

# Criteria For Evaluating Commercial Off-The-Shelf E-Commerce Software Packages

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## Abstract

*An increasing number of organisations will be procuring e-commerce software solutions from commercial vendors rather than develop them in-house. The successful selection of commercial off-the-shelf (COTS) systems that fit customer requirements needs to be addressed. As a preliminary investigation, our study, through expert opinion, identified features of such e-commerce solutions from the perspective of the customer, the information systems, the technology demands and the architectural design components. From this a methodology for determining the effectiveness criteria of e-commerce software packages can be developed.*

## Keywords

Electronic Commerce, Commercial off-the-shelf software packages, Web Development Tools

## INTRODUCTION

The incredible rate of growth of e-commerce is compelling many organizations to go online in order not to be left behind. Many companies, which sell goods to the general public, are looking at the Internet as a new sales channel. Although a creation of a simple Web site might be a relatively easy undertaking, designing and implementing a full e-commerce solution is not a trivial task. Many of the technologies involved are certainly out of reach of most Web page designers. By its very nature, e-commerce involves the integration of the organisation's database systems with transaction processing and the Web server software. In its simplest form an e-commerce solution provides a list of products, which a customer selects from, places the item into a 'shopping basket', and then allows the customer to order. In its more complex form, an e-commerce site might tie into existing IT systems for inventory and billing, and also support interactive relationships with suppliers and distributors.

Until recently, e-commerce solutions were prohibitively expensive. They involved costly and 'know-how' intensive development of custom applications. A sound knowledge of HTML (hypertext markup language) for creating Web pages and CGI (common gateway interface) scripting on a Web server computer were essential prerequisites for building an effective e-commerce presence. Now, however, a considerable number of integrated, "shrink-wrapped" systems have become commercially available from a variety of vendors.

A packaged electronic commerce software is an application program that can be purchased 'off-the-shelf' and used to set-up and manage an on-line store with minimal customisation, technical and programming expertise. Such systems promise to support all aspects of electronic commerce from the stage of product identification, through the agreement phase all the way to the settlement of a deal and customer support services (Lincke 1998). Such software packages are often referred to as 'turnkey' e-commerce solutions (although, this, traditionally, has meant to include the hardware component as well). Where the term 'turnkey' appears in this paper it will be in the context of a software solution only.

In the packaged solutions marketplace there is now a plethora of choices. A closer look at these products however, reveals considerable differences in the amount of functionality supported and the suitability for different types of applications (Lincke 1998). This therefore calls for users who are establishing e-commerce sites to evaluate all of these vendor's claims, matching the various applications' key features to their specific needs (Carr 1997). This paper reports on preliminary research being undertaken to ascertain the essential and desirable features that such e-commerce packaged solutions should have and provides guidelines for selection of appropriate products for setting up e-commerce sites by small-to-medium sized enterprises (SMEs).

## LITERATURE REVIEW

### Classifying e-Commerce solutions

Many business models of Internet enterprises are emerging, for example, content sites, auctions sites, incentive sites, electronic malls and portals. However the most common electronic commerce model is the storefront catalogue-based purchasing site (Lawrence et al 1998). For a small number of goods this can be implemented without integrating the Web site to the database system of the enterprise. However, maintaining a large list of goods can be time consuming and labour intensive, especially in cases where the volatility of the data is high; for example, price changes, addition of new goods and removal of obsolete ones. In such cases the use of centrally maintained database systems to dynamically update the catalogue pages has become an essential component.

A number of solutions can be utilized to implement an e-commerce system. These include:

- ◆ Custom written solutions;
- ◆ Hosting solutions;
- ◆ Outsourced solutions;
- ◆ Pre-built software applications.

**Custom written or in-house solutions** can be developed to conform to the firm's specific business process and requirements. These may take thousands of hours to complete, and,

although they will fulfill all requirements of the firm, they are expensive to develop and maintain. Custom written solutions are prohibitively expensive for most small-to-medium sized enterprises.

