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An investigation to measure the performance of commercial printing firms for conducting business-to-customer activities on the Web

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AN INVESTIGATION TO MEASURE THE PERFORMANCE OF COMMERCIAL PRINTING FIRMS FOR CONDUCTING BUSINESS-TO-CUSTOMER ACTIVITIES ON THE WEB

A Dissertation

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Doctor of Industrial Technology

Approved:

Dr. Charles D. Johnson, Chair

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August 2001

This dissertation
is dedicated to
my wife, Shrimati Pauravi D. Mehta
for her support and encouragement

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ABSTRACT

This research was conducted to investigate the current status of commercial printing firms regarding the success of their performance using Web technology for conducting business-to-customer (B2C) activities. It was primarily based on Rogers' innovation theory and Auger's empirical study. The impact of the Web technology on the organizational performance was studied. The organizational performance was divided into three levels: financial performance (FP), non-financial performance (NFP), and overall performance (OP). The financial performance was measured by four financial indicators; whereas, the non-financial performance was measured by three non-financial indicators. The overall performance was then measured by adding the four financial performance and three non-financial performance indicators.

The variables used in this study were: (a) financial performance, (b) non-financial performance, (c) overall performance, (d) size of company, (e) length of Web site operation, (f) number of business-to-customer activities, and (g) frequency of Web site modification. The associations between these variables were then measured using the Spearman correlation method.

A total of 103 commercial printing firms in the midwest region of the United States were selected to participate in this study. Thirty-eight (36.89%) firms responded to questionnaires.

It was found that conducting business-to-customer activities on the Web significantly and positively affected the non-financial performance. It did not, however, affect the financial and overall performances of commercial printing firms. Offering

more services to customers on the Web played an important role in improving the organizational performance. A significant positive association was found between the number of B2C activities and the non-financial performance based on the Spearman correlation and Chi-Square results. In like manner, the frequency of Web site modification significantly and positively affected the non-financial performance, but did not affect the financial and overall performances of commercial printing firms. Results also indicated that the size of a company and the length of Web site operation have no significant effect on the organizational performance. It was suggested that commercial printing firms should conduct more B2C activities on the Web, and should modify the Web sites at least once a month in order to take the advantage of the Web technology.

CHAPTER I

INTRODUCTION

Technological change is a fact of life. This is true with any technology, such as automobiles, television, telecommunication, and computer technologies. As technology changes, it causes direct or indirect changes in other systems. Rogers (1995) states that technology brings changes to individuals, organizations, and social systems.

Rogers developed a diffusion of innovations theory to explain technological changes. This theory was used to investigate the impact of Web technology on organizational performance. Specifically, the researcher tried to find out the impact of Web technology on organizational performance in commercial printing companies for conducting business-to-customer activities (B2C).

The fast growing World Wide Web technology is relatively new that is built on other technologies such as computers, telecommunication, and graphic communications. It is rapidly changing because of the advancement in computer hardware, computer software, and telecommunications.

Roth (1998) indicated that a majority of graphic communications companies were not performing well in terms of profits regarding conducting online B2C activities. Auger (1997) stated

> A survey by CIO magazine found that over half of the firms with an on-line presence characterized their effort as 'just playing or dabbling'. As such, many firms appear to view the Web as an experiment and do not seem to pay a lot of attention to the overall performance of their corporate Web sites. (p. 21)

Because of that, it was important to study the current status of graphic communications companies on how well they are performing by conducting B2C activities on the Web. This information that helps companies make good decisions regarding establishing effective Web strategies in conducting B2C activities with limited resources will be beneficial.

The research study was limited to investigating the performance of commercial printing firms in the midwest region of the United States for B2C activities. Financial, non-financial, and overall indicators of performance were measured.

Purpose

The purpose for conducting this research was two-fold. First, the purpose was to determine how commercial printing firms are performing when conducting business-to-customer (B2C) activities on the Web. Second, the associations between variables related to B2C activities on the Web were measured. This findings will be useful in guiding commercial printing companies who conduct B2C activities on the Web.

Problem

The problem of this study was to determine the performance of commercial printing firms regarding their business-to-customer (B2C) activities on the Web with respect to their past performance without the online activities. Wide differences were found in the performance of companies who were administering B2C activities on the Web. A review of literature revealed that some companies were performing well and making money by establishing Web sites to carry out B2C activities. On the other hand, some companies were losing money by implementing Web sites for their B2C activities,

or were reluctant to create a virtual relationship with their customers through the Web for various reasons. As Emerly (1996) stated

> The Internet brings many benefits to businesses but it is not every company's cup of tea. . . . Business and the Internet are like teenagers and sex. Everyone's obsessed with it. Everyone thinks everyone else does it. Everyone wants everyone else to think they do it, too. But hardly anyone *really* does it, and most of them do it bad. (p. 30)

Hypotheses

The use of Web technology as a business tool is a relatively new concept, and so the study of the performance of commercial printing firms on the Web regarding their business-to-customer (B2C) activities is very important. The hypotheses in this study were related to organizational performance. Based on Auger's (1997) study, the organizational performance was divided into two categories: financial and non-financial. The financial performance (FP) was measured using four financial indicators which were sales, profits, costs, and return-on-investment (ROI). The non-financial performance (NFP) was measured using three non-financial indicators which were the number of customers, merchandise return rate, and productivity related to marketing and sales functions. Finally, the overall performance (OP) was measured using the aforesaid seven indicators.

Auger (1997) states that "The Web is an inherently different medium for business and, as such, requires different methods of measuring performance" (pp. 91-92). Therefore, financial and non-financial performance indicators were modified to be appropriate for this technology. Each hypothesis was divided into three categories to measure the financial, non-financial, and overall performances separately.

$H_{1.1}$: Conducting business-to-customer (B2C) activities on the Web affects the financial performance of a commercial printing firm.

$H_{1.2}$: Conducting business-to-customer (B2C) activities on the Web affects the non-financial performance of a commercial printing firm.

$H_{1.3}$: Conducting business-to-customer (B2C) activities on the Web affects the overall performance of a commercial printing firm.

By formulating these hypotheses, an attempt was made to determine the effects of Web technology on organizational performance regarding B2C activities. These hypotheses were developed based on the consequences of an innovation model by Rogers (1995) and other supporting studies. Rogers believed that an innovation brings desirable, undesirable, direct, indirect, anticipated, and unanticipated consequences. Generally, the desirable, direct, and anticipated consequences positively affect organizational performance; whereas, the undesirable, indirect, and unanticipated consequences negatively affect organizational performance. In addition, empirical studies have found that conducting B2C activities on the Web have both positive and negative impacts on organizational performance (Connolly, Olsen, & Moore, 1998; Nath, Akmanligil, Hjelm, Sakaguchi, & Schultz, 1998; Roth, 1998).

There are other factors such as the early adoption of the Web technology, the size of a commercial printing firm, the number of activities performed on the Web, and the frequency of modification of a Web site that may affect organizational performance. The relationship between these factors and organizational performance was investigated through the following hypotheses. Hypotheses 2 and 3 are based on the Rogers' diffusion

of innovations theory and other related studies; whereas, Hypotheses 4 and 5 are based on Auger's study.

$H_{2.1}$: There is a positive relationship between the length of time for conducting B2C activities on the Web and the financial performance of a commercial printing firm.

$H_{2.2}$: There is a positive relationship between the length of time for conducting B2C activities on the Web and the non-financial performance of a commercial printing firm.

$H_{2.3}$: There is a positive relationship between the length of time for conducting B2C activities on the Web and the overall performance of a commercial printing firm.

Rogers (1995) states that by being the first in the field, innovators frequently secure a kind of economic gain called windfall profits. Web technology is a relatively new and developing technology in addition to being dynamic in nature. Therefore, it was assumed that commercial printing firms who are conducting B2C activities on the Web over a longer period of time perform better than others.

$H_{3.1}$: There is a positive association between the size of a commercial printing firm (as measured by the number of employees) and the financial performance for conducting B2C activities on the Web.

$H_{3.2}$: There is a positive association between the size of a commercial printing firm (as measured by the number of employees) and the non-financial performance for conducting B2C activities on the Web.

$H_{3.3}$: There is a positive association between the size of a commercial printing firm (as measured by the number of employees) and the overall performance for conducting B2C activities on the Web.

Rogers (1995) states that "large organizations are more innovative" (p. 379). He says that innovators and early adopters have favorable attitudes toward new ideas and are more likely to search actively for innovations. They also possess the available resources to adopt higher-cost innovations, while later adopters do not. By adopting innovations sooner than others, innovators and early adopters achieve windfall profits. An assumption was made that larger firms initially receive more benefits than smaller firms for conducting B2C activities on the Web.

Auger (1997) found positive associations between multi-objective Web sites and performance, and between frequency of site updates and performance. Based on his findings, the following hypotheses were formulated.

$H_{4.1}$: The number of B2C activities conducted on the Web is positively related to the financial performance of a commercial printing firm.

$H_{4.2}$: The number of B2C activities conducted on the Web is positively related to the non-financial performance of a commercial printing firm.

$H_{4.3}$: The number of B2C activities conducted on the Web is positively related to the overall performance of a commercial printing firm.

$H_{5.1}$: The frequency with which a Web site is revised and modified is positively related to the financial performance of a commercial printing firm.

$H_{5.2}$: The frequency with which a Web site is revised and modified is positively related to the non-financial performance of a commercial printing firm.

$H_{5.3}$: The frequency with which a Web site is revised and modified is positively related to the overall performance of a commercial printing firm.

Need for the Research

A review of literature revealed that there was a great need for conducting research in the study of the performance of commercial printing firms using Web technology. Only one similar study was conducted in the graphic communications industry. Auger (1997) conducted a similar type of study using small businesses in the computer, telecommunications, electronics, and food industries as the research subjects. He recommended that there is a need to do research in different industries and to compare the practices of small businesses with large companies.

Limitations

Limitations identify potential weaknesses of any study such as generalizing findings for different populations (Creswell, 1994). The following limitations were identified in this study.

1. The performance was measured on the basis of perceptions of respondents.
2. The findings may not be generalized to companies other than those dealing with commercial printing.
3. Spearman correlation and Chi-Square were not expected to provide consistent results.

