrate this point well. When a firm seeks to reposition itself, it will weigh the favorable and unfavorable factors that are external to the firm. In general, these external factors, opportunities and threats, are common to all firms in the marketplace, and usually uncontrollable. On the other hand, the internal factors, both strengths and weaknesses, can be considered controllable, and are different from firm to firm. Thus, a firm that can design the best "fit" between the most favorable external factors and the most significant, inherent and unique strengths has the best chance to make a successful repositioning campaign.

3.1. Augmentation of the balanced scorecard model for external factors

These arguments are prevalent in the strategy literature, and serve as an alerting signal that firms need to pay adequate attention to both internal and external factors. More specifically, there is ample evidence in the strategy literature that the degree of being attentive to both internal and external constituencies can be a good indicator of organizational performance. Known as the stakeholder approach or constituency theory (e.g., [16,27,29,73]), this comprehensive method is to gauge the effectiveness of an organization by measuring the satisfaction of the stakeholders or constituencies. A stakeholder is any group of people within or outside the organization who have a stake in its performance. According to this approach, various constituencies are identified along with their criteria for organizational performance. The seven stakeholder groups and their respective indicators are:

- Owners ... financial return.
- Employees ... job satisfaction, pay, supervision.
- Customers ... quality of goods and services.
- Creditors ... creditworthiness.
- Community ... contribution to community affairs.
- Suppliers ... satisfactory transactions.
- Government ... obedience to laws, regulations.

Among the seven stakeholder groups, only two are internal to a firm, namely owners and employees. Therefore, if one agrees that various stakeholders provide indicators or views of a firm's performance, the traditional BSC approach can
be considered to have neglected a large number of constituencies.

Neely and Adams [56] have a similar view. They present a performance prism model that can be used for measurement design. They propose five perspectives and key questions:

1. Stakeholder satisfaction – Who are the key stakeholders and what do they need?
2. Strategies – What strategies do we need to put into place to satisfy the wants and needs of these key stakeholders?
3. Processes – What critical processes do we require if we are to execute these strategies?
4. Capabilities – What capabilities do we need to operate and enhance these processes?
5. Stakeholder Contribution – What contributions do we require from our stakeholders if we are to maintain and develop these capabilities?

Their performance prism model is based on the concept that performance is not uni-dimensional. Consequently, to understand performance, one needs multiple and interlinked perspectives.

3.2. Augmentation of the balanced scorecard model for e-business

Although the traditional BSC has served the traditional operations (so-called ‘bricks-and-mortar’ businesses) rather well, there is a growing need to accommodate the new business models due to the incorporation of e-commerce into the traditional businesses (so-called ‘clicks-and-mortar’ businesses). As suggested by Gulati and Garino [36], there can be numerous variations of clicks-and-mortar businesses in addition to the four suggested configurations, which were mentioned earlier, depending on the firm’s disposition toward the degree of integration between the ‘bricks’ and the ‘clicks.’

In order to understand the need to expand the traditional BSC, let us consider a firm that has expanded its traditional retailing business model to incorporate an electronic retailing line of business (so-called ‘e-tailing’). Since it is potentially feasible to engage in e-commerce not only with the customers (for revenue generation) but also with the suppliers (for cost reduction in procurement and inbound logistics), from the perspective of supply chain management, both business-to-consumer or B2C (downstream) e-business models and business-to-business or B2B (upstream) models should already be fairly well integrated in the entire operation. This situation is depicted in Fig. 2. This scenario is impracticable unless the firm embraces the clicks-and-mortar business models, but it is not to say that they are uncommon. Rather, we note that most established retailers have already taken that path to incorporate clicks and bricks.