An e-commerce **hosting solution** typically provides for a 'canned' database on an e-commerce host. The functionality provided in this database is generalized to cater for a broad business base and the tools and templates are generally restricted to those supplied by the provider. While encompassing many different business processes, it is likely that a business would have to alter its current practices to meet with the technology requirements of the service provided by the hosting company. The most attractive feature of this type of e-commerce option is its cost. Typically, e-commerce hosts charge a flat monthly fee or a percentage of the gross monthly on-line sales in addition to a monthly service fee.

**Outsourcing** the development activities can speed up implementation, particularly with regards to discrete peripheral functions such as credit card payment processing, remote hardware hosting, site administration, ISP service, content creation, online advertisement procurement, fulfillment, or call center support.

A **COTS e-commerce software application** is a pre-built generalized packaged software that provides a solution that has sufficient flexibility to allow users with little technical knowledge and no programming experience to adapt the package to their business. Most pre-built software provide for features that can enable a business to fully implement an online commercial solution, while allowing for user modifications in order to adapt to unique requirements and business situations. In addition, they can significantly ease the time and cost of up-front development, training, and ongoing support inherent in a homegrown development project

### **Characteristics of an e-commerce site**

Like traditional companies, e-commerce businesses succeed or fail by the quality and appropriateness of their products or services, how reasonable their prices are, how conveniently they can be bought, and how well they are marketed. Electronic commerce systems are typically characterized as adding value to a business by (Bloch et al, 1996; Turban et al, 1999):

- ◆ Expanding the marketplace
- ◆ Decreasing the transaction friction
- ◆ Shortening the supply chain
- ◆ Directly connecting buyers and sellers
- ◆ Supporting fully digital information exchange between them
- ◆ Suppressing time and space limitations
- ◆ Supporting interactivity
- ◆ Dynamically adapting to customer behavior
- ◆ Updating data in real-time

In a 1996 telephone poll of Datamation readers, the survey found that 60% of the respondents had not implemented an e-commerce system and had no plans to do so within the next three years (Hayashi, 1996). The reasons cited were cost, security issues and lack of available software and the maturity of those that did exist on the market. Today many of these issues have been addressed to a lesser or greater extent (Tan & Thoen 1999). Many vendors such as CA, IBM, Microsoft and Netscape are introducing e-commerce software to the market. Furthermore, the advent of secure programming environments and protocols such as Java and SET (Secure

Electronic Transaction) are assisting in increasing the confidence of the consumer in e-Commerce (Ghosh 1998).

Ideally, an e-commerce solution should provide end-to-end support for carrying out business transactions (Lindemann & Runge 1997). This means that every step in the transaction process is to be electronically supported by some system component. We suggest a reference model for analyzing the e-commerce business process that separates the transaction processing into four distinct phases, adapted from (Lincke 1998) (see Figure 1):

**INTERACTION PHASE:** Goods and service selection from an electronic product catalogue, supported by search engines.

**CONTRACTUAL PHASE:** Contractual agreement between buyer and seller negotiated on the purchase conditions (rebates, discounts, taxes, etc.) to be applied through price discovery mechanisms.

**ACTION PHASE:** Order fulfillment and settlement through payment and shipping of goods using a range of electronic payment methods and logistic services (order tracking, inventory checking, etc.).

**REACTION PHASE:** Customer support services throughout the lifetime of a purchased product.

End-to-end support is a core criterion in the assessment of e-commerce applications (Schmid and Lindemann 1998). The claim of most integrated e-commerce software today is that they fulfill this criterion (Lincke, 1998). Many software vendors claim to include tools to assist with several aspects of this process. However, while some may support catalogues comprehensively, for example, they may fall short in the other processes. To succeed in an e-commerce venture, an organisation must design and build a commerce-capable web site, develop a standard method of accepting and handling orders, and be receptive to customer feedback to assist in improving the web site and on-line offerings. In view of the fact that they support these business processes to varying degrees of sophistication it is necessary to carry out a systematic analysis of their strengths and weaknesses in each of the four transaction phases.