Delimitations

Delimitations usually address how a study will be narrowed in scope (Creswell, 1994). In order to make this research feasible, it was narrowed using the following delimiting factors.

1. Four financial and three non-financial indicators of performance of commercial printing firms for conducting B2C activities on the Web were measured.

2. Commercial printing firms who are the members of professional printing organizations in the midwest region of the United States and who have Web sites were selected for the questionnaire survey.

Assumptions

The research design was descriptive. A questionnaire survey method was used to collect data. Based on the type of the research design, the following assumptions were made:

1. The data were reliable, unbiased, and error free.

2. All the various levels of respondents had the same knowledge.

Definition of Terms

Special terms related to this study are used. Some of the terms are defined according to their usage in the study.

Browser: A more common term for *client*. It is the software that allows users to access and browse the Web over the Internet to collect information (World Wide Web, 1994, p. 94).

Business: The sum total of all enterprises--agriculture, production, construction, distribution, transportation, communication, service establishments, and government—that play a part in the manufacture and marketing of goods and services to customers (Musselman & Hughes, 1964, p. 2).

Business-to-customer activities: The activities that take place between businesses and their customers such as transactions of forms, selling goods, marketing products and services, and the like.

Commercial printing: Producing printed products according to customers' requirements (Prust, 1999).

Electronic-commerce (e-commerce): The use of computer networks to facilitate transactions involving the production, distribution, and sale and delivery of goods and services in the marketplace (McLure, 1997, p. 731).

Graphic communications: The exchange of information in a visual form such as text, drawings, photographs or combination of these elements (Prust, 1999, p. 13). The visual elements could be in a hand-made, printed, photographic, or electronic form. These elements could be integrated with other communication media such as sound and video. Graphic communications products include paintings, sculptures, publications, greeting cards, playing cards, credit cards, cheques, currency bills, postage stamps, business forms, packaging items, banners, billboards, pop cans, signs, printed or embroidered textile materials, animated films, video games, and Web pages.

Hypertext: A hypertext document is one that provides clearly visible links to other documents (World Wide Web, 1994, p. 6).

Internet/Net: The global system of networked computers that allows user-to-user communication and transfer of data files from one machine to any other on the network (World Wide Web, 1994, p. 6).

Marketing: A social process involving the activities necessary to satisfy individuals and organizations through exchanges with others and to develop ongoing exchange relationships (Boyd, Walker, & Larreche, 1995, p. 4).

Performance: An act of doing, carrying out, or executing something (Webster's, 1993). In this study, the performance of a company, that is, how it is doing using the Web technology for conducting business-to-customer activities, was measured. Four financial indicators such as sales, profits, costs, and return on investment were used to measure financial performance. Three non-financial indicators such as number of customers, merchandise return rate, and sales and marketing productivity were used to measure non-financial performance. Overall performance of a company was then measured using these seven indicators.

World Wide Web: A convergence of computational concepts for presenting and linking information dispersed across the Internet in an easily accessible way. It is also known as WWW or the Web (World Wide Web, 1994, p. 7).

CHAPTER II

RELATED RESEARCH AND INFORMATION

Since the research study was conducted to determine how commercial printing companies are performing using the Web for their business-to-customer (B2C) activities, information was gathered in that field primarily from secondary sources. The secondary sources included magazines, journals, and books. Borg and Gall (1989) assert that secondary sources are useful because they synthesize and refine knowledge from many primary sources into a single publication. This gathered information was synthesized and categorized into the following topics: World Wide Web and E-commerce, theoretical background, and discussion of related research studies.

World Wide Web and E-Commerce

The World Wide Web (WWW or Web) was developed by Tim Bernes-Lee of CERN (Corporation for Education and Research Networking) in 1992 (Pfaffenberger, 1996). It is one of the tools of the Internet through which people exchange information using a browser and hypertext or hypermedia.

The Web is an information/communication medium. It is useful for conducting business-to-customer (B2C) activities. The B2C activities for graphic communications firms usually include providing information to customers about the business, communicating with customers, exchanging files and forms, and marketing and selling of products and/or services (Auger, 1997; Roth, 1998). Each of these will be explained.

People, companies, or organizations can establish Web sites and provide information to their audiences or customers. This information can be about their products

and services, about new developments, or about events. California-based Kinko's uses its site to display products and services (Hirshowitz, 1997).

The Web can be used as a communication tool to communicate with people by providing options for e-mail, chat groups, discussion groups or FAQ (Frequently Asked Questions) databases to enhance customer services and sales. People can exchange their thoughts, ideas, opinions, suggestions, or other information using these options. Companies can also use the Web for video conferencing.

Companies can also transfer their electronic files through the Web. The availability of e-commerce enables fastcolor.com to receive orders and digital files from clients worldwide once they complete a brief form on the company's Web site. The firm prints clients' files using Corel, QuarkXPress, PageMaker, Photoshop; most other design formats are sent directly via the Web. Fastcolor.com's e-commerce also accepts payment from customers through a special area on the site (Fastcolor.com, 1998). AlphaGraphics in Scottsdale, Arizona, developed a Web site that allows customers to transact business with its 300 franchised print shops worldwide (Hirshowitz, 1997).

Marketing and sales is another important feature of Web technology. Companies can place information about their products and services on Web sites. People from all over the world can access the information instantly at any time. Also, companies can reduce their advertisement budget because, on their Web sites, they can advertise about products, services, or sale prizes. Companies can distribute discount coupons on the Web too as well as take orders on the Web and can provide intangible items like digital images, electronic books, or magazines online. They can ship tangible or physical items

like printed books or magazines, printed t-shirts, packages, labels, or any printed materials through conventional shipping after taking orders over the Net.

Most of the publishing companies and news media publish news, magazines, journals, books, and other information online. McGraw-Hill has released an on-line catalog of more than 8,800 of its professional and educational publications (Vinocur, 1995). A 1996 survey found that 31% of more than 800 newspaper and magazine editors expect to distribute at least part of their publications electronically within two years (Behrens, 1997).

Graphic communications companies are engaged in Web activities. Recently, R. R. Donnelley and Sons contracted with Microsoft to publish eBooks over the Web (Microsoft, 1999). William L. Davis, Donnelley's chairman and CEO said, "As technology has evolved, and as consumer habits have changed, publishers, catalogers, retailers, and businesses must adapt. They now must reach their customers through multiple channels" (Microsoft, 1999, p. 2). Toppan Printing Company Ltd. of Japan announced a collaboration with four IT industry leaders—Internet Initiative Japan Inc. (IIJ), Intel K. K., Sun Microsystems K. K., and IBM Japan—to start a new electronic commerce project called Bitway (Toppan, 1999). This collaboration will allow them to specialize in the distribution of content (information) over the Internet. World Color Press, Inc. contracted with broadcast.com, a leader in video and audio programming on the Web, to sell its services to their customers (Broadcast.com, 1998). Giordano (1997) indicates that the online printing company, Iprint, is bringing paper to the Web with its Cyberstationery, business cards, invitations, and announcements which can be sent via

e-mail. Herndon, a Virginia-based Insty-Print, generates $5,000 to $15,000 monthly sales on the Internet (Hirshowitz, 1997).

There is a wide variety of B2C activities on the Web and some graphic communications companies are actively involved in implementing them. It is no wonder then that Auger (1997) found a positive correlation between multi-objective sites and the performance of a company.

Theoretical Background

This research study was partially based on the diffusion of innovations theory. Rogers (1995) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). The innovation can be an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 1995, p. 11). In this study the Web is such an innovation or technology and its diffusion in the society in terms of how it affects performance of companies was discussed.

Rogers (1995) identifies the study of consequences of an innovation as one of the types of diffusion research. The model for studying the consequences of an innovation is represented in Figure 1.

Consequences are the changes that occur to an individual or to a social system as a result of the adoption or rejection of an innovation (Rogers, 1995, p. 405). In this study, changes related to organizational performance were investigated as a result of adoption of Web technology for conducting B2C activities. Rogers (1995) classifies three dimensions of consequences as:

1. Desirable versus undesirable: Desirable consequences are the functional effects of an innovation for an individual or for a social system, whereas undesirable consequences are the dysfunctional effects of an innovation to an individual or to a social system.

2. Direct versus indirect: Direct consequences are the changes to an individual or a social system that occur immediately after the adoption of an innovation. Indirect consequences are consequences of consequences; they occur as a result of direct consequences.

3. Anticipated versus unanticipated: Anticipated consequences are changes brought about by an innovation that are recognized or intended by the members of a social system. On the other hand, unanticipated consequences are neither recognized nor intended by the members of a social system. A review of literature found that Web technology was not different from other technologies. It had brought about all these dimensions of consequences. Rogers (1995) states "the undesirable, indirect, and unanticipated consequences of an innovation go together, as do the desirable, direct, and anticipated consequences" (p. 421). He indicates that "the effects of an innovation usually cannot be managed to separate desirable from the undesirable consequences" (p. 416). As a result, the consequences of Web technology are grouped into two categories: desirable, direct, and anticipated consequences, and undesirable, indirect, and unanticipated consequences.