![Fig. 2. E-business operation of clicks-and-mortar firms in the supply chain.](image-url)
4. Components of the e-business performance measurement framework

The two concerns described thus far – namely, (1) the need to incorporate the role played by the external constituencies in the performance measurement system, and (2) the need to take into account the ‘click’ side of business in addition to ‘bricks’ due to e-business – lead us to re-examining the efficacy of current BSC. As shown in Fig. 3, we realize that the BSC approach inevitably needs to be expanded on two dimensions, i.e., in the scope of constituencies (external) and in the domain of business models (e-business). This is the basis of the development of our framework that will provide guidelines for devising performance measures in clicks-and-mortar businesses.

4.1. The C-suite issues for performance measurement

We view an e-business performance measurement framework as a model that will be adapted to fit the firm’s stakeholders and strategy. Key questions are used to formulate the BSC and performance prism models. Similarly, we use key questions to formulate our framework. The firm’s top-level managers are in the C-suite such as the CEO, CFO, CIO, COO, CSO, CPO, and CHRO. C-suite executives are concerned with different questions than P-suite executives, who primarily manage processes. Strategy implementation requires alignment of C-suite and P-suite executives.

In Table 1, we present eight core C-suite issues, which stem from expanding the traditional BSC model in two directions, as shown in Fig. 3. The expansion to account for e-business is based upon the premise that new information technology (IT) and the associated emerging/enabling technologies (ET) have an important bearing on C-suite issues. Rapid technological and market changes present many challenges to C-suite executives in an e-business environment. We present internal focus and external focus questions to help the C-suite executive select metrics that will be useful in managing the eight issues in an e-business environment. Wheeler presents the Net-Enabled Business Innovation Cycle (NEBIC) as an applied dynamic capabilities theory for measuring, predicting, and understanding a firm’s ability to create customer value through the business use of digital networks. The main thesis of the NEBIC asserts that, “Emerging/Enabling Technologies (ET) lead to Economic Opportunities (EO). Selected opportunities can enable growth through Business Innovation (BI) for the purpose of creating Customer Value (CV)” [75, p.129]. NEBIC theory identifies four sequenced constructs: choosing new IT, matching economic opportunities with technology, executing business innovation for growth, and assessing customer value, along with the processes and events that interrelate them as a cycle [75].

Choosing new IT includes emerging technologies still in a development stage and enabling technologies already commercially available. ET provides the potential to enhance a firm’s value propositions and position in the industry. ET can create or redefine an industry. A firm’s matching ET with economic opportunities capability reveals new ET-induced economic opportunities. However, a firm must select opportunities for strategic initiatives that it believes will deliver an enhanced value proposition to targeted customers. Executing business innovation for growth in an e-business involves developing growth opportunities using net-enablement. An integrated organizational effort is need to deliver a new or improved value proposition. This involves leadership and taking risks. Assessing Customer Value is neces-
necessary to determine whether customer value is being realized.

The eight core C-suite issues presented in Table 1 are based on key concepts of the BSC model, which is documented extensively in the literature. Many firms that utilize the BSC key concepts in their performance measurement systems, even though they do not use the balanced scorecard format. Fig. 3 shows an expansion to account for e-business. In our framework development, the eight C-suite issues and key questions are strategically important to the ‘clicks’ side. Our framework development was influenced by the NEBIC theory, the existing taxonomies of e-business models found in the literature, and the theories behind the e-business models. C-suite executives set financial goals for success (C1). The financial goals may include return on investment, earning per share growth or economic value added, which would be reported on the BSC. Improved financial performance is achieved by revenue growth or improved productivity, which are enabled by new IT decisions.

The firm’s strategic focus and themes are designed to provide desired growth and productivity (C2). C-suite executives develop a strategic vision based upon the firm’s mission statement and core values. The BSC model achieves alignment of C-suite and P-suite managers action by a cascading process. The BSC is formulated at the top of the organization, and it is cascaded downward and supporting balanced scorecards are developed at lower levels. Thus, measurements are used throughout the organization to implement strategy. P-suite managers will develop strategic initiatives that need to be aligned with strategic themes.

