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Ronald T. Cenfetelli

University of British Columbia, cenfetelli@commerce.ubc.ca

Izak Benbasat

University of British Columbia, benbasat@commerce.ubc.ca

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MEASURING THE E-COMMERCE CUSTOMER SERVICE LIFE CYCLE

Ronald T. Cenfetelli

E-mail: Cenfetelli@commerce.ubc.ca
Tel: (604) 908 - 1091 Fax (604) 822 - 0045

Izak Benbasat

E-mail: Benbasat@commerce.ubc.ca
Tel: (604) 822 - 8396 Fax (604) 822 - 0045
Faculty of Commerce
University of British Columbia
Vancouver, BC, V6T 1Z2 CANADA

ABSTRACT

This paper describes the preliminary conceptual development of an instrument to measure the ability of an e-commerce site to meet the service aspects of the Customer Service Life Cycle (CSLC) through the use of information technology (IT). In light of the emergence of e-commerce, there is a pressing need for the evaluation of IT-supported services from a customer service perspective. The CSLC purports to be a source of competitive advantage through the differentiation of service offerings (Ives and Learmonth 1984). The CSLC framework can also serve as a basis for the strategic development of interorganizational IT applications. While the CSLC has been discussed in the information systems literature since 1984, little empirical work has been done to develop measures of its constructs of interest

1. INTRODUCTION

Ives and Learmonth first proposed the Customer Service Life Cycle (CSLC) in 1984 as a framework for applying information technology (IT) to externally oriented, customer-focused applications. The CSLC is based primarily on the extant knowledge that customers follow a "birth to death" cycle when dealing with a supplier's product or service. Broadly, a customer first establishes a need and characteristics of a product or service. She then acquires the product, possesses it and at some point returns, disposes or otherwise discontinues ownership. A visual depiction of the CSLC is shown in Figure 1 (Ives and Mason 1990). Ives and Learmonth posited that IT could provide the necessary tools and infrastructure for a company to serve its customers across the breadth of the life cycle. IT can be applied to the role of assisting customers identify the right products, managing purchased products or speeding the return of an item. Amazon.com, for example, uses collaborative filtering to recommend books of potential interest to a customer. These may well be products that the customer never before perceived a need for until presented with the targeted choice. The vast majority of e-commerce sites provide electronic "shopping carts" to assist the customer in managing the order process and then determining payment. Symantec's anti-virus software maintains contact with a customer's computer to assure both the software and the library of virus definitions are up to date to assure maximum protection. Symantec automatically notifies the customer when either the software or the virus definitions have upgrades available.

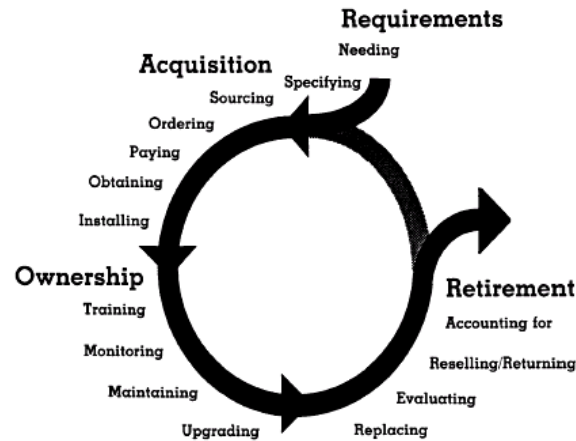


Figure 1 (Ives and Mason 1990, pg 59)

The incentive for suppliers to focus resources around the life cycle framework is mainly to gain competitive advantage. Dealing with customers throughout acquisition to post-transaction support involves many complex attributes and thus a potential for developing a customer relationship that is difficult for a competitor to imitate (Barney 1991). As noted by Ives and Learmonth, the commonly used Porter "Five Forces" model (1980) defines customers as a key consideration. Porter further posited that businesses achieve advantage by focusing on cost, attacking a specific market segment, or differentiating its product or service. Ives and Learmonth view the CSLC as a prescriptive framework to deal with the "customer force" through the latter strategy of differentiation:

"If the supplier can assist the customer in managing this life cycle, the supplier may be able to differentiate itself from its competitors, usually on the basis of enhanced customer service or, in some cases, by introducing direct costs savings." [pg. 1197]