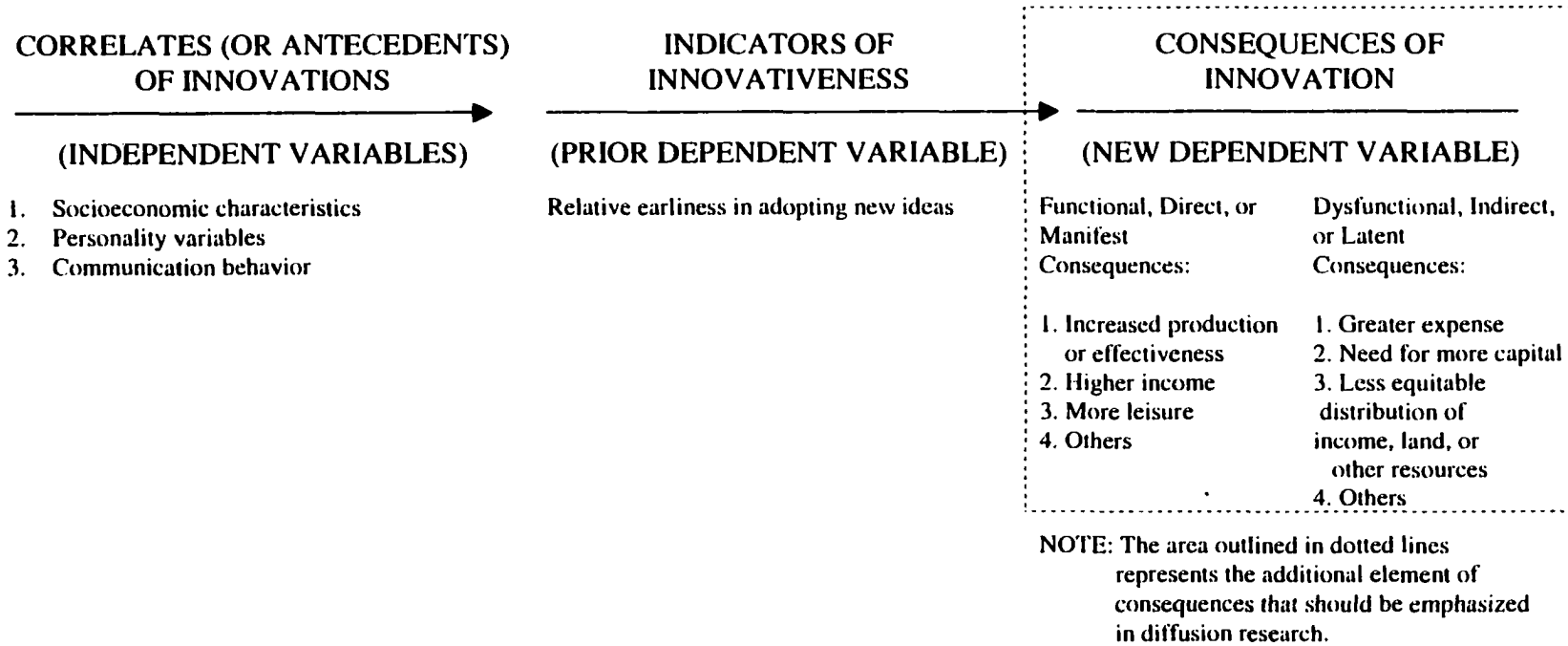

Figure 1. Consequences of Innovation Model.

Note. From Diffusion of Innovations, (4th ed.), p. 410, by E. M. Rogers, 1995.

There are many illustrations of desirable, direct, and anticipated consequences with Web technology. For example, Jupiter Communications, a New York based market research firm, estimates that interactive home shopping (IHS) will expand to $82.35 billion by the year 2003 (Conway, 1994). Consumers can take advantage of buying services or intangible items over the Net because there is no sales tax on services and intangible items that are sold over the Internet (McLure, 1997). Cleland (1997) says that delivery orders on the Web generate approximately 6% higher gross margins than in-store purchases, because customers are less likely to pick sale items. A study by Cap Gemini Consulting indicates that by eliminating the physical store and the associated operating costs, Internet retailers can triple profit margins or cut prices by 12% compared to the conventional retailer (Cope, 1996). Williamson (1997) states that using the appropriate software, Internet-based retailers can communicate customized messages and promotions to individuals with the desired interests and shopping patterns. Because of interactive technology, manufacturers can build a one-to-one relationship with their customers, tailoring the marketing mix to individual preferences (Pine, Peppers, & Rogers 1995). Emerly (1996) mentions that the Digital Equipment Corporation sold $20 million worth of products and services over the Internet in 1995. Sun Microsystems sells more than $1 million over the Internet each month, plus it saves more than $1 million per year by cutting customer support costs (Emerly, 1996). Emerly (1996) says that Corner Store closed its physical store and made a profit of more than $2 million over the Internet in 1994. Cisco Systems saves about $535 million through e-commerce.

Regarding graphic communications companies, Behrens (1997) indicates that the usefulness of e-mail and Web sites as present-day marketing vectors can trigger sales promotion, and thus can be widely used by many printing companies. Hirshowitz (1997) says that the World Wide Web provides several benefits to quick printers. Kinko's uses its site to display products and services, while Herndon, Virginia-based Insty-Print generates $5,000 to $15,000 monthly sales on the Internet (Hirshowitz, 1997). Hirshowitz (1997) cites that AlphaGraphics in Scottsdale, Arizona, developed a Web site that allows customers to transact business with its 300 franchised print shops worldwide.

There are also undesirable, indirect, and unanticipated consequences associated with Web technology. Burke (1998) argues that consumer sales over the Internet were just $520 million—less than 0.03% of the $2.2 trillion total. Quelch and Takeuchi (1981) found consumers will be reluctant to shop in nonstore channels (Web, direct mail, telemarketing etc.) as long as the experience is inferior to the conventional store. Home shopping services typically do not provide the same levels of product information, personal service, entertainment, and social interaction as do physical stores. Consumers also find it difficult to compare goods and are concerned about reliable product fulfillment and the loss of privacy. In another study, Jarvenpaa and Todd (1997) indicates that the main drawbacks for Internet shopping are not technical issues like network security and bandwidth. Instead, consumers complain that the Web is hard to navigate, that it is difficult to find specific items, and that the offerings of individual sites are too limited and not competitive in price. Shoppers were generally disappointed by the customer service and expressed a preference for locally run stores and familiar merchants

to the unknown retailers on the Internet. Burke (1997) discovered that existing retailers have also been reluctant to support electronic shopping for the following reasons:

1. Building and maintaining a Web site requires a significant investment of time and money with an uncertain return on investment.

2. If retailers post their prices on the Internet, customers and competitors have easy access to this information, increasing market efficiency and reducing margins.

3. Electronic-sales incur shipping and handling costs.

4. Electronic-sales have higher return rates of goods because sometimes customers do not get the goods which meet to their expectations.

Burke (1997) states that considering all these factors, many retailers find that selling electronically is more expensive than selling in conventional ways. Koehn, Burke, and Verter (1996) mention that the retailer incurs an additional $12 of expense to serve home shoppers. Quelch and Takeuchi (1981) suggest that manufacturers may not engage in direct marketing to avoid retaliation from the traditional retailers who account for most of their sales. Burke (1997) indicates that consumers do not see familiar product packages on the Internet, so the brand equity communicated by the package shapes, colors, and logos is lost. He mentions that there are still issues like on-line privacy, marketing to children, unsolicited e-mail, and taxation that need to be resolved.

Regarding graphic communications companies, Roth (1998) finds that not many companies are making profits by conducting business-to-customer activities on the World Wide Web. She says that only 11% of respondents believed that they made money.

In addition to these consequences, Rogers (1995) indicates that the size of a company and the early of adoption of technology are positively related to organizational profits. This is based on Rogers's idea that large organizations are early adopters and, by being first in the field, they gain windfall profits. Supporting evidence for this idea was found in other studies. Acs and Audretsch (1990) found that the rate of innovation varies from industry to industry for both large and small firms. In 1982, the large-firm innovation rate (LIE) was the highest for rubber (2.1814); whereas, the small-firm innovation rate (SIE) was the highest for instruments (2.9987). The number in the parentheses shows the rate of innovation which is calculated as the number of innovations divided by number of employees. However, regarding the printing industry, they find that the LIE (0.0468) was higher than the SIE (0.0313) in 1982. Chiao's (1998) constructed a dynamic model to analyze Acs and Audretsch's empirical findings. His theoretical findings remained consistent with Acs and Audretsch's empirical findings that innovation behavior of small and large firms varies across industries. The Schumpeterian view argues that large enterprises support the exploitation of innovation opportunities (Acs & Audretsch, 1990).

In addition, Acs and Audretsch (1990) identify five factors that favor the innovative advantage of large firms. First, because development is costly, it can be carried on only by a firm that has the resources which are associated with considerable size. Second, only firms that are large enough to attain at least temporary market power will choose innovation as a means for profit maximization. Third, R&D is a risky investment, small firms involved in R&D make themselves vulnerable by investing a

large proportion of their resources in a single project. Their larger counterparts, however, can reduce the risk accompanying innovation through diversification into simultaneous research projects. The larger firm is also more likely to find an economic application of the uncertain outcomes resulting from innovation activity. Fourth, economies of scale in promotion and in distribution facilitate the penetration of new products, thus enabling large firms to enjoy a greater profit potential from innovation. Fifth, an innovation yielding cost reductions of a given percentage results in higher profit margins for larger firms than for smaller firms.

Discussion of Related Research Studies

Several research studies have been conducted on e-commerce and one is specifically related to graphic communications companies in the United States. These studies will be described.

Roth (1998) published the findings of research conducted by the Graphic Arts Marketing Information Service of Printing Industries of America (GAMIS/PIA) through Gordon S. Black Corporation. She said that there were only about 1,500 printing industry related Web sites in an industry with 35,000 companies. The researcher at Gordon S. Black Corporation selected about 326 graphic communication companies for their study. The researcher found that four out of five companies had access to the Internet in some form; however, they did not have their own Web site. Ninety percent of large-sized companies (50 or more employees) had Internet access, compared with only 73% of small-sized companies (less than 20 employees). The researcher determined that although 80% of commercial printers and trade shops had Internet access, often these

companies did not allow universal use of these services. Sixty five percent of locations allowed Internet access through specific departments such as prepress and administration.

Regarding maintaining and developing Web sites, the researchers found that only 48% of graphic communications companies maintained their Web sites. Only 40% intended to modify their sites monthly, 33% believed it was okay to make changes each quarter, while 25% did not see the need for changes more than once or twice a year. Thirty four percent of the sample were in the process of developing a Web site, another 26% considered it an important step but were too busy to work on it; whereas, an additional 23% did not think a Web site would be useful to their companies at this time. Researchers noted that only 11% made money on Web sites, while 43% thought they broke even and 38% lost money.

As found in the Roth study, the main reasons for launching Web sites were marketing (41%), sales-related functions (21%), customer services (20%), and transferring files (17%). She found that 99%of respondents believed that a listing of business services was a basic requirement, and 98% included general company information. E-mail was a high ranking service at 95%, along with information on production capabilities (91%) and sales information (87%).