### Table 1
The core C-suite issues for performance measurement in an e-business environment

<table>
<thead>
<tr>
<th>Core C-suite issues</th>
<th>Key question</th>
<th>Internal focus&lt;sup&gt;a&lt;/sup&gt;</th>
<th>External focus&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: Financial strength</td>
<td>What are our financial goals and measures of success?</td>
<td>Does our financial control system guide managers toward adopting new IT that will help us achieve our financial goals?</td>
<td>How do the financial markets respond to our accomplishments in achieving our financial goals?</td>
</tr>
<tr>
<td>C2: Strategy focus</td>
<td>Is our strategy providing desired growth and productivity?</td>
<td>At what levels are strategies changing most frequently?</td>
<td>What new IT factors are root causes of strategy change?</td>
</tr>
<tr>
<td>C3: Customer value proposition</td>
<td>Does the customer value proposition we offer to targeted customers provide desired growth?</td>
<td>Do we have sustainable capabilities for turning new IT into customer value in a consistent and reliable manner?</td>
<td>Does the market agree with our customer value proposition assessment?</td>
</tr>
<tr>
<td>C4: Key processes</td>
<td>What key processes enable us to deliver the customer value proposition and achieve productivity goals?</td>
<td>How good are we at adopting new IT to integrate key business processes within the firm?</td>
<td>How good are we at adopting new IT to integrate key business processes with suppliers and customers?</td>
</tr>
<tr>
<td>C5: Knowledge focus</td>
<td>What knowledge do we need to design and implement strategy?</td>
<td>How are we using new IT to enable our knowledge management system to support our strategic initiatives?</td>
<td>How does the market view our knowledge competencies?</td>
</tr>
<tr>
<td>C6: Stakeholder perspective</td>
<td>How do our stakeholders view us?</td>
<td>How do our internal stakeholders view the impact of new IT initiatives on rewards and contributions?</td>
<td>How do our external stakeholders view us?</td>
</tr>
<tr>
<td>C7: Business model</td>
<td>What are the value drivers in our business model?</td>
<td>What are we doing to use new IT to continuously improve or reinvent our business model?</td>
<td>What new IT forces are working in favor or against our business model?</td>
</tr>
<tr>
<td>C8: Risk and vulnerability</td>
<td>What risks do we face?</td>
<td>How are we using new IT to manage our operational risks?</td>
<td>How vulnerable are we to new IT that changes competitive and market forces?</td>
</tr>
</tbody>
</table>

<sup>a</sup> Traditional BSC and expansion to account for e-business.

<sup>b</sup> Augmentation to account for external constituencies.
adopted by C-suite managers. C-suite managers will want to know at what levels strategies are changing most frequently, especially those associated with matching ET with economic opportunities capability. New IT factors that are becoming pervasive enabling technologies in the industry may be the root causes of strategy changes.

An e-business strategy will identify customer segments to target for revenue growth and productivity. A differentiated customer value proposition will be used to target customers to achieve growth (C3). The firm must be able to turn new IT into customer value by matching economic opportunities with technology and executing business innovation for growth. This is an innovation process that involves designing and developing new products or services and launching them. The firm will need measures for assessing customer value to assess whether the market agrees with the customer value proposition assessment. In this regard, the BSC model uses the customer perspective.

While firms have many processes, there are key processes that are strategic for an e-business (C4). The BSC internal business process perspective model uses four clusters of processes – operations management, customer management, innovation, regulatory and social. While the innovation process is included in C3, key process integration is a key issue. Looking externally, C-suite executives will be concerned with supplier and customer integration.

The BSC learning and growth perspective describes strategic alignment of intangible assets to implement strategy. Human capital is needed to have skills, training and knowledge. Information capital includes information systems, networks and infrastructure. Organizational capital with an effective mix of culture, leadership, and teamwork is needed to sustain the process of change [43]. In order to compete in an e-business environment, the C-suite must be concerned about the knowledge do we need to design and implement strategy. Human capital is a key factor in creating intangible assets. Employees are important internal stakeholders, especially those with key skills (C6). External stakeholders such as customers and suppliers are also important concerns for C-suite executives.