The significant contribution of the CSLC framework to the MIS literature was its call for applying information technology (IT) to externally oriented, customer-focused applications (Ives 2001). The CSLC attempts to identify and provide a supporting structure for IT resources in this regard. IT strategy had, at that time, been primarily internally-oriented and seen as a business support mechanism for such functions as payroll, inventory or accounting. However, greater emphasis was being placed on *interorganizational* information systems (Barrett and Konsynski 1982) that allowed companies to transact electronically with other organizations. This shift from internally to externally focused systems called for a different strategic perspective and was a fundamental purpose of the CSLC. As a basis for application development, the CSLC changes the fundamental focus of resources. Whether internally or externally focused, IT applications many times are generated from a "bottom-up" perspective. If a tool is developed, a use is sought for the tool. The CSLC, in contrast, takes a "top-down" perspective by first seeing what can be done for the customer and *then* developing applications to meet this need.

The CSLC contribution was prescient. The emergence of e-commerce has created a user base of millions of ordinary customers, thus demanding a significant shift in IS resources and thinking from an internal to an external focus (Straub and Watson 2001). Surprisingly, little research has been conducted on how this vast new IS application environment (business-to-consumer e-commerce) is seen and valued by the everyday customer. This is an important unmet need given that one in three adults in North America now shop online (BusinessWeek 2002) and customers spent over US\$60 billion dollars in Internet shopping in 2001 (Nielsen/NetRatings). Such a shift emphasizes the need for evaluation of the CSLC. While well accepted as prescriptive, little has been done to measure the CSLC's constructs of interest, let alone challenge the framework to empirical analysis. Valid measures of the associated constructs are essential to theory development and analysis (Sethi and King 1994,

Bagozzi 1992). Furthermore, there is a pending need for valid, performance-based metrics of the unique aspects of e-commerce (Straub et. al. 2002). Despite two decades of existence in the MIS literature, there has been no evaluation of matching the CSLC to business performance and empirically challenging whether or how the CSLC contributes to competitive advantage. Another unanswered question is the relative importance of the various aspects of the cycle to the customer. Straub and Watson (2001) have commented on the importance of determining which aspects of the Porter Value Chain (Porter 1980) are most critical in an e-commerce context. The CSLC shares many of the same attributes as the Porter chain and so would also benefit from an analysis of how practitioners should focus scarce resources where customers most desire attention. All of these yet unanswered research questions drive the need for an instrument to evaluate the framework's underlying theory, validity as well as provide a basis for practitioner evaluation of their own e-commerce efforts.

2. PRIOR RESEARCH

The CSLC was derived from IBM's four-stage Systems Planning Process (1981) and Burnstine's 11-stage resource life cycle (1980). The four-stage model is a useful summarization of the overall life cycle that begins with **Requirements** followed by **Acquisition**, **Ownership** and finally **Retirement**. The Burnstine model adds detail to each of these four stages and the activities that can take place during a given stage. Ives and Learmonth integrated these two perspectives to form the Customer Resource Life Cycle and added two dimensions (**Pay** and **Acquire**) to create 13 dimensions. Ives and Mason (1990), in furthering the 1984 work, added the dimensions **Training** and **Evaluating** to create a 15 dimensional service life cycle. While the terms resource and service have been used interchangeably, we adopt the term *service* for consistency.

Though not previously cited, the CSLC, as one would expect, also shares concepts from the marketing and buyer behavior literature. The concept of a customer decision process that flows from problem recognition to post-purchase evaluation has existed in the marketing literature for some time (Engel et. al. 1968, 1986; Nicosia 1966). For example, the Engel-Kollat-Blackwell model (1968) discusses Need Recognition; Alternatives Search; Evaluation of Alternatives; Purchase and Use; and Evaluation of Use. Nicosia's perspective is also cyclic in detailing the consumer's behavior from stimulus (need recognition) through search and choice to finally the post-purchase evaluation and its influence on future purchases.