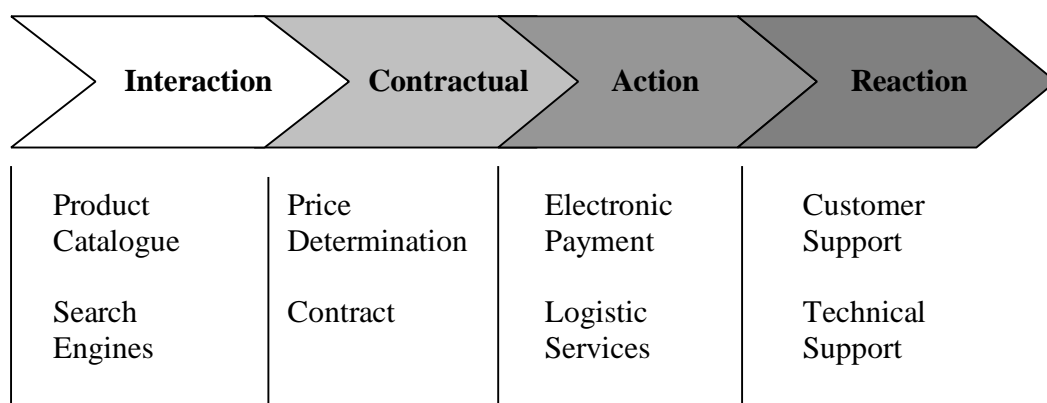


Figure 1: Phase model of an electronic market transaction (*Adapted from: Lincke 1998*)

Each e-commerce site is designed with a set of actions that may be presented to the user. The basic processes handled by e-commerce systems start with customer product selection, shopping cart update, payment and order fulfillment. The processes of a core e-commerce system is detailed in the Figure 2 below:

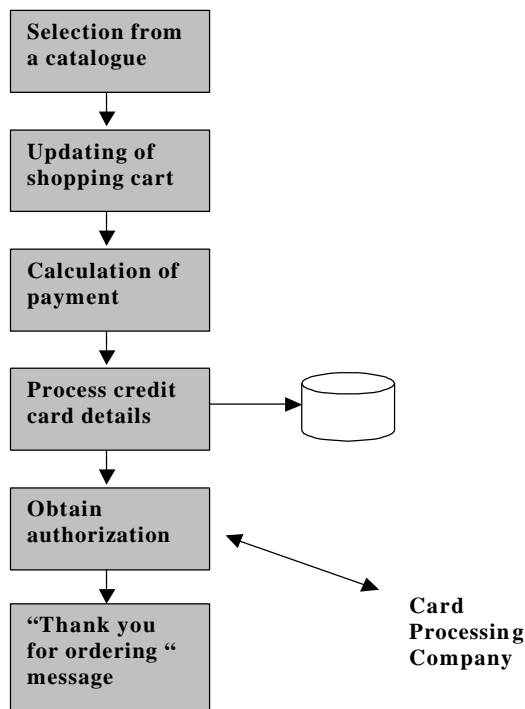


Figure 2: Core processes of e-commerce system

### Characteristics of packaged software solutions

The characteristics of packaged software solutions are in general governed by several factors identified by Jones (1996). These are:

- ◆ Consideration of all user needs
- ◆ Use of formal package evaluation criteria
- ◆ Consideration of all relevant vendors
- ◆ Formal estimation of modification, training and support costs
- ◆ Polling of package user groups
- ◆ Collection of published evaluations
- ◆ Package agreements reviewed as legal documents
- ◆ Package works and meets user needs

From the perspective of e-Commerce packaged solutions Mougayar (1998, pp.188-189) identified characteristics as listed in Table 1 below:

### The Consumer Perspective

- ◆ side-by-side products and services comparison
- ◆ multiple options for purchasing, a top sellers list
- ◆ a new arrivals list, today's specials
- ◆ easy payment options, including micro-transactions
- ◆ an on-line transaction history
- ◆ a personalised view of products and services
- ◆ multi-parameter notification service by e—mail and/or push channel
- ◆ extensive linkages to other related information and services for cross-selling purposes, order tracking and shipment status by account number
- ◆ proactive advice while shopping
- ◆ advanced search techniques such as parametric search or agent-based search
- ◆ on-line auction capability
- ◆ virtual reality handling of products
- ◆ live chat with a real person for customer service
- ◆ the ability to download a personal catalogue for off-line viewing, and efficient interfaces

### The Information Technology Perspective

- ◆ the ability to assimilate into legacy or existing systems and infrastructure
- ◆ support for open systems and standards
- ◆ incorporation of component and object oriented methodologies and technologies
- ◆ industry standard databases
- ◆ ease of installation and maintenance
- ◆ minimal administrative support
- ◆ security
- ◆ customer information management/data mining

### The Architectural Perspective

- ◆ modularisation
- ◆ content and services in digital format
- ◆ the dynamic creation and maintenance of information
- ◆ merchant services such as shopping carts, cash registers and product display/layout choices
- ◆ transactions management
- ◆ payment mechanisms
- ◆ order fulfillment
- ◆ customer service and support
- ◆ data reporting and analysis to identify Web site activity and customer behaviour
- ◆ multimedia user interfaces to attract and retain customers
- ◆ integration elements to integrate Intranet applications, back-end databases, new and old applications, and existing links to financial institutions

Table 1: Generalised features of COTS e-commerce software. *Source: Mougayar 1998 (pp.188-189)*

Other categorizations of e-Commerce solutions have been proposed by Korper & Ellis (1999) and Deise, Nowikow, King & Wright (2000). Korper & Ellis (1999) have classified the features under the categories of vendor-oriented, customer-oriented and advertising, as shown in Table 2.

Vendor oriented	<ul style="list-style-type: none"> <li>• Product administration</li> <li>• Inventory tracking</li> <li>• Purchase order generation</li> <li>• Credit card verification</li> <li>• Sales tax calculation</li> <li>• Shipping calculation</li> <li>• Site analysis tools</li> </ul>
Customer-oriented	<ul style="list-style-type: none"> <li>• Product listing</li> <li>• Discount pricing/auction technology</li> <li>• FAQ's</li> <li>• Product comparisons</li> <li>• Order tracking</li> <li>• Shipment tracking</li> <li>• Search tools</li> </ul>
Advertising features	<ul style="list-style-type: none"> <li>• Registration</li> <li>• Cross-selling</li> <li>• Advertising and promotion tools</li> <li>• Push technologies</li> <li>• Mail distribution tools</li> </ul>

Table 2: Korper & Ellis (1999) classifications

On the other hand Deise et al (2000) produced the following seven classifications:

1. Catalogue
2. Merchandising
3. Configuration
4. Shopping cart
5. Tax calculation
6. Shipping/logistics
7. Payment system

Such a large variety of features in a rapidly changing technological environment renders the selection of a suitable e-commerce software package solutions as a non-trivial activity.

## THE RESEARCH ISSUE AND METHOD

The classic build-versus-buy dilemma that has dogged software implementations over the years is still with us today. In the light of the Internet-emerging technologies that abound, it is essential to investigate the extent to which the off-the-shelf products have matured in this short space of time and how they support business goals and strategies. Generally, a successful e-commerce system

should focus on three structural elements: content, functionality and usability. Other key design considerations include support and maintenance requirements, resultant hardware/server/database impacts, and overall performance and cost considerations. The purpose of this research project, therefore, is to develop a research strategy to identify the features and technologies typically required in an e-commerce site and to evaluate some current packages against the extent to which they meet these criteria.

### **Aims of this Research**

This research project seeks to develop a framework for the evaluation of e-commerce packaged solutions so as to assist the enterprise planning in making more informed selection of such systems.

The main objectives of the research are to:

- ◆ Identify the essential and desirable features of e-commerce solutions;
- ◆ Validate such features with existing e-commerce enterprises; and
- ◆ Develop a framework and instruments for the evaluation of e-commerce solutions.