The BSC model views strategy as a combination of hypothesized cause and effect relationships that cut across traditional functional areas. A strategic learning loop utilizes leading and lagging indicators to monitor strategy implementation. Leading indicators are performance driver-oriented indicators that measure certain things (cause) that are linked to a hypothesized value creating result (effect). The strategic learning loop tests causal linkages to evaluate strategic themes and initiatives. The firm may have to update a strategy or abandon it. In a fast changing e-business environment, C-suite executives should be concerned about using new IT to continuously improve or reinvent the firm’s business model (C7). They must also be concerned about managing risk (C8).

The C-suite executives rely on the P-suite executives to implement strategy. P-suite executives manage processes and report to C-suite executives. P-suite executives support C-suite executives in dealing with C-suite issues. Finneran [26] presents an e-business metrics model, which includes:

- E-strategy – enterprise strategy and market development.
- E-customer – customer development/management (including CRM).
- E-supply chain – e-business supply chain management.
- E-enterprise – product, business party, knowledge, and resource development/management, and financial services.
- E-technical services – e-business infrastructure.

The Finneran model suggests some important P-suite issues.

4.2. The P-suite issues for performance measurement

In Table 2, six core P-suite issues of the framework are presented. These P-suite issues provide a general framework to be adapted to the firm’s business model and organizational structure. P-suite executives must deal with the key questions and set goals. Metrics are needed to assess progress toward goals and test assumed cause-and-effect relationships. P-suite executives must
continually question whether metrics are relevant to decisions. If a metric's relevance is diminished, it will need to be replaced. New IT has an important bearing on P-suite issues.

The website functionality (P1) is rather obvious issue for P-suite managers. In order to take advantage of the around-the-clock ubiquity of network access, a website is an indispensable element of any electronic commerce endeavor, especially for online marketing and transactions. Once a firm decides to engage in e-commerce, the issue of website functionality becomes a new and critical factor that was never a concern before. In this regard, the P-suite manager who is sensitive to the new consumerism and aware of this apparent revenue generation potential is bound to ask, “How does our website contribute to the customer value proposition?”

As in the case of Table 1, the issues in Table 2 also stem from augmenting the traditional balanced scorecards (BSC) method in two directions: (1) to incorporate e-commerce and (2) to account for external constituencies. The various net-enabled [67,75] business activities, including e-commerce, call for additional performance measurement metrics due to the unique characteristics underlying the new medium [8,68]. The first three P-suite issues, i.e., website functionality (P1), e-business model infrastructure (P2), and e-separation emphasis (P3), are primarily due to the augmentation of the BSC toward e-commerce.

Palmer relates the success of a website to its usability and the underlying design quality, proposing a set of overall website performance measures, i.e., frequency of use, likelihood of return, user satisfaction, which are a function of other variables that characterize the functionality of website such as availability of web site and responsiveness, access speed and display rate, download delay, ease of navigation, and quality of content [57]. In a study by Gefen [34], the neat and appealing appearance of a website, which is considered the counterpart of the tangible aspect of bricks-and-mortar outfits, is found to contribute to the loyalty of online customers.