These perspectives as well as extant knowledge provide support for the face validity of the CSLC. However, little empirical research has been performed to substantiate construct validity let alone predictive validity towards competitive advantage. As recently as 1999, Gonsalves et. al. stated "an extensive literature search revealed only one study where the C[S]LC model played a role in an empirical investigation (Sethi and King, 1994)". That investigation used the CSLC dimensions as one of a series of measurements of IT application competitive advantage (CAPITA). In this study, the CSLC was developed as a measure of the broad construct *functionality*. A single survey item was created for each CSLC dimension (e.g. "The IT application has increased/decreased the ability to determine the attributes of the desired resources"). Thus, while CAPITA is a useful measure of advantage conferred by the broad capabilities of an IT application, there was no validation of the underlying dimensions of customer service. In fact, Sethi and King found that the functionality trait was not unidimensional and consisted instead of two dimensions. These were essentially pre- and post-acquisition functionalities. An inference could be made that further decomposition would be possible with focused study of this trait. The authors also called for more precise higher-order models behind the dimensions they developed thus further supporting a detailed validation of the CSLC.

The only other CSLC empirical study, that of Gonsalves et. al. (1999), attempted to validate a scale measure of the CSLC. However, the population surveyed consisted of managers, not customers. As Ives (1988, pg. 11) states regarding the original 1984 life-cycle paper "[the authors] suggest using the

CRLC to look at the product or service from the perspective of the customer". Extrapolating, a survey of an e-commerce site's ability would be targeted at customers rather than managers. A second critique of the Gonsalves study is that it relied upon single item measures for each dimension potentially jeopardizing reliability.

3. PRESENT STUDY

To develop a measure of the Customer Service Life Cycle and its impact on competitive advantage, a three-stage instrument development study was conducted. The first study generated a pool of items related to the CSLC followed by review and refinement using a judged sorting method. The second study consisted of pilot testing of the items with customers of a small online grocery service (n=26). A third field test study is currently in progress and will be described at ECIS 2002.

3.1 Study 1: Instrument Development

Phase 1- Item Generation: The item generation phase was designed to address content validity with respect to the fifteen dimensions of the CSLC. The goal was to develop a wide range of aspects to be found on an e-commerce site as they relate to the CSLC dimensions.

Procedure 1: A group of ten graduate students in the business school of a large Canadian university were solicited for aspects relating to each dimension of the CSLC. These students were experienced e-commerce users. An exploratory survey form was provided that described the overall CSLC framework, individual dimensions and their definitions and a brief example of each. The respondents were asked to generate items that dealt with each dimension for either a generic e-commerce web site or a specific one of their choosing. This exercise produced a total of 56 items after culling redundant or similarly worded items.

Procedure 2: The authors developed a total of 43 items by using past literature on each dimension and its definition (Ives and Learmonth 1984; Ives and Mason 1990; Ives 2001). For example, Ives (2001) defines the **specify** dimension as "Determining the specific features or model of the product or service that is appropriate for the particular customer". This became "The website helps me to determine/identify the features of the product or service". Ives and Learmonth (1984) define **Account for** as "To monitor where and how much is spent on a resource." This was used for creating the item "The website allows me to monitor expenses related to the product (after purchase)".

Phase 2 - Item Review and Refinement: The card-sorting method developed by Moore and Benbasat (1991) was used as a basis for the scale refinement process. This method relies upon a panel of judges to conduct a screening of items in relation to constructs (construct validity). The general procedure for the card sort involves placing each item on an index card, randomly sorting the cards, and asking an individual judge to place the cards in columns headed by the constructs of interest. The method used for this survey used a slightly modified version of the Moore and Benbasat method by eliminating the first phase of the sorting process whereby judges are asked to determine construct identification, i.e. provide a label for the construct. Instead, sorting was performed with the fifteen CSLC dimensions explicitly provided as column headings.

Judges were recruited from various departments of a large Canadian business school and were of differing backgrounds. Three faculty members, four doctoral students, and two administrative assistants participated representing the Organizational Behavior, Marketing, Public Policy and Management Information Systems departments.

Judges were provided with an overview of the CSLC and a set of instructions on how the sorting process was to be conducted. A trial sort using a set of simple constructs associated with an automobile (e.g. efficiency) and questions such as "the car should have good gas mileage" were used

to help orient judges to the sorting process. Column headings were then shown representing the various dimensions of the CSLC such as **Specify** and **Ordering**. A definition for each dimension was also provided and the judges were asked to familiarize themselves with both the dimensions and definitions prior to conducting the card sort. A column labeled as "Ambiguous/Does Not Fit" was provided so as to avoid forcing an item into a given dimension. It was emphasized that the items to be sorted were not to be applied to a specific web site nor were the judges to interpret the questions as being applicable to their own personal interaction with a website.