### **Research Method**

This section describes the methods that were used in establishing the common effectiveness criteria for packaged e-commerce solutions. The study was divided into two phases, each of which utilises a different technique for data gathering as shown in Figure 3 below. The first of the two phases was to determine the specific business requirements and the essential and desirable package features. The second phase, yet to be completed, will evaluate the established criteria against a selection of available packages currently on the market.

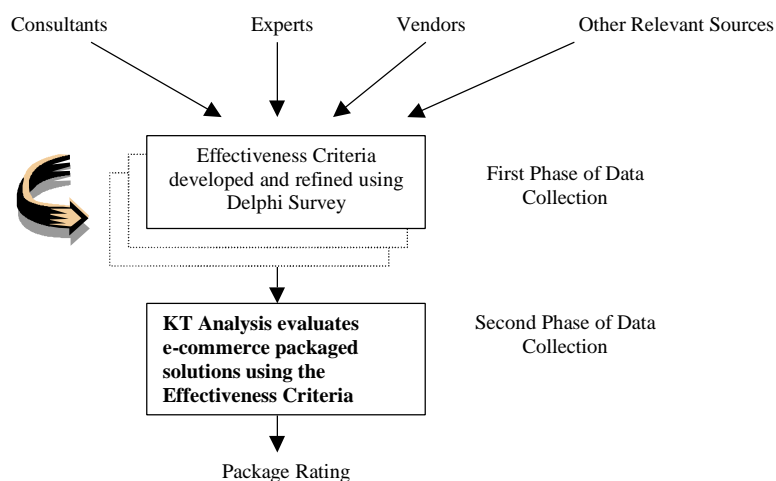


Figure 3: Two-phase model for the evaluation of e-commerce packaged software. Source: Ally et al 1999.

The first phase of this research comprised the adoption of the Delphi survey approach to canvas expert opinion to assist in the development of the effectiveness criteria of e-commerce software.



The Delphi technique was employed in this study for two reasons. Firstly, this is a relatively new and rapidly developing area for which no formal models exist and new issues continue to surface. Secondly, the study had the potential for generating a large list of criteria for which expert opinion was essential to obtain consensus on their relative importance. The term Delphi is used to describe a reliable consensus of opinion, obtained from a group of experts by a series of intensive questionnaires interspersed with controlled feedback (Linstone & Turoff 1975).

A modified form of the Delphi technique was used. Rather than rank the criteria, participants were asked to rate them on the basis of whether they considered the feature to be:

- ◆ **Essential** (without it the package would not perform the fundamental tasks generally associated with an e-commerce site);
- ◆ **Desirable** (a feature that would enhance the use and/or operation of the package and/or the developed site); or
- ◆ **Optional** (a feature that, while has its use in an e-commerce solution, does not impact on its basic operation or usability).

During the second phase of this research project the Kepner-Tregoe (KT) decision analysis will be used to evaluate the features identified during first phase. KT decision analysis technique is a rigorous method for making decisions and has been particularly useful in evaluating software solutions (O'Donnell 1998). It will involve the preparation of a list of “wants” and “must have” features of the software package, which have been previously identified during the Delphi survey. Software packages that do not satisfy any of the “must have” features are eliminated. A weighting is then applied to each “want” feature, on a scale from 1 to 10, and, on the basis of this feature, each package is scored a value from 1 to 10 and a weighted score is computed for the package feature. The total weighted score is used to evaluate and select those packages that satisfy the criteria for effectiveness.

## Research Design

From an analysis of the promotional literature and Web sites of a number of leading e-Commerce packages currently on the market it became evident that there was a need to classify the list of features under appropriate categories. The classification proposed by Korper & Ellis (1999) (vendor oriented, customer-oriented, advertising) appeared to be too generic while several of those suggested by Deise et al (2000) could be regarded as features rather than categories. However, using these categories as a basis, and the results from our analysis of the commercially available packages, the following generic categories were used as a starting point:

- ◆ Store Creation and Management Tools
- ◆ Security Tools
- ◆ Sales and Marketing Tools
- ◆ Order Fulfillment Tools
- ◆ General Characteristics

An open-ended question was used in the first round of the survey, asking the respondents to identify preliminary criteria under these categories.