<table>
<thead>
<tr>
<th>Augmentation type</th>
<th>Core P-suite issues</th>
<th>Key question</th>
<th>Metric needs</th>
<th>Metric relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clicks Augmentation</td>
<td>P1: Website functionality</td>
<td>How does our website contribute to the customer value proposition?</td>
<td>What insight does click stream analysis provide into customer behavior?</td>
<td>How does our website compare to our chief rival?</td>
</tr>
<tr>
<td>Clicks Augmentation</td>
<td>P2: E-business model infrastructure</td>
<td>How are we using new IT to improve the infrastructure necessary to support our business model?</td>
<td>Do we have measures of efficiency, effectiveness and relevance to our business model?</td>
<td>Do we have leading and lagging measures?</td>
</tr>
<tr>
<td>Clicks Augmentation</td>
<td>P3: E-separation emphasis</td>
<td>What degree of e-business integration do we want?</td>
<td>Do we have measures of efficiency, effectiveness and relevance to our business model?</td>
<td>Do we have leading and lagging measures?</td>
</tr>
<tr>
<td>External Constituencies Augmentation</td>
<td>P4: E-customer</td>
<td>How are we using new IT to improve the customer value proposition?</td>
<td>Do we have an integrated view of our e-customers?</td>
<td>Do we have leading and lagging measures?</td>
</tr>
<tr>
<td>External Constituencies Augmentation</td>
<td>P5: E-supply chain</td>
<td>How integrated is our supply chain?</td>
<td>Do we have measures of efficiency, effectiveness and relevance to our supply chain?</td>
<td>Do we have leading and lagging measures?</td>
</tr>
<tr>
<td>Composite Augmentation</td>
<td>P6: E-intangibles</td>
<td>How are we using new IT to create firm intangible value?</td>
<td>Do we have measures of intangible value creation?</td>
<td>Does the market agree with our intangible value assessment?</td>
</tr>
</tbody>
</table>
There are various metrics that have been put forth as a means to measure how well a website serves the e-business. For example, there are website traffic tracking measures [2] such as number of times a page is viewed, frequency of unique visits, and the rate of return visits. There are other measures intended to gauge the satisfaction of website visit experiences such as ease of use, ease of navigation, usefulness, and overall user satisfaction, all of which are measured through some type of survey. And, yet other metrics were suggested for measuring how ‘sticky’ a website can be, for which the main concern is to determine the degree of sense of community and loyalty. In addition, there are more structured aggregation metrics such as the Bizrate operational efficiency measure, which is a compilation of self-reported ratings by individual consumers about the speed of online transactions and perceived of convenience [9]. Specifically for online transactions, measures like transaction processing time, transaction failure rate, user response time, and website reliability have been proposed. (See [57].)

To address the issue of e-business model infrastructure (P2), one must first consider the strategic significance of business models [13, 51] and understand how they are enabled by the firm’s infrastructure. A business model is a blueprint of a business, describing how it is to create value in the marketplace. It is a common belief that most unsuccessful dot-coms did not have a clear idea of what a business model was, nor did they develop one for themselves [62]. Porter’s criticism toward the notion of business model – “The definition of a business model is murky at best. Most often, it seems to refer to a loose conception of how a company does business and generate revenue.” [60, p.73] – in fact points to the fact that the practices of the bygone Internet-based merchants were rather untidy and loose in terms of making strategic use of their business models, if they had one.

Barua et al. [6] propose a four-layer architecture of Internet-based economy in which the two lower layers (the Internet infrastructure layer and the Internet applications infrastructure layer) represent the infrastructure of the architecture, whereas the other two layers on the top (the Internet intermediaries layer and the Internet commerce layer) represent the economic activities using the infrastructure. Mahadevan re-organizes the e-business models – whether B2B or B2C – into three market structures, i.e., portals, market makers, and product/service providers [51]. In this view, a business model is a unique blend of three streams that are critical to the business: value stream, revenue stream, and logistical stream. The business processes and activities for e-commerce are dramatically different from the traditional bricks-and-mortar operations in many ways primarily due to the characteristic infrastructure of the Internet economy. Therefore, the key issue for the P-suite manager is the extent to which the firm utilizes its IT resources to improve the infrastructure necessary to support its business model.

For P-suite managers, the main concern is the strategic use of Web-oriented information technologies to improve the infrastructure which is necessary to support the e-business models. To this end, the needed metrics should measure the effectiveness, efficiency, and relevance of the infrastructure in relation to the e-business models under consideration.