An important observation during the first sorting round was the importance that items were *targeted* in scope. There were three potential targets for an item: buyer, the e-commerce site, or the product/service. For item phrasing, this operationalizes as the object of the sentence that forms the item. For example, "Characteristics for evaluation are provided on the web site" was changed to "Characteristics for my evaluation *of the company* are provided on their web site". Where applicable, items were revised to assure this focus was applied.

To facilitate participation and avoid fatigue, the sorting process was divided into halves based upon the four broader concepts of the life cycle. Judges sorted items associated with either **Requirements** and **Acquisition** (61 items) or **Ownership** and **Retirement** (38 items).

Results of First Sort: Three judges participated in the initial sorting round for each of the two cycle halves and the results used to reword, clarify or add missing items. A matrix of target dimension versus sorted dimension was used to assess the accuracy of item placement. This analysis is essentially a qualitative measure of construct validity and reliability as there are no specific quantitative guidelines for fit (Moore and Benbasat 1991). However, the method is useful in highlighting item wording and construct definition. By giving particular attention to those items that are "off-diagonal", items can be identified that are either vague, poorly worded or tapping a non-intended construct.

The first round of the card sorting process produced general guidance in terms of both nomenclature as well as discriminant validity. In terms of construct nomenclature, the **Install** dimension was replaced with **Test and Accept** as being more descriptive of this cycle step. The **Need** dimension was renamed **Establish Requirements** to help distinguish it from **Specify**. Of the items designed to target either of these two categories, 28% fell under the alternative dimension. The constructs **Maintain**, **Monitor** and **Upgrade** were particularly difficult for judges to discern as separate constructs. During the first sorting round, almost half (42%) of the items in these three categories fell under one of the other two related concepts. As a result, it was decided to consolidate these three dimensions into a single **Maintaining** category. In similar fashion, **Return** was consolidated with **Transfer or Dispose** to form a single construct **Replace/Return/Dispose**. While there was greater discrimination between the two original constructs in the first round sorting as compared to the **Maintain** items, judges reported difficulty in discerning the two. All three terms relate to a customer relinquishing ownership. The noted consolidations to 12 dimensions also served to provide greater parsimony and clarity to the life cycle framework.

An additional observation that was useful for item refinement was the inherent chronology of the life cycle. This applies particularly to ordering, payment and obtaining. The ordering and obtaining processes both involve delivery (expected versus actual). Thus "The web site provides anticipated availability and delivery date or the resource" may be interpreted as falling under either construct. Refining the item with time by adding "*before I place my order*" brings it into the **Ordering** phase of the cycle.

A final outcome of the first sorting round was the addition of examples to some items to improve saliency. For instance, "Amazon's online reviews written by customers" was added to enhance the item "The site displays success stories from customers. For example: Amazon's online reviews written by customers".

Results of Second Sort: The revised items from the first sort were subsequently subjected to a second sorting round with a new set of three judges. With the construct consolidation noted, 12 dimensions were involved. As with the first sorting round, judges sorted items associated with either **Requirements** and **Acquisition** (68 items) or **Ownership** and **Retirement** (32 items).

Based upon the results of the second round, items that consistently matched to their targeted concepts were retained. These included items that were accurately matched by 5 or 6 judges across both sorting rounds as well as new or reworded items that were accurately matched by all three judges in the second round. This led to an overall hit rate of 87% with the remaining retained items. In terms of the range at the dimensional level, the **Accounting** dimension had the lowest hit rate with 58% while the **Ordering** and **Paying** dimensions each scored 100%. Each dimension had a minimum of three items. A detailed listing of definitions and dimensions is shown in Table 1.