There were 54 candidates who were invited to participate in the survey. Candidates were identified from lists of e-commerce developers, academics engaged in research in e-commerce,

and e-commerce package vendors and their customers. Participation was via e-mail, resulting in a short turn around time as each round was completed within 10 days.

Respondents were invited to add any additional categories that they felt were appropriate as well as features within each category.

During round two, respondents were sent a consolidated list of features to comment upon and to rate each of the features with an E = Essential, D = Desirable, and O = Optional. The summary of the response rates is provided in Table 3 below.

	<b>Number of Participants</b>	<b>Number of Responses</b>	<b>Response Percentage</b>
<b>Invitation round</b>	54	28	52%
<b>Round 1</b>	28	12	43%
<b>Round 2</b>	12	7	58%

Table 3: Participation rates per round

## PRELIMINARY FINDINGS

The results of the Delphi survey were collated and summarised. A total of 54 invitations were sent to suitable candidates and 28 of them agreed to participate in this research. Of the 28 first round questionnaires 12 responses were received. During the second round 7 responses were received.

A summary of the results is presented in Table 4. A discussion of the results by category follows.

<b>Category</b>	<b>Essential features retained in final round of Delphi survey</b>	<b>Overall number of features identified by Delphi respondents</b>
<b>Store creation and management tools</b>	<ol style="list-style-type: none"> <li>1. Development environment</li> <li>2. Store creation</li> <li>3. Templates</li> <li>4. Catalogue Builder</li> <li>5. Site customisation</li> <li>6. Maintenance</li> <li>7. Data quality</li> <li>8. Shopping Cart</li> <li>9. Product Search support</li> </ol>	28
<b>Security</b>	<ol style="list-style-type: none"> <li>1. User and merchant trust systems</li> <li>2. Secure credit charge storage</li> <li>3. In Transit encryption</li> <li>4. Systems Security</li> </ol>	4
<b>Sales and marketing</b>	<ol style="list-style-type: none"> <li>1. Email notification of orders</li> <li>2. Online order tracking</li> <li>3. Customer database (emails)</li> </ol>	12
<b>Order fulfillment</b>	<ol style="list-style-type: none"> <li>1. Ordering</li> </ol>	13

	2. Payment systems 3. Shipping mechanisms 4. Tax mechanisms 5. Back orders	
<b>General characteristics</b>	1. Quality and cost 2. Ease of use 3. Reliability 4. Documentation 5. Customer support 6. Ability to use different ISP(s)	14

Table 4: Results of Delphi survey to identify essential features for a preliminary criteria list for selection of an e-commerce solution

In the *Store creation and management tools* category only 32% of the features were considered essential. A majority of the respondents regarded the support for on-line and off-line creation of the Web as essential, as well as the provision of tools to guide the development process. They regarded the availability of a range of customizable templates as essential, as well as support for product searching mechanisms. A configurable shopping cart with support for server-side and client-side management was considered essential by all of the respondents.

Interestingly, all *Security* features identified by the Delphi respondents were retained as essential in the final round of the Delphi survey. This indicates that there was strong consensus among the Delphi respondents regarding the importance of security features in an e-commerce packaged solution. These features included support for authentication and digital certification, the encryption of credit card numbers, and secure operating systems platforms.

In the *Sales and marketing* category, only 25% of the features identified by the Delphi respondents were retained as essential features in the final round. These included support for the immediate customer and merchant notification of orders and sales and the ability for customers to track the progress of their orders

In the *Order fulfillment* category, nearly half of the features identified by the Delphi survey were retained as essential features, indicating that the consensus was that order fulfillment was an important issue in selecting an e-commerce packaged solution. In particular, the majority of respondents considered the capability of creating customizable order forms and invoices as an essential feature. They saw the support for real-time credit card processing and verification software as also an essential feature of packaged e-Commerce software.