Any established firm coming from the traditional bricks-and-mortar operation into the realm of e-commerce has to consider how to mix the ‘bricks’ and ‘clicks’ so long as it does not plan to abandon its existing offline business. Gulati and Garino’s framework [36] for determining the degree of integration – or separation – of e-commerce and traditional business (P3) is based upon two premises. The first premise is that the firm’s decision to integrate or separate bricks and clicks falls within a spectrum between the two extremes. The extreme case of integration is to maintain the clicks operation within the firm as an in-house division, while the other extreme is to spin off the clicks as a separate company so that it can enjoy flexibility, agility, and focus. The second premise is that such a decision can be made rationally by considering the firm’s position, intention, and other characteristics. Gulati and Garino’s roadmap for the decision making involves four areas of consideration: branding strategy, composition of the management team in the clicks operation
and its relationship to the bricks management, operations from the perspectives of physical and information flows, and the ownership. Apparently, the P-suite manager’s concern in a clicks-and-mortar firm must address the degree of integration.

The next two core P-suite issues are due to the augmentation to account for external constituencies of e-commerce, namely e-customer (P4) and e-supply chain (P5). Knowing who the customers are in the electronic marketplace and what they desire is a thorny task for online marketers, and yet, an unavoidable task if a firm wants to be successful. The web technologies not only created new class of customers but also posed challenges as to how to retain them. Various factors have been proposed to explain the online customers’ behavior to stay with an e-business, such as trust, switching cost [12], network effects, brand loyalty, etc. However, the most fundamental question of clicks-and-mortar P-suite managers concerning the e-customers is “How are we using the new information technologies to create or improve the customer value proposition?” Indeed, improving the understanding about e-customers has been a major thrust of much of the recent e-commerce research, especially in the area of online retailing, or ‘e-tailing’ [49,50,52,63].

As much as online businesses feel the pressure to ‘know’ their online customers, the e-customers have the same concerns about e-businesses. A good deal of research findings have come out regarding the relationship between the risk perceived by online consumers and their trust toward online sellers, and the resultant impact on their intention to engage in e-commerce transactions. Teo and Yeong [71] report the negative influence that a consumer’s perceived risk exerts upon the evaluation of online transactions. Gefen [34] also finds that there is a positive relationship between certain service qualities of e-commerce websites and the customer’s trust, and a negative relationship between the trust and perceived risk. In addition, according to Gefen, the online consumer’s trust has a substantial, positive impact on the customer loyalty toward the e-business [34].

According to Chang et al. [10], market-oriented firms outperform the counterparts in the e-business environment. They consider market orientation to have two components, i.e., customer orientation and competitor orientation, which is a notion adopted from Narver and Slater [55]. The reasoning behind the significance of customer orientation is that, by leveraging the established customer knowledge, a firm can avoid competing on pricing and also can provide differential prices based on the customer’s own demand curve. Their proposition that firms with such an orientation will outperform those without it was tested and ascertained by the differences in gross profit margin and profit growth between the two groups.

The other core issue concerning external constituencies of e-business pertains to electronic supply chain management (P5). As one can see in Fig. 2, a firm’s business activities result from partaking in a supply chain, and any firm that is involved in e-commerce is bound to engage in B2B e-business with other upstream business partners, and most likely with other downstream business entities. The only exception to this notion applies to online retailers as their primary concern is B2C e-business for consumers who represent the terminal of a supply chain.