Roth (1998) stated that "The biggest gap in the printer Web site offerings relates to electronic-commerce. As e-commerce begins to take off in the consumer arena, the printing industry still appears reluctant to venture into these uncertain waters" (p. 44). The researcher found that only 69% of respondents sold services of any type directly through their Web sites. Forty-eight percent of respondents directly sold prepress

services and about 40% sold printing, with color digital printing being more likely to be "sold" than offset. Approximately 16% of the respondents claimed to sell Web-related services such as, site hosting and maintenance, along with design services and digital image management. Despite this, 31% did not offer customers the chance to purchase any services directly.

Regarding evaluating customers' satisfaction, the researchers at Gordon S. Black Corporation found that 82% did not evaluate their customers' satisfaction; whereas, 17% used some form of tracking. Based on the GAMIS study, there is no best way to develop and evolve a Web site. Many sites were built-in house; whereas, 25% were created off-site by an independent designer or other vendor.

Auger (1997) conducted similar research to investigate the relationship between a Web strategy and the financial and non-financial measures of performance of a company. He selected four financial and five non-financial measures of performance. The four financial measures were sales, sales growth, profits, and return on investment (ROI); and five non-financial measures were market development, cost reduction programs, customer service enhancement, image enhancement, and the number of visitors to a site. He concluded that there were positive associations between multi-objective sites and performance, between advertising of a Web site and performance, between number of visitors and performance, and between frequency of site updates and performance. He found that transactions on the Web was a much more successful strategy than anticipated. He also found that the collection and analysis of customer feedback was the most important market research activity. Surprisingly, he found a negative association of Web

site design features and services with performance. Further, Auger found that the more the complicated the Web site, the less would be the number of visitors. Hence, the performance could be negatively affected.

Nath et al. (1998) conducted research on e-commerce. They interviewed executives of ten organizations. They found that the executives believed that the Internet was an inexpensive advertising tool which can reach a huge audience, the barriers to conducting business were minimal, and an Internet presence improved the image of the business. However, they also found that executives were worried about security, costs, site maintenance and support, lack of knowledge, lack of skilled personnel, and legal issues.

Connolly et al. (1998) conducted research on e-commerce for the hotel industry. They concluded that the Internet was capable of boosting revenues of hotels by extending the company's reach to global markets, reducing costs by over-riding traditional distribution channels, and improving customer services with better information in a multimedia form. They said that although the Internet offered important benefits, the hoteliers were concerned about issues like customer's privacy and data security.

Summary

This research study is based on Rogers' diffusion of innovations theory, especially the consequences of an innovation and other related research studies. Based on the literature, Web technology brings about both positive and negative consequences that affect organizational performance. Positive consequences of Web technology, such as

reaching a large number of customers, online marketing and sales, online transactions, and customization of messages, usually improve performance of a company. On the other hand, there are negative consequences as well, such as the costs of building and maintaining a Web site, shipping and handling costs for tangible goods, higher return rate of items sold on the Web, and increasing competitiveness. Other factors such as the size of a company and the early of adoption of Web technology that also affect organizational performance.

Roth (1998) found from the GAMIS study that most of the graphic communications companies were not performing well in conducting B2C activities on the Web. Auger (1997) concluded that implementation of Web strategies related to advertising of a Web site, number of activities on a Web site, frequency of site updates, and design features of a Web site also had an impact on organizational performance.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

The research design for this study was descriptive. Gay (2000) says that descriptive studies are used to report the way things are. He further states that descriptive data are usually collected through questionnaires, interviews, observations, or some combination of these methods. In this study, the current status of graphic communications firms regarding using Web technology for business-to-customer activities was investigated and the data were collected by the questionnaire survey method.

Commercial printing firms of the midwest region of the USA who have Web sites were selected. Questionnaires were sent to appropriate graphic communications professionals such as presidents or owners, vice-presidents, directors, and marketing managers of those firms and the collected data were analyzed to test hypotheses. This is in accordance with Gay (2000) analysis that in descriptive studies the data are collected to test hypotheses or answer research questions.

The method for conducting research consisted of several steps as follows: (a) identification of population, (b) identification of the sample, (c) selection of the research method, (d) development of the research instrument, (e) pre-testing the research instrument, (f) administering the pilot test, (g) selecting the final sample, (h) collection of data, and (i) analysis of data. These steps are explained in the following sections.

Identification of Population

The study population was commercial printing firms in the midwest region who had Web sites. The midwest region of the United States consists of 12 states, namely Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin according to Graphic Arts Monthly magazine's classification of regions. The subjects were selected from Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, Ohio, and South Dakota. The final population was comprised of commercial printing firms who had Web sites and were located in these eight states.

Characteristics of the Population

Commercial printing is one of the segments of the graphic communications industry. A commercial printing firm has two major areas: management and technical (Prust, 1999). Some companies have additional areas like maintenance and research and development. The management area consists of customer services, estimating, sales, marketing, finance, operations, human resources, and shipping and delivery. The technical area of a commercial printing company includes pre-press or digital, press or printing, and post-press or binding and finishing areas.

Commercial printing companies are classified as large-sized, medium-sized, and small-sized based on number of employees. Large-sized companies have 50 or more employees, medium-sized companies employ 20 to 49 people, while small-sized companies have less than 20 employees (Roth, 1998).

Identification of the Sample

The sample for this research study was commercial printing firms who had Web sites and were members of one of the Printing Industries of America affiliations. These organizations are Printing Industry of the Midlands, Inc. which includes Iowa, Nebraska, and South Dakota; Printing Industry of Illinois/Indiana Association; Printing Industry of Michigan; Printing Industries Association, Inc. which includes Ohio; and Printing Industries of St. Louis which includes several counties of Missouri. Letters were sent to these organizations, asking for information regarding commercial printing firms (see Appendix A). The size of the sample was 103 commercial printing companies who were located in Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, Ohio, and South Dakota.

Selection of the Research Method

This was a descriptive research design because the research was conducted to find out how the things were (Gay, 2000). The descriptive research design is categorized on the basis of how data are collected, through self-report or observation (Gay, 2000). For this study, questionnaires were sent to graphic communications professionals either through conventional mails or through a facsimile machine to collect data. The questionnaire survey method is a self-report study (Gay, 2000). White (1987) states that the survey is the most frequently used method of collecting descriptive information. The questionnaire survey method is an inexpensive way of collecting data because the researcher does not have to travel to collect data. Bailey (1987), Balian (1982), and Balsley and Clover (1988) state that mailed questionnaires have advantages of standardized wording, no interview bias, respondent privacy, cost and time saving, and

convenience, but, at the same time, they have disadvantages, such as a low response rate. The research design was cross-sectional and explanatory because the data were collected at one point in time and then, these data were used to describe the larger population at that time (Babbie, 1990).

Development of the Research Instrument

A descriptive study requires the development of an instrument appropriate for obtaining the desired information that has not been asked before or is not already available (Gay, 2000). A questionnaire was prepared to collect data through a conventional mail or a facsimile. A sample of the questionnaire is shown in Appendix B. The questionnaire consisted of both closed- and open-ended questions. Closed-ended questions save respondents' time while open-ended questions give respondents freedom to express their opinions (Babbie, 1990). For Question 4, a seven-point Likert scale was used to measure the performance of commercial printing firms for conducting business-to-customer activities on the Web. The seven-point Likert scale was designed as: (1) strongly disagree, (2) disagree, (3) somewhat disagree (4) no difference, (5) somewhat agree, (6) agree, and (7) strongly agree.

Pre-Testing the Research Instrument

Pre-tests refer to initial testing of one or more aspects of the study design such as the questionnaire, the observation form, the interview guide, the sample design, a computer program for analysis and the like (Babbie, 1990). One of the benefits to pre-test a research instrument is to achieve a higher response rate. These people do not necessarily share the same characteristics of the research sample, but provide

considerable feedback for making the research instrument better (Babbie, 1990). The questionnaire was pre-tested by several members of the dissertation committee. The committee members suggested the rephrasing of some of the words for better understanding and clarity. The research instrument was modified according to these suggestions made by the committee members.

Conducting the Pilot Test

Since the research instrument was newly designed, a pilot test was conducted to check the validity of the questionnaire, eliminate any ambiguity, and to make appropriate changes according to respondents' suggestions. Creswell (1994) suggests that pilot testing or field testing is important to establish the face validity of an instrument and to improve questions, format, and scales. Pilot tests are miniaturized walkthroughs of the entire study from sampling to reporting (Babbie, 1990). Subjects selected for the pilot study are fewer in number as compared to the final study (Babbie, 1990), but should hold some characteristics that are the same as the subjects of the final study in order to gain proper response (Bailey, 1987; Bradburn & Sudman, 1982). The number of subjects for a pilot test varies according to the size and type of a study, but at least one subject should be selected for the pilot test (Dr. R. E. Kramer, personal communication, October, 1996).

Based on this information, the subjects for the pilot test were selected from a population of 103 commercial printing firms. A convenience sampling technique was applied to select four commercial printing firms from the sample. Those firms were located in Iowa. The researcher visited two commercial printing firms and requested respondents to fill the questionnaire in front of him, so that any misunderstanding

regarding the questions can be solved. The researcher explained the purpose of the research study. Respondents' filled out and handed in the questionnaires. The researcher faxed cover letters and questionnaires to the other two commercial printing firms. The respondents faxed back the completed questionnaires. One respondent provided suggestions regarding improving the format and highlighting certain words to capture attention. Those changes were made in the questionnaire prior to conducting the final study.

Selecting the Final Sample

A targeted sampling technique was applied to select the final subjects as indicated in the Identification of the Sample section. Babbie (1990) mentions that in using this technique, it is appropriate for the researcher to select the sample on the basis of one's knowledge of the population, its elements, and the nature of the research goals. The final sample size was 103 commercial printing firms including the pilot test subjects.