Table 1: Results of second sorting round

<u>Broad Construct</u>	<u>Dimension</u>	<u>Average Hit rate</u>	<u>Number of Items</u>	<u>Definition</u>
<u>Requirements</u>	<i>Establish Requirements</i>	87.5%	4	Helping the customer to understand what a product or service does and how it can meet their particular need.
	<i>Specifying</i>	93.3%	5	Determining the specific features or model of the product or service that is appropriate for the particular customer.
<u>Acquisition</u>	<i>Sourcing</i>	86.1%	6	Making it easy for the customer to find a location to obtain the product or service. For instance, identifying nearby retail outlets or outlets that have the item in stock.
	<i>Ordering</i>	100.0%	6	The customer accepts the suppliers offer to sell the product or service and provides specifics regarding features and delivery.
	<i>Paying</i>	100.0%	5	Pay For: The mechanism by which the customer pays for the product and the means by which that payment is authorized.
	<i>Obtaining</i>	87.8%	3	Taking ownership of the product or beginning to receive the particular service. Refers to the means by which the product or service is distributed to the customer.
	<i>Test & Accept</i>	88.9%	4	Demonstrating product or service meets the customer's requirement. Information based products or services can often be tested prior to purchase.
<u>Ownership</u>	<i>Training</i>	80.0%	5	The process that supports resource utilization by making the customer capable of making use of the resource to its full extent.
	<i>Maintaining</i>	80.0%	5	Helping the customer to analyze, diagnose, and repair problems with the product or service. Assist in tracking usage (how the product is being used, amount remaining, problems in usage, recommendations for more effective use).Upgrading to improved version
<u>Retirement</u>	<i>Replace/Return/Dispose</i>	98.2%	9	Returning the product; reselling the product; recognizing the need to buy a new one; disposing of the product; trading the product in; returning a rental product. Replacing a product that has been consumed or beyond repair.
	<i>Accounting for</i>	58.3%	4	Helping the customer to understand how much they are spending (or saving) on the product, the use of the product, and or other resources used in conjunction with the product.
	<i>Evaluating</i>	87.5%	4	The final "tally" by the customer of the life-cycle experience. Were expectations met? Satisfied?

3.2 Study 2: Pilot testing

Phase 1 - Initial testing: An initial version of the scale consisting of 62 items was developed and an invitation was made to 25 university personnel to participate in exchange for \$10. Various target web sites were used with the primary criterion that the respondent had experience using the web site (shopped at least 3 times in the prior 3 months). This helped assure familiarity with all aspects of the web site that involved both pre and post purchase activities of the CSLC. Respondents rated each item to measure web site *effectiveness* on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

The key benefit of the initial pilot testing was the addition of a "Not Applicable" category since some items may not necessarily fit a particular web site. For example, "My product can be updated automatically while I own it" does not lend itself to grocery shopping. In the absence of construct categories used in the judging process, some items were noted to be unclear and were reworded to improve clarity.

Phase 2 – Full-scale pilot testing: Arrangements were made to solicit a convenience sampling of customers from a local grocery store that offered online ordering and delivery. Customers were invited through a paper flyer sent with their grocery order. Surveys respondents were compensated with a free future delivery equivalent to C\$10. Given the target population were online internet users, it was decided to convert the survey to an online format. The flyer provided a link to this online survey thus greatly simplifying administrative overhead associated with delivery and data collection. Given aesthetics and overall survey length, it was decided to use a 5-point Likert scale for both effectiveness and utility.

Minor wording changes to items were made to assist in saliency. For example, the item "The web site provides a means to assess the condition of a product that I have purchased from the company *such as freshness*".

Table 2: Reliability Analysis (Effectiveness scale items) n=26

	Items	Alpha	Alpha*	Number of items deleted**
<u>DIMENSION</u>				
Establish Requirements	5	0.77		
Specifying	5	0.63	0.71	1
Sourcing	5	0.23	0.52	2
Ordering	6	0.50	0.74	1
Paying	5	0.81		
Obtaining	3	0.57	0.60	1
Test & Accept	4	0.61	0.72	1
Training	3	0.76		
Maintaining	5	0.69	0.77	1
Replace/Return/Dispose	8	0.41	0.90	1
Accounting for	5	0.48	0.66	2
Evaluating	3	0.77		
Competitive Advantage	3	0.53	0.82	1
<u>FOUR STAGE</u>				
Requirements	10	0.77		
Acquisition	23	0.87		
Ownership	8	0.84		
Retirement	19	0.45	0.70	2

*Revised Alpha if item(s) with low inter-item correlation are deleted

**The number of items, with low inter-item correlation, deleted to achieve the revised alpha

Analysis of Pilot Survey: Scale reliability was performed to assess the adequacy of the scale. As there were more variables than subjects in the pilot study, dimensionality and validity assessment, such as through factor analysis, was not possible at the item level. Reliability of items was measured using Cronbach's alpha. An alpha value of 0.7 or greater is preferred but 0.6 can be acceptable when conducting an exploratory study (Nunnally 1978). Two aspects of reliability were assessed. The CSLC items were assessed against the 12 dimensions and then the four-stage model.