A peculiar and yet common problem that these supply chain participants often face is so-called ‘supply chain bullwhip effect.’ The bullwhip effect is a term coined to describe a supply chain phenomenon in which, when a downstream firm’s demand information is passed to an upstream business partner (a supplier), the information tends to be distorted in such a way that the variance of orders exceeds the variance of sales, and more seriously, such distortions are amplified as the information moves further upstream [47,48]. Detecting and recognizing the bullwhip effect in a supply chain is an easier task than quantifying and measuring the extent of the bullwhip effect to signal decision makers so that counter measures can be deployed [11,28,69,18]. Even more challenging is to devise such counter measures. Given the fact that all the supply chain participants are profit-maximizing entities, it seems that solutions other than Pareto improvement in inventory management and operational cost containment can mean some local optimization while global sub-optimization along the supply chain is inevitable. Among the various solutions that have
been proposed (See [3,11,18,19,47,48,54,79]), improved information sharing, or better communication, among the supply chain partners stands out as a common thread [17,45,66,78]. This, however, is not necessarily a simple solution to implement since the goal to be attained is to overcome the frictions that unavoidably exist in inter-organizational information flows while at the same time it is also desirable to enhance the degree of automation in such inter-firm information exchanges. Sharing information, at least in theory, in today’s e-business environment can be most effectively achieved through integrating the enterprise resources planning (or ERP) applications with supply chains [5,7], and by architecting distribution channels around B2B exchanges and other e-Hubs [77]. As such, the e-supply chain integration is obviously a major concern for P-suite managers.

Finally, creation of intangible value (P6) in the e-business ‘marketspace’ [61] is another core issue that concerns the P-suite managers. Creation of e-intangibles by employing digital medium to reach out to the market, as opposed to traditional

| Table 3 | Framework for performance measurement in an e-business environment: key implementation issues for metric |
|----------------|--------------------------------------------------|----------------|----------------|----------------|
| **Key question** | **C-suite** | **P-suite** | **C-suite** | **P-suite** |
| **Sources of value creation** | How are we using new IT to develop performance measures for sources of value creation? | Are we improving and refining our insight into value creation? | Are our BI and CRM systems providing more refined insights into the components of value creation? |  |
| **Time lapse** | Is the time lapse between action occurrence and measuring results shrinking? | Are we relying on too many lagged measures? | Are our BI and CRM systems effectively using data as it is captured? |  |
| **Continuous versus discrete measures** | Are our performance measures transitioning from discrete to continuous tracking? | Are we relying on too many discrete measures? | What decisions can be improved by the availability of continuous measurements? |  |
| **Sensor technology** | Does sensor technology enable us to observe new and relevant performance measures? | Are we using the latest sensor technologies? | What is unobservable with our current technology that we need to measure? |  |
| **Adaptive control models** | Can we use fast feedback and IT to improve our adaptive action? | How do our adaptive control models compare with competitors? | Can we use fast feedback and IT to support a distributed decision-making model by managers close to customers, suppliers, and other stakeholders? |  |
| **Relevance to business model** | Are our measures relevant to our business model? | Do our measures provide insight into the relevance of our business model? | Do leading indicators enable us to evaluate strategic cause and effect relationships? |  |
| **Integration** | Are we measuring IT, supply chain and process integration? | What is the ROI on our investments? | What is the ROI on our investments? |  |
| **Leading indicators** | Are leading indicators providing for more accurate predictive models? | Are leading indicators becoming more useful? | What processes provide opportunities to rely more on leading indicators? |  |
| **Uniqueness** | Do we have too many related measures? | Do we have unique and reliable measures? | Do we have unique and reliable process measures? |  |
| **Risk relevance** | Do our measures alert managers to risk factors? | Do our metrics provide insight into environmental, process and Information risk? | Do our metrics provide insight into environmental, process and Information risk? |  |
| **Privacy and legal issues** | What privacy and other legal issues are constraints? | Are we respecting the privacy and legal rights of stakeholders? | Are we respecting the privacy and legal rights of customers, suppliers, and employees? |  |
bricks-and-mortar means, can therefore be regarded as augmentation the traditional BSC to incorporate both e-commerce and external constituencies. Digital value creation is not a new concept. Ghosh [35] once pointed out that established firms were running the risk of large-scale damages by neglecting the potential impact of digital value creation that new online competitors strived to bring about, and that such major destruction would manifest in the form of ‘digital termites’ rather than ‘digital tornadoes’.