Similarly, in the *General characteristics* category, nearly half of the features identified by the Delphi respondents were retained as essential features. All the respondents favoured the provision of on-line and downloadable versions of the software for purposes of evaluation. A majority suggested that the ability of the package to operate on multiple platforms and the availability of installation guides and online help was essential.

The overall results regarding the preference of the respondents of the Delphi survey are presented in Table 5. A discussion of the overall results follows.

Category of features	Essential	Desirable	Optional	Overall
<b>Store creation and management tools</b>	9	8	11	28
<b>Security</b>	4	0	0	4
<b>Sales and marketing</b>	3	4	5	12
<b>Order fulfillment</b>	6	7	1	14
<b>General characteristics</b>	6	5	3	14

Table 5: Summary of the distribution of e-commerce packaged solution across the categories

*Store creation and management tools* features were evenly spread across the three rating categories. *Security* features were considered to be essential by all the respondents in the Delphi survey as full consensus was achieved for this category of features. Similar to the store creation and management category, sales and marketing features were spread across the category ratings. This could be explained in part by the purpose of the package that the respondents had in mind when evaluating the features. Plans for future work include segmenting this preliminary criteria list into different market segments of electronic commerce (e.g. B2B, B2C, etc.) to make the criteria more robust and applicable. The *Order fulfillment* category was considered to be important by all Delphi respondents, as the ratings were concentrated in essential and desirable rating. *Order fulfillment* is a major issue in e-commerce as has been evidenced by the problems that occurred in the United States over Christmas where firms were caught by surprise at the demand for online purchases. Many of the firms' order fulfillment systems were found inadequate. General characteristics were evenly spread across the ratings. Similar to store creation and management and sales and marketing categories, this can be explained in part by the application of the package that the respondents had in mind when answering the Delphi survey.

Overall, security and order fulfillment features appear to be critical across the different applications of electronic commerce.

## RESEARCH LIMITATIONS AND FUTURE WORK

While the sample size fell short of the ideal, we were able to compile a reasonably comprehensive feature list from those who participated. However, our Delphi process can easily be replicated in the future with a larger number of stakeholders and experts.

Another limitation of this study's results is that the list of the evaluation criteria established here does not conclusively rank software features according to their level of importance. A preliminary investigation shows that some of the evaluation criteria are essential, while others are desirable or even optional. However, further quantitative research is required to test these preliminary results.

The fact that the results do not differentiate between the different types of organizations presents yet another limitation. Some comments from the respondents show that organizations have different e-commerce requirements and might rank different turnkey features on different levels of significance. Therefore, another dimension to future research could be added to investigate the impact the type of an organization would have on the significance level of each criterion, if any. Organizations could be segmented on the basis of:

- ◆ Costs
- ◆ Revenue/business model
- ◆ Organisation size, and
- ◆ Business relationship (business-to-business or business-to-consumer).

This study was done in the Australian context as all the respondents come from Australia. A similar research could be conducted for other countries to identify evaluation criteria for e-commerce software packages suitable for businesses in those countries, or to determine whether Australian findings are typical of other countries.

## CONCLUSION

This paper has reported on phase one of a study to determine a list of essential, desirable and optional features to be found in typical e-commerce software packages. Several factors suggest that research in this area will have significance and relevance to a broad range of stakeholders. Firstly, there is a lack of empirical research into the decision making process involving the procurement of e-commerce software packaged solutions. This issue is not well reported and most of the literature is anecdotal and superficial. Secondly, e-commerce package development is in its infancy in many respects. The rapid emergence of new technologies continues to shift the goalposts. Phase two of this research will validate the features identified during phase one and develop a framework for the evaluation of e-commerce software packaged solutions. This research attempts to address the current gaps in the literature regarding the procurement of e-commerce solutions. The findings of this research may also be of value to purchasers and developers of e-commerce packaged solutions as well as to users and to other researchers developing software package evaluation models.

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