Collection of Data

As discussed earlier, the data were collected through the questionnaire survey method. The questionnaires along with cover letters (Appendix C) were mailed or faxed to participants. The data were recorded on questionnaire sheets by respondents and the completed questionnaires were mailed or faxed back to the researcher. Qualitative and quantitative data were collected at one point in time. For the pilot test, four questionnaires were sent and received from four subjects. The return rate for the pilot test was 100%. For the final study, 14 completed usable questionnaires were received out of 99 questionnaires by the deadline. The response rate was 14.14%. In order to receive a

higher response rate, the participants were requested several times through phone calls to complete and return the questionnaires. Bailey (1987) indicated that telephone calls are an effective approach to follow-up. A total of 34 questionnaires out of 99 subjects were ultimately received. Thus, the response rate was increased to 34.34% for the final study. The cumulative response rate including the pilot study and the final study was 36.89%. Babbie (1990) mentions that a United States senator made the statement "this is regarded as a relatively high response rate for a survey of this type," regarding a poll of constituents that obtained a 4% return rate. Auger (1997) states that the majority of large-scale mail surveys typically obtain 10% to 20% response rates. Thus, the response rate of 36.89% is considered adequate for this kind of study to perform data analysis and reporting. Thank you letters were then sent to participants (see Appendix D).

Analysis of Data

The collected data were analyzed using appropriate descriptive and inferential statistical methods. Descriptive statistics were used to measure the frequency of responses for each question (see Table E1 to Table E13 and Table E15). Other descriptive analyses such as mean scores were performed. Inferential statistics such as the t-test, Spearman's correlation, ANOVA, and Chi-Square were used to test the appropriate hypothesis. Statistics software, SAS, was used for analyzing data.

The organizational performance was divided into three levels: financial performance, non-financial performance, and overall performance. A seven-point Likert scale was used to measure these three levels of performance (see Appendix B, Question 4). Four financial indicators, including sales, profits, costs, and return-on-investment

(ROI) were used to measure financial performance. Three non-financial indicators, as number of customers, merchandise return rate, and productivity related to marketing and sales functions, were used to measure non-financial performance. All the seven indicators were combined to measure overall performance. The other variables identified in this study were: length of Web site operation, size of company, number of B2C activities, and frequency of modification.

Different statistical analysis methods require different sets of data. As a result, in this study the data were treated differently for different methods. For the t-test, the seven-point Likert scale data were used as interval data. In the Spearman correlation, the variables were treated as ranked data and in the Chi-Square data analysis, the variables were assumed to be nominal data.

CHAPTER IV

FINDINGS

This chapter includes results of descriptive and inferential statistics. There is also a discussion of findings of descriptive statistics and the findings of inferential statistics.

Findings of Descriptive Statistics

Descriptive statistics, such as, frequency of responses and mean scores were used to analyze data. The frequency of responses was measured for all the questions (see Table E1 to Table E13 and Table E15).

Positions or titles of respondents were divided into three categories: high level management, middle level management, and low level management. High level management included positions such as owner, president, and chief executive officer. Positions such as vice president and director were included in middle level management. Low level management consisted of positions like manager, supervisor, executive secretary, and technical advisor. The responses were almost equally distributed among those three categories (see Table E1).

The size of a commercial printing firm was divided into three groups based on the number of employees. The companies that had more than 49 employees were grouped as large-sized firms. The companies that hired less than 20 employees were grouped as small-sized firms. The medium-sized firms included those companies who had more than 19 employees but less than 50 employees. There were more large-sized firms (63.16%) than medium-sized firms (23.68%) and small-sized firms (13.16%) in the study sample (see Table E2).

The length of operation of a Web site was divided into five categories: one year or less, two years, three years, four years, and five years or more. It was found that a majority of firms (71.05%) has been conducting business on the Web for three years or less. Only 29.95% of respondents had been operating Web sites for more than three years (See Table E3).

Table E4 provides data on the number of B2C activities performed by commercial printing firms. The firms performed two to 11 different types of activities in order to serve their customers. Table E5 provides more data regarding responses on conducting a particular B2C activity. The most popular activities among commercial printing firms were providing information regarding their products and services (100%), providing general information regarding the company such as history, size, employment, and the like (94.74%); and communicating with customers through e-mail (92.11%). Some of the activities such as communication with customers through chat groups, discussion groups, or videoconferencing; distribution of discount coupons, rebates, and publishing information in different languages were not conducted through their Web sites. Some companies used different types of tools for conducting B2C activities. For example, some companies used bulletin boards, requesting media, registrations or comments, and customer classrooms to communicate with their customers. Some participants responded that they conducted other types of B2C activities such as taking online orders, providing tips for electronic documents, tracking of customers' jobs, and providing access to a FTP site.

The frequency at which commercial printing firms modify or update their Web sites was categorized into four groups: at least once a month, once in three months, once in six months, and once a year or less than a year (see Table E6). Only 18.42% of the total respondents said that they modified their Web sites at least once a month. On the contrary, 23.68% of the total respondents agreed that they modified their Web sites once a year or less than once a year.

Table E7 to Table E13 shows how participants responded to Question 4. Question 4 contains sub-questions A to G based on the seven-point Likert scale (Appendix B). One of the results found was that the "No Difference" criterion of the Likert scale received the highest number of responses in each sub-question. Approximately one third of the total respondents believed that conducting business-to-customer activities on the Web does not affect financial, non-financial, and overall indicators of performance. On the other hand, about two-thirds of the total respondents perceived that conducting B2C activities on the Web affects sales, profits, costs, return-on-investment, number of customers, and sales and marketing productivity. A majority of respondents (84.21%) believed that conducting B2C activities has no effect on merchandise return rate (see Table E12).

Question 5 of the questionnaire was an open-ended question. It was used to obtain respondents' viewpoints about conducting B2C activities on the Web. The respondents' comments were divided into three groups: positive, neutral, and negative. The positive comments consisted of comments in favor of conducting B2C activities on the Web. One of the respondents mentioned "greatest benefit is electronic file

transmissions, which cuts back need for additional sales/customer service contacts and FedEx expenses." Five such positive comments were received. Respondents' comments that conducting B2C activities did not benefit their business were classified as negative comments. There were a total of four negative comments. One of the negative comments was "commercial printing is not a commodity. It is difficult to have a B2C Web site." A couple of comments were neither positive nor negative, so they were grouped as neutral comments. One of the respondents said "the use of the Internet is a great tool for printers, but will also decrease profits due to increased competition." See Table E15 for more information.

Descriptive statistics provided important information about the frequency of responses for each question and mean scores for the Likert scale question. To test research hypotheses inferential statistics were performed which are explained in the following section.

Findings of Inferential Statistics

The t-test was performed to measure the effect of online B2C activities on the organizational performance. To determine associations between variables, inferential statistics such as Spearman correlation, Chi-Square, and ANOVA were performed. ANOVA was performed to find out the differences between means for the categorial data. The variables were divided into two groups. One group consisted of the following variables: size (employee-wise) of company (S), length of Web site operation (L), number of B2C activities (A), and frequency of Web site modification (M). The second group included variables as follows: financial performance (FP), non-financial performance

(NFP), and overall performance (OP). The associations between two groups of variables were measured. The research hypotheses H_1 to H_5 were tested as follows.

Testing of Hypothesis 1 Using Spearman Correlation

To test the research hypotheses, $H_{1.1}$, $H_{1.2}$, and $H_{1.3}$, mean scores and the two-tail t-test were performed. Table 14 provides the data on mean scores and the two-tail t-test. The data collected from Question 4 of the questionnaire were analyzed (Appendix B). One of the significant results found from this table was conducting business-to-customer activities on the Web positively affects non-financial performance ($\bar{x} = 4.32$, $p = 0.0176$) of a commercial printing firm that is significant at $\alpha = 0.05$. This supports the research hypothesis, $H_{1.2}$. The result was obtained because non-financial indicators, number of customers ($\bar{x} = 4.63$, $p = 0.0028$) and sales and marketing productivity ($\bar{x} = 4.58$, $p = 0.0019$) were positively affected at $\alpha = 0.01$. As a result, the negative effect of another non-financial indicator, merchandise return rate ($\bar{x} = 3.74$, $p = 0.0289$) to the non-financial performance is unseen.

The mean of the merchandise return rate is affected by the few extreme outliers (see Table E12 and Figure G2). Those outliers can not be discarded because the responses could be true for those particular companies. However, the results of these outliers may not be representators of most companies, the merchandise return rate that is negatively affected at $\alpha = 0.05$ can not be generalized because of a few extreme outliers. As discussed earlier, 84.21% of the total respondents said that conducting B2C activities on the Web did not affect merchandise return rates.

Conducting B2C activities on the Web did not significantly affect the financial and overall performances. The other directional hypotheses $H_{1.1}$ and $H_{1.3}$ were not supported by the findings.

Table 14

Degree of Agreement/Disagreement of Performance Indicators—Hypothesis 1

			t-Test Procedure	
Performance Indicators	Means	G/L	t-Statistics	p-value
Financial Performance	4.01	G	0.07	0.4716
Sales	4.58	G	2.25	0.0153*
Profits	4.00	—	—	—
Costs	3.76	L	1.01	0.0241*
Return on Investment	3.83	L	0.78	0.2193
Non-Financial Performance	4.32	G	2.19	0.0176*
Number of Customers	4.63	G	2.94	0.0028**
Merchandise Return Rate	3.74	L	1.96	0.0289*
Sales & Marketing Productivity	4.58	G	3.09	0.0019**
Overall Performance	4.13	G	0.83	0.2068

Note. G = H_0: $\mu \leq 4$ against H_A: $\mu > 4$
L = H_0: $\mu \geq 4$ against H_A: $\mu < 4$
*significance level $\alpha = 0.05$
** significance level $\alpha = 0.01$

The Spearman correlation was used to test Hypothesis 2 to Hypothesis 5. When stratifying by size, the sample is too small to utilize Chi-Square, Spearman correlation was used.

Testing of Hypothesis 2 Using Spearman Correlation

To determine the relationship between the length of time for conducting B2C activities on the Web and three levels of performance (financial, non-financial, and overall) of a company, the Spearman correlation was used. The data were collected from Question 1 on the length of Web site operation and Question 4 of the questionnaire (Appendix B). There was no significant association between the length of Web site operation and the three levels of performance at $\alpha = 0.05$. The findings did not support the directional hypotheses $H_{2.1}$, $H_{2.2}$, and $H_{2.3}$. Using the ANOVA method, there was no difference in means of the categorial data found. It appears that the performance of a company is independent of the length of Web site operation (see Table 16).