A number of studies have addressed the measure of success of e-business [44,58,72,74], most of which deal with the intangible aspects of online
operations, either explicitly or indirectly. Pather et al. [58], in their attempt to incorporate the traditional IS user satisfaction paradigm with the new and evolving settings in which the Web-based users are typically outside the organization, propose an approach that combines user satisfaction measures and service quality measures. Kim et al. [44] report that the patrons of virtual malls on the Internet, online stock brokerage, portals, and online game sites find both tangible qualities (e.g., stability and security of the sites) of such e-commerce establishments and intangible qualities (e.g., convenience, and delight) positively influence online customers’ satisfaction, leading to loyalty. Successful expansion of a firm’s scope of business to encompass e-commerce is dependent upon the internal IT capabilities. Extending the prior work by Feeny and Willcocks [23,24] on measuring IT capabilities, van der Heijden [74] shows that the core IT capabilities such as the capability to satisfy information users and to influence firm’s strategy, effective IT governance structure, and the ‘business thinking’ capability, among others, are crucial in assessing the success of e-commerce endeavors from the IT perspectives.

4.3. The integrated framework

In Table 3, key implementation issues for metrics are presented. New IT and associated ET provide opportunities for improved performance measurement and control systems. With new IT, e-business firms capture huge amounts of data from sources such as websites, emails, and e-business transactions. Firms are working on using business intelligence (BI) and customer relationship management (CRM) systems for improved analytics. Our framework presents eleven areas where important questions must be asked about the metrics the firm is using or plans to use. With ET providing opportunities for better metrics, we present these key questions. C-suite and P-suite executives must take a critical look at the metrics that they use and the potential for improvements.

The eleven key areas in Table 3 were obtained from a systematic mapping from the eight C-suite core issues (Table 1) and six P-suite core issues (Table 2) through five common threads – value creation, IT alignment, business model, performance measurement, and business environment – and finally into the elements of which our integrated framework is composed. This mapping is presented as Fig. 4. Since the principle and the process are fairly self-explanatory, detailed description about the mapping is abbreviated.

5. Conclusions

We present a model that provides a framework for developing performance measurement metrics for e-business. Our e-business metrics model was developed using insights from taxonomies of e-business models, the IT literature, and the performance measurement literature. We provide a framework for firms to develop metrics that are needed to implement e-business strategies and tactics. We present eight issues for C-suite executives and seven issues for P-suite executives. We identify eleven key implementation issues for metrics which pose important questions must asked about the metrics the firm is using or plans to use. Our framework provides basic structure for firms relevant to developing a performance measurement metrics useful in strategy implementation of e-business initiatives.

Our framework for performance measurement in an e-business environment has limitations. We have presented our view of key issues in the framework. A case can be made that we omitted some issues that are important to some firms in Tables 1–3. We acknowledge this limitation. We have provided a conceptual framework to provide guidance for firms with varying business models. There are cost-benefit issues for firms. We agree with Neely and Adams [56], who observe that the interest in performance measurement has resulted in the creation of numerous performance measurement frameworks and methodologies. They conclude that the multiple, seemingly conflicting, measurement frameworks and methodologies can exist because they all can add value. The various methods use a different set of lenses to provide a unique perspective on performance. Using our
framework should be helpful to firms in designing and using a lens to provide a perspective of performance for e-business. We believe that our framework has relevance to firms using the balanced scorecard, performance prism, or another performance measurement model. Some of the C-suite issues can be directly mapped to the balanced scorecard and performance prism perspectives. Our framework can be used in conjunction with these performance measurement models to provide some structure to the e-business view of C-suite and P-suite executives. We expect e-business to continue to change at a fast pace. As a result, our framework will evolve.

There are many opportunities for future research in performance measurement in e-business. In-depth case studies of how e-business firms use metrics at the C-suite and P-suite levels to implement strategy and formulate strategy can provide insight into the state of the art. Case studies may show that some firms are not concerned with some the issues presented in our framework. We may find that some issues are not viewed as being important by firms with certain types of business models, or firm size and complexity may be an important variable.

References