Effectiveness Dimensional Analysis: The dimensional effectiveness scale performed well on reliability analysis (see Table 2) with all but one dimension measuring at or above 0.60. **Sourcing** was the most problematic dimension in terms of reliability as it was with the Gonsalves et. al. (1999) study. An analysis of the correlation among the five items in this dimension showed little correlation among the items with two exceptions. The items "provides detailed contact points and company histories" and "provides press articles that introduce the suppliers presence" had a bivariate correlation of 0.65 ($p < 0.01$). The two items "I can locate products through the internet site" and "The web site helps me to locate the products I need, such as choosing the best vendor or most suitable off-line location" also had a high bivariate correlation of 0.71 ($p < 0.01$). These may be the result of sourcing not being unidimensional. Two possible phenomena may be at play. For one, the items generated for this dimension were designed to apply to both a single supplier's web site as well as a website that provides access to multiple vendors. Sourcing may be interpreted as either *which company* or *which vendor at a single company*. A second explanation may be found from looking at the buyer behavior model and its two processes Alternatives Search and Evaluation of Alternatives (Engel, Kollat and Blackwell 1968). These are distinct concepts that could be described by the Sourcing construct.

Effectiveness Four-Stage Model Analysis: The four-stages of **Acquisition**, **Requirements**, **Ownership**, and **Retirement** can also be explored as a more parsimonious model of the CSLC. In this model, the reliability of measures is greatly enhanced by the pooling of items from the 11 dimensions. As noted in Table 2, all four stages measured at or above 0.70 in terms of inter-item reliability.

3.3 Study 3: Field testing

The pilot test demonstrated the reliability of items, their general clarity and comprehension as well as the utility of conducting an online survey delivery with the general public. The purpose of this final field-testing phase is to gather a large sample size of various target web sites. While the pilot study focused on a single site, the appropriate unit of analysis for predictive validity is across multiple sites.

The field test is currently ongoing and so only a description of delivery will be provided. Respondents are being solicited via newspaper advertisement with a similar compensation as offered in the pilot study. Respondents are asked to respond to the scale items as well as identify the site that they are choosing to evaluate and their experience with that site. The desired sample size for this final phase is 400 to 500 respondents.

4. LIMITATIONS, CONCLUSIONS, AND FUTURE RESEARCH

The small sample size is clearly a limitation in drawing generalizable conclusions from the pilot study data. The single context of an online grocery service also limits external validity. Optimally, the unit of analysis should be multiple sites and the impact of CSLC effectiveness on competitive advantage (i.e. satisfaction and purchase intention). This can be an area for future research and is being pursued via the field test.

Another limitation of this study at this point of time is the limited context of an online grocery store. Clearly different contexts will emphasize different aspects of the life cycle. Maintenance, for instance,

will be less important for food products and more important for a durable item such as an automobile. The field study will also seek to address this issue.

Another broader limitation of the CSLC is as a source of differentiation. Service in an e-commerce context may not be inimitable. If you install a product comparison agent on your site and capture market share, your competitor can just do the same. As Porter (2001) discusses, any service differentiation offered via the internet must do so as a complement to an *existing* differentiation strategy. In other words, the use of the CSLC framework as a sole source of advantage may not be sustainable.

Further data collection through the field-testing noted will allow for greater analysis of the relationships among various aspects of the life cycle as well as add power to the predictive validity assessment. In particular, a large sample size will allow for exploratory factor analysis to determine the true number of dimensions underlying the life cycle process. The current work shows anywhere from four to 12 dimensions. It is expected that a factor analysis will determine a parsimonious yet useful number of dimensions to be used in the assessment of an e-commerce site.

One goal of this scale development lies in the prescriptive benefits to practitioners. The instrument, once fully validated, could be used to measure not only web site effectiveness but target shortcomings to be addressed through IT application development. The expectancy-valence approach would be particularly useful in this regard. If usefulness of the various dimensions were measured along with effectiveness, a total weighted-effectiveness score can be produced as follows.

$$\text{Overall Success} = \sum_{i=1}^{n \text{ dimensions}} \text{Effectiveness}_i \times \text{Usefulness}_i$$

By focusing on highly useful items that are judged less effective, management can focus resources on areas of service improvement in their e-commerce strategy. Overall effectiveness can be benchmarked against other sites as well.

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