Table 16

Association Between Performance Indicators and Length of Web Site Operation—Hypothesis 2

	Spearman Correlation Analysis		ANOVA Method to test Difference in Means	
Performance Indicator	Coefficient	p-value	F-Statistics	p-value
Financial Performance	0.1016	0.5553	0.53	0.7145
Sales	0.1023	0.5412	0.73	0.5802
Profits	-0.0648	0.6993	0.26	0.9031
Costs	-0.0668	0.6902	0.37	0.8304
Return on Investment	0.2230	0.1911	0.85	0.5054
Non-Financial Performance	0.0752	0.6535	0.40	0.8060
Number of Customers	0.1413	0.3973	0.88	0.4852
Merchandise Return Rate	-0.1928	0.2463	0.37	0.8268
Sales & Marketing Productivity	0.0729	0.6634	0.47	0.7548
Overall Performance	0.1396	0.4168	0.56	0.6908

Testing of Hypothesis 3 Using Spearman Correlation

The data regarding the number of employees were collected in Question 1 of the questionnaire (Appendix B). These ratio data were converted into ordinal data by dividing them into three groups: small, medium, and large. These ordinal data were then converted to rank data by assigning them numbers. The numbers were assigned as follows: small-sized firms = 1, medium-sized firms = 2, and large-sized firms = 3. A Spearman correlation was completed to measure the relationship between the size of a company (employee-wise) and the three levels of performance of a company. The data regarding the performance indicators were collected in Question 4 of the questionnaire on a seven-point Likert scale (Appendix B). There was no significant association between the size of a company and any of the performance levels at $\alpha = 0.05$. The results did not support the directional hypotheses $H_{3.1}$, $H_{3.2}$, and $H_{3.3}$. The ANOVA test was performed to determine the difference in means among the small-sized, medium-sized, and large-sized firms. There was no difference in means was found. Based on this finding, the performance of a commercial printing firm is independent of its size when conducting B2C activities on the Web. See Table 17 for more information.

Table 17

Association Between Performance Indicators and Size of Company—Hypothesis 3

	Spearman Correlation Analysis		ANOVA Method to test Difference in Means	
Performance Indicator	Coefficient	p-value	F-Statistics	p-value
Financial Performance	-0.1704	0.3204	1.06	0.3593
Sales	-0.2184	0.1877	0.64	0.5342
Profits	-0.2229	0.1786	1.32	0.2797
Costs	-0.1238	0.4391	1.38	0.2653
Return on Investment	-0.1104	0.5216	0.96	0.3938
Non-Financial Performance	-0.1063	0.5251	0.60	0.5556
Number of Customers	-0.1318	0.4303	0.52	0.6006
Merchandise Return Rate	-0.1046	0.5319	0.61	0.5490
Sales & Marketing Productivity	-0.0713	0.6706	0.34	0.7114
Overall Performance	-0.1646	0.3375	0.92	0.4101

Testing of Hypothesis 4 Using Spearman Correlation

To find out the relationship between the number of B2C activities conducted on the Web (A) and the three levels of performance (FP, NFP, OP), the Spearman correlation method was performed. To test the research hypotheses, $H_{4.1}$, $H_{4.2}$, and $H_{4.3}$, the data were collected from Question 2 and Question 4 of the questionnaire (see Appendix B). The number of B2C activities conducted on the Web had a positive relationship with the three levels of performance. There was a positive relationship between the variables A and FP ($p = 0.014$) that is significant at $\alpha = 0.05$. A significant positive relationship was found between A and NFP and between A and OP at $\alpha = 0.01$. These findings supported the directional hypotheses $H_{4.1}$, $H_{4.2}$, and $H_{4.3}$. See Table 18 for additional information.

Table 18

Association Between Performance Indicators and Total Number of B2C Activities—Hypothesis 4

Performance Indicator	Spearman Correlation Analysis	
	Coefficient	p-value
Financial Performance	0.4061	0.0140*
Sales	0.5326	0.0006**
Profits	0.4577	0.0039*
Costs	0.2779	0.0912
Return on Investment	0.2889	0.0874
Non-Financial Performance	0.5183	0.0009**
Number of Customers	0.4025	0.0122*
Merchandise Return Rate	0.1944	0.2422
Sales & Marketing Productivity	0.3890	0.0158*
Overall Performance	0.4926	0.0023**

Note. * significance level $\alpha = 0.05$. ** significance level $\alpha = 0.01$.

Testing of Hypothesis 5 Using Spearman Correlation

The Spearman correlation method was used to measure the association between the frequency of Web site modification (M) and the three levels of performance (FP, NFP, OP). The data were collected from Question 3 and Question 4 of the questionnaire (Appendix B). There was a positive relationship found between the variables, M and NFP ($p = 0.0054$) that is significant at $\alpha = 0.01$. The independent variable, M did not affect the other dependent variables, FP and OP. The findings supported the directional hypothesis $H_{5.2}$, but did not support the hypotheses, $H_{5.1}$ and $H_{5.3}$ (see Table 19).

Table 19

Association Between Performance Indicators and Frequency of Web Site Modification—Hypothesis 5

	Spearman Correlation Analysis		ANOVA Method to test Difference in Means	
Performance Indicator	Coefficient	p-value	F-Statistics	p-value
Financial Performance	0.0970	0.5793	0.53	0.4698
Sales	0.3653	0.0262*	5.22	0.0285*
Profits	0.1530	0.3661	0.83	0.3674
Costs	-0.0457	0.7881	0.72	0.4012
Return on Investment	0.1112	0.5249	0.87	0.3580
Non-Financial Performance	0.4485	0.0054**	6.01	0.0193*
Number of Customers	0.3374	0.0411*	6.04	0.0191*
Merchandise Return Rate	0.1375	0.4172	0.27	0.6094
Sales & Marketing Productivity	0.4037	0.0132*	6.18	0.0178*
Overall Performance	0.2384	0.1679	2.03	0.1632

Note. * significance level $\alpha = 0.05$. ** significance level $\alpha = 0.01$.

Chi-Square Statistics to Validate the Results of Spearman Correlation

An additional statistical method, Chi-Square, was performed to determine the consistency of results that were obtained using the Spearman correlation. To avoid the problem of a cell size being less than five, the seven-point Liker scale was divided into two groups: (a) no agreement (scale 1 – 4) and (b) agreement (scale 5 – 7). In the same manner, other variables were divided into two groups rather than having several smaller groups. The length of Web site operation was divided into two groups: (a) two years or less and (b) three years or more. The size of a company was divided into two groups:

(a) small- and medium-sized companies and (b) large-sized companies. The number of B2C activities were divided into two groups: (a) five or less and (b) six or more. The frequency of Web site modification was divided into two groups: (a) once a year or more and (b) once or more in six months.

It was not expected that results would be consistent with the Spearman correlation results, because both the methods are different, and different groups of variables were used in Chi-Square. However, a majority of Chi-Square results were consistent with the results obtained using Spearman correlation. Out of 40 Chi-Square tests, only three results (7%) were not consistent. Contrary to the Spearman correlation results, Chi-Squares results did not show significant positive associations with the financial performance and the overall performance with the number of B2C activities. On the other hand, Chi-Square showed a significant positive association with the financial indicator, return on investment, and the length of Web site operation. Please see Appendix F for the results of Chi-Square statistics and Appendix B for the questionnaire.

Inferential statistics were useful in testing Hypothesis 1 to Hypothesis 5. From the t-test, it was determined that conducting B2C activities on the Web significantly increased sales, number of customers, and productivity related to sales and marketing. These positively affected the performance of a company. On the contrary, it was found that costs had been significantly increased which negatively affected the performance of a company. As a result, conducting B2C activities on the Web had a significant positive effect on the non-financial performance, but had no significant effect on the financial and overall performances. The findings of the t-test supported $H_{1.2}$, but did not support $H_{1.1}$

and $H_{1.3}$. Hypothesis 4 and Hypothesis 5.2 were supported by the Spearman correlation results. The Spearman correlation results did not support Hypothesis 2, Hypothesis 3, Hypothesis 5.1 and Hypothesis 5.3. Chi-Square results supported Hypothesis 4.2 and Hypothesis 5.2. It did not support Hypothesis 2, Hypothesis 3, Hypothesis 4.1, Hypothesis 4.2, Hypothesis 5.1, and Hypothesis 5.3.

Summary

Both the descriptive and inferential statistics were performed to analyze data. Frequency analysis provided information that how respondents replied to each question. Means of the seven-point Likert scale and the t-test for Question 5 were calculated to measure the perceptions of respondents. These perceptions related to conducting B2C activities on the Web and company performance. It was found that conducting B2C activities on the Web significantly and positively affected non-financial performance. It had no significant effect on financial performance and overall performance. Hence, Hypothesis 1.2 was supported, but Hypothesis 1.1 and Hypothesis 1.3 were not supported by the findings.

Based on the descriptive statistics, inferential data analysis was performed to determine the associations between variables. A Spearman correlation was performed to test Hypothesis 2 to Hypothesis 5. The result was that the number of B2C activities being conducted on the Web had a significant positive effect on all the three levels of performance. A significant positive association was found between the frequency of Web site modification and the non-financial performance. Hence, Hypothesis 4 and Hypothesis 5.2 were supported by the findings. Hypothesis 2, Hypothesis 3, Hypothesis

5.1, and Hypothesis 5.3 were not supported by the findings, because no significant associations were found between variables. To find out the differences among means of categorial data, the ANOVA test was performed. No significant differences were found among means of different sizes of a commercial printing firm. Similarly, no significant differences were found among means for different lengths of time the Web site was in operation. A significant difference was found between the means for the frequency of Web site modification, and sales, number of customers, and sales and marketing productivity. There is evidence to support the fact that frequency of Web site modification increases sales, number of customers, and sales and marketing productivity.

An effort was made to determine the consistency of results. Chi-Square analysis was used to provide some validations to the Spearman correlation that was used for Hypothesis 2 to Hypothesis 5. A majority of results were consistent using both the data analysis methods.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter is divided into three sections: summary, conclusions, and recommendations. The dissertation is summarized in the summary section. Conclusions are drawn from findings and discussed in relation to hypotheses. Recommendations include suggestions for conducting future research studies and suggestions to commercial printing firms for improving performance.

Summary

This research was conducted to investigate the current status of commercial printing firms on how they are performing using the Web technology for conducting business-to-customer (B2C) activities. It was based on Rogers' theory of innovations, Auger's empirical study, and other related research studies. The consequences of the Web technology on the organizational performance was studied. The organizational performance was divided into three levels which were financial performance (FP), non-financial performance (NFP), and overall performance (OP). The financial performance was measured by four financial indicators, whereas non-financial performance was measured by three non-financial indicators. The four financial indicators used in this study were sales, profits, costs, and return on investment (ROI). The three non-financial indicators included were number of customers, merchandise return rate, and sales and marketing productivity. The overall performance was measured by adding four financial performance and three non-financial performance indicators. The three levels of performance were identified as variables. The other variables used in this study were:

(a) size of company, (b) length of Web site operation, (c) number of business-to-customer activities, and (d) frequency of Web site modification. The relationship between these variables were measured using Spearman correlation and Chi-Square.

A survey was conducted in the midwest region of the United States. A total of 103 commercial printing firms were selected to participate in the study. Thirty-eight (36.89%) returned the completed questionnaires.

The findings supported the hypotheses $H_{1.2}$, $H_{4.1}$, $H_{4.2}$, $H_{4.3}$ and $H_{5.2}$. Conducting B2C activities on the Web significantly and positively affect the non-financial performance. There was a significant positive association between the number of B2C activities conducted on the Web and all the three levels of performance. The more the number of activities conducted, the better will be financial, non-financial, and overall performances. The frequency of Web site modification had a significant positive relationship with the non-financial performance. The commercial printing firms that updated the Web sites more frequently had a significant positive effect on sales, number of customers, and sales and marketing productivity. Although the other hypotheses were not supported by the findings, some of the indicators were significantly affected. See Table 14 and Table 16 to Table 19 for more details.

Hypotheses 1 to 3 were formulated on the basis of Rogers' theory of innovations. The results supported Hypothesis 1 and hence the theory of innovations that an innovation brings desirable, undesirable, direct, indirect, anticipated, and unanticipated changes to an adopter. The results did not support the Hypothesis 2 and Hypothesis 3 that the size of a company and the length of an innovation adoption affect organizational

performance. As a result, the findings of this study did not match with the findings of theory of innovations regarding the size of a company and the early of an innovation adoption.

Hypothesis 4 and Hypothesis 5 were formulated on the basis of Auger's study. The findings supported the research hypotheses, $H_{4.1}$, $H_{4.2}$, $H_{4.3}$ and $H_{5.2}$. The same results were found for Hypothesis 4 as compared to those with Auger's study. The results supported only $H_{5.2}$, but did not support $H_{5.1}$ and $H_{5.3}$, so the results of hypotheses $H_{5.1}$ and $H_{5.3}$ differed from the findings of Auger's study.

Conclusions

Based on the findings, several conclusions were drawn. Considering the limiting and delimiting factors of the study, conclusions can be generalized for commercial printing firms of the midwest region of the USA. The conclusions are listed as follows:

1. Conducting B2C activities on the Web positively affects the non-financial performance of a commercial printing firm. It does not affect the financial and overall performances of a company. In relation to the consequences of an innovation model, it can be concluded that the use of the Web technology as a business tool brings desirable, direct, or anticipated changes; that is, enhancing non-financial performance. At the same time, it brought undesirable, indirect, or unanticipated changes; that is, no significant improvement in the financial and overall performances.

2. The performance of a company is independent of the length of the Web site operation and the size of a company for conducting B2C activities on the Web. Web technology is inherently different from other technologies. The length of Web site

operation does not affect the financial, non-financial, and overall performances. Similarly, the large-sized companies do not gain windfall profits by being the first to use the technology. As a result, the size of a company does not affect any of the three levels of performance.

3. Conducting more B2C activities on the Web positively affects all the three levels of performance based on the Spearman correlation results. These findings correlate with the findings of Auger's study. If a company provides more services on the Web, then its financial, non-financial, and overall performances are likely to be increased. However, Chi-Square results showed that there was a significant positive relationship between the number of B2C activities conducted on the Web and the non-financial performance of a company. In conclusion, the number of B2C services offered on the Web positively only affects the non-financial performance of a company.

4. The frequency of Web site modifications positively affects the non-financial performance. It does not affect the financial and overall performances.

5. Another conclusion drawn is that out of seven indicators, the three indicators—sales, number of customers, and sales and marketing productivity—are more sensitive to the effect of Web technology. Profits, costs, return-on-investment, and merchandise return rate are less affected by the Web technology.

6. There are more large-sized firms (63%) that conduct B2C activities on the Web than medium-sized and small-sized firms.

7. Most of the firms (71.05%) have three or less than three years of online business experience.

8. Publishing information (100%) and communicating through e-mail (92.11) are widely use B2C activities.

9. A few companies (18.92%) modify their Web sites once a month.

10. Conducting B2C activities on the Web does not affect the merchandise return rate to a majority of companies (84.21%).

In general, it was concluded that commercial printing firms were not enormously benefited by the use of Web technology. Web technology increased the number of customers as well as sales and marketing productivity. As a result, it positively affected the non-financial performance. It increased sales, but also increased costs, so its effect on the financial performance was neutralized. The overall performance was not significantly affected by the use of the Web technology.

Recommendations

Recommendations were made based on limitations, delimitations, research design, and findings. They are divided into two categories: recommendations for future research studies and recommendations to commercial printing firms.

Recommendations for Future Research Studies

The following recommendations are made for future research studies. The findings of those studies could be different from this study.

1. A longitudinal experimental study should be conducted in a commercial printing firm in order to study the effect of the Web technology, once it is introduced.

2. A similar study should be performed with a larger sample size.

3. The effect of other variables on the organizational performance should be measured, such as advertisements of a Web site and the design of a Web site.

4. The effect of conducting online B2C activities on company's image should be measured.

5. The above-mentioned research studies should be conducted in different industries.

6. Further research should be conducted to identify what type of Web site modification positively affects the organizational performance most.

7. Further research should be conducted to investigate what type of online B2C activity positively affects the organizational performance most.

Recommendations to Commercial Printing Firms

Correlation analysis provided important information regarding the associations between variables. Recommendations are based on the findings. The recommendations will be helpful in improving organizational performance. They are cited as follows.

1. A commercial printing firm should offer more services on the Web to its customers. In other words, a company should take full advantage of the Web technology. It should not limit the use of the Web.

2. A commercial printing firm should update the Web site at least once a month.

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APPENDIX A

LETTER TO ORGANIZATIONS

Date

FirstName LastName
Position Title
Commercial Printing Company
Street Address
City, State - Zip

Dear Mr. LastName:

I am a doctoral student and working with Dr. Charles D. Johnson in the Department of Industrial Technology at the University of Northern Iowa. I am investigating how commercial printing companies are performing using the Web for conducting business-to-customer activities. I will greatly appreciate, if you take part in the research study. The findings will be useful in guiding commercial printing companies in establishing and improving Web sites.

Please fill in the attached questionnaire and return it to:
Devang Mehta, 17-D Hiltin Place, Greensboro, NC 27409.
Tel/Fax: (336) 855-8147

It will take about 15 minutes to fill in the questionnaire. It will be greatly appreciated, if you can return the questionnaire in two days. Please call if you have any questions.

Thank you for your cooperation.

Sincerely,

Devang P. Mehta, Doctoral Candidate
University of Northern Iowa

Encl.: Questionnaire
Self-addressed stamped envelope

APPENDIX B

QUESTIONNAIRE

1. **Please provide the following information.**

   Title of your position:

   Name of your company:

   # of employees:

   Length of operation of your Web site (check one):

   ❑ 1 year or less ❑ 2 years ❑ 3 years ❑ 4 years ❑ 5 years or more

   Web address of your company:

2. **What kinds of the following features do you have on your Web site for conducting business-to-customer activities? (please check all that apply)**

   ❑ General information about your company

   Communication tools to communicate with your customers as follows:
   - ❑ Electronic-mail (e-mail)
   - ❑ Chat group
   - ❑ Discussion group
   - ❑ Videoconferencing
   - ❑ Other (please specify):

   Exchange of graphic files with your customers as follows:
   - ❑ Print job related, such as graphics that are to be printed
   - ❑ Electronic job related, such as graphics that are to be placed on the Internet/Web

   Exchange of electronic forms with your customers as follows:
   - ❑ Quotation
   - ❑ Purchase order
   - ❑ Payment
   - ❑ Receipt
   - ❑ Other (please specify):

   Marketing activities as follows:
   - ❑ Information about your products and/or services
   - ❑ Listing of prices
   - ❑ Online distribution of discount coupons
   - ❑ Announcements of special discount prices
   - ❑ Sweepstake
   - ❑ Rebate
   - ❑ Providing links to related/interested Web sites for customers
   - ❑ Other promotional activity (please specify):

   - ❑ Publishing information on the Web in different languages in order to target customers of different languages
   - ❑ Other marketing activity (please specify):

   - ❑ Other features for conducting business-to-customer activities on the Web (please specify):

-Continued on the other side-

3. **How often do you modify your Web site?**

- ❑ At least once a month
- ❑ Once in three months
- ❑ Once in six months
- ❑ Once a year or less than once a year

4. **Please answer the following questions based on your perceptions regarding conducting business-to-customer activities on the Web *compared to* conducting business-to-customer activities without the Web. Please make a check mark in an appropriate box.**

		Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	No Difference (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
A	Conducting business-to-customer activities on the Web has *increased* sales for my company.							
B	Conducting business-to-customer activities on the Web has *increased* profits for my company.							
C	Conducting business-to-customer activities on the Web has *reduced* overall costs for my company.							
D	Conducting business-to-customer activities on the Web has *increased* return-on-investment for my company.							
E	Conducting business-to-customer activities on the Web has *increased* number of customers for my company.							
F	Conducting business-to-customer activities on the Web has *reduced* merchandise return rate for my company.							
G	Conducting business-to-customer activities on the Web has *increased* sales and marketing productivity in my company.							

5. **I will greatly appreciate if you would like to share additional information or comments related to this study.**

☺ *Thank you for your participation !!*

APPENDIX C

COVER LETTER TO PARTICIPANTS

Date

FirstName LastName
Position Title
Commercial Printing Company
Street Address
City, State - Zip

Dear Mr. LastName:

I am a doctoral student and working with Dr. Charles D. Johnson in the Department of Industrial Technology at the University of Northern Iowa. I am investigating how commercial printing companies are performing using the Web for conducting business-to-customer activities. I will greatly appreciate, if you take part in the research study. The findings will be useful in guiding commercial printing companies in establishing and improving Web sites.

Please fill in the attached questionnaire and return it to:
Devang P. Mehta, 17-D Hiltin Place, Greensboro, NC 27409-2450
Tel/Fax: 336-855-8147

It will take about 15 minutes to fill in the questionnaire. If you can return the questionnaire in two days that will be greatly appreciated. Please call if you have any questions.

Thank you for your cooperation and participation.

Sincerely,

Devang P. Mehta
Doctoral Candidate, UNI

Enc.: Questionnaire

APPENDIX D

THANK YOU LETTER TO PARTICIPANTS

Date

FirstName LastName
Position Title
Commercial Printing Company
Street Address
City, State - Zip

Dear Mr. LastName:

I greatly appreciate your taking time to fill in the questionnaire and return it to me. As soon as I analyze the collected data, the results will be sent to you. The relationship of the size of a company, the length of operation of a Web site, the frequency of modifications of a Web site, and the number of activities performed on the Web with the performance of a company will be investigated. These findings will be useful to improve the performance of your company.

Thank you again for your cooperation and participation in the research study "An Investigation to Measure the Performance of Commercial Printing Firms for Conducting Business-to-Customer Activities on the Web." Please feel free to call/fax at 336-855-8147 or e-mail at mehtad@ncat.edu for the graphic communications industry related questions. Currently, I am employed at the North Carolina Agricultural and Technical State University as an Assistant Professor.

Sincerely,

Devang P. Mehta
Doctoral Candidate, UNI

APPENDIX E

RESULTS OF DESCRIPTIVE STATISTICS

Table E1

Position Title of Respondents—Question 1

Position Title*	Frequency	Percent	Valid Percent	Cumulative Percent
High Level Management	13	34.21	34.21	34.21
Middle Level Management	12	31.58	31.58	65.79
Low Level Management	13	34.21	34.21	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Note. *Respondents' position titles are divided into three categories: 1 = High Level Management, 2 = Middle Level Management, and 3 = Low Level Management. The position titles such as owner, president, and CEO are included in High Level Management. The Middle Level Management category includes job titles such as vice-president and director. The Low Level Management category consists of manager, supervisor, executive secretary, and technical advisor.

Table E2

Firm Size–Question 1

Firm Size*	Frequency	Percent	Valid Percent	Cumulative Percent
Small	5	13.16	13.16	13.16
Medium	9	23.68	23.68	36.84
Large	24	63.16	63.16	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Note. *The size of a graphic arts firm is divided into three categories based on the number of employees. Small (1) = less than 20 employees, Medium (2) = 20 to 49 employees, and Large (3) = more than 49 employees.

Table E3

Length of Web Site Operation–Question 1

Length	Frequency	Percent	Valid Percent	Cumulative Percent
1 Year or Less	7	18.42	18.42	18.42
2 Years	8	21.05	21.05	39.47
3 Years	12	31.58	31.58	71.05
4 Years	7	18.42	18.42	89.45
5 Years or More	4	10.53	10.53	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E4

Total Number of B2C Activities–Question 2

Number	Frequency	Percent	Valid Percent	Cumulative Percent
2	2	5.26	5.26	5.26
3	1	2.63	2.63	7.89
4	6	15.79	15.79	23.68
5	6	15.79	15.79	39.47
6	8	21.05	21.05	60.53
7	8	21.05	21.05	81.58
8	4	10.53	10.53	92.11
9	2	5.26	5.26	97.37
11	1	2.63	2.63	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E5

Responses on B2C Activities–Question 2

Activities	Responses	Percent
General Information About Company		
General Information	36	94.74
Communication Tools		
Email	35	92.11
Chat Group	0	0.00
Discussion Group	0	0.00
Videoconferencing	0	0.00
Other	4	10.52
Graphic File Exchange		
Print Job Related File Exchange	29	76.31
Electronic Job Related File Exchange	15	39.47
E-Forms Exchange		
Quotation	24	76.31
Purchase Order	7	18.42
Payment	4	10.53
Receipt	2	5.26
Other	5	13.16
Marketing Activity		
Information About Products & Services	38	100.00
Listing of Prices	1	2.63
Distribution of Discount Coupons	0	0.00
Special Discount Prices	2	5.26
Sweepstake	1	2.63
Rebate	0	0.00
Related Links	15	39.47
Other Promotional Activity	1	2.63
Publishing Information in Different Languages	0	0.00
Other Marketing Activity	2	5.26
Other B2C Activity	5	13.16

Table E6

Frequency of Web Site Modification–Question 3

Frequency of Modification	Frequency	Percent	Valid Percent	Cumulative Percent
At least once a month	7	18.42	18.92	18.92
Once in three months	7	18.42	18.92	37.84
Once in six months	14	36.84	37.84	75.68
Once a year or less than once a year	9	23.68	24.32	100.00
Total	37	97.37	100.00	
Missing	1	2.63		
Total	1	2.63		
Total	38	100.00		

Table E7

Sales–Question 4A

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	3	7.89	7.89	7.89
Disagree	2	5.26	5.26	13.16
No Difference	13	34.21	34.21	47.37
Somewhat Agree	8	21.05	21.05	68.42
Agree	9	23.68	23.68	92.11
Strongly Agree	3	7.89	7.89	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E8

Profits–Question 4B

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	1	2.63	2.63	2.63
Disagree	5	13.16	13.16	15.79
Somewhat Disagree	4	10.53	10.53	26.32
No Difference	16	42.11	42.11	68.42
Somewhat Agree	8	21.05	21.05	89.47
Agree	3	7.89	7.89	97.37
Strongly Agree	1	2.63	2.63	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E9

Costs–Question 4C

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	2	5.26	5.26	5.26
Disagree	7	18.42	18.42	23.68
Somewhat Disagree	5	13.16	13.16	36.84
No Difference	12	31.58	31.58	68.42
Somewhat Agree	10	26.32	26.32	94.74
Strongly Agree	2	5.26	5.26	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E10

Return on Investment–Question 4D

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	1	2.63	2.78	2.78
Disagree	6	15.79	16.67	19.44
Somewhat Disagree	5	13.16	13.89	33.33
No Difference	13	34.21	36.11	69.44
Somewhat Agree	8	21.05	22.22	91.67
Agree	3	7.89	8.33	100.00
Total	36	94.74	100.00	
Missing	2	5.26		
Total	2	5.26		
Total	38	100.00		

Table E11

Number of Customers–Question 4E

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	2	5.26	5.26	5.26
Disagree	1	2.63	2.63	7.89
Somewhat Disagree	1	2.63	2.63	10.53
No Difference	11	28.95	28.95	39.47
Somewhat Agree	15	39.47	39.47	78.95
Agree	6	15.79	15.79	94.74
Strongly Agree	2	5.26	5.26	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E12

Merchandise Return Rate–Question 4F

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	2	5.26	5.26	5.26
Disagree	2	5.26	5.26	10.53
Somewhat Disagree	1	2.63	2.63	13.16
No Difference	32	84.21	84.21	97.37
Somewhat Agree	1	2.63	2.63	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E13

Marketing Productivity–Question 4G

Degree of Agreement	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	1	2.63	2.63	2.63
Disagree	2	5.26	5.26	7.89
No Difference	14	36.84	36.84	44.74
Somewhat Agree	13	34.21	34.21	78.95
Agree	8	21.05	21.05	100.00
Strongly Agree	0	0.00	0.00	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Table E15

Respondents' Comments–Question 5

Comments*	Frequency	Percent	Valid Percent	Cumulative Percent
Positive	5	13.16	13.16	13.16
Neutral	2	5.26	5.26	18.42
Negative	4	10.53	10.53	28.95
No comments	27	71.05	71.05	100.00
Total	38	100.00	100.00	
Total	38	100.00		

Note. *The respondents' comments are divided into three sub-groups: 1 = Negative, 2 = Neutral, and 3 = Positive.

APPENDIX F

RESULTS OF CHI-SQUARE STATISTICS

Table F20

Chi-Square Statistics to Validate the Results of Spearman Correlation for Hypothesis 2

Length of Web Site Operation Variables	df	Chi-Square	Significance
Financial Performance	1	2.1406	0.1434
Q4A	1	3.7021	0.0543
Q4B	1	0.2768	0.5988
Q4C	1	0.0353	0.8510
Q4D	1	5.9181	0.0150*^
Non-Financial Performance	1	0.9913	0.3194
Q4E	1	1.9925	0.1581
Q4F	1	1.5748	0.2095
Q4G	1	0.0373	0.8468
Overall Performance	1	1.4610	0.2268

Note. * significance level $\alpha = 0.05$

^ shows inconsistent results with the results of Spearman correlation analysis. The seven-point Likert scale was divided into two groups: (a) No Agreement (scale 1 – 4) and (b) Agreement (scale 5 – 7). The length of Web site operation was divided into two groups: (a) Two years or less and (b) Three years or more.

Table F21

Chi-Square Statistics to Validate the Results of Spearman Correlation for Hypothesis 3

Size of Company Variables	df	Chi-Square	Significance
Financial Performance	1	0.0487	0.8253
Q4A	1	3.1415	0.0763
Q4B	1	0.0928	0.7607
Q4C	1	1.3049	0.2533
Q4D	1	0.5994	0.4388
Non-Financial Performance	1	0.0000	1.0000
Q4E	1	0.1062	0.7445
Q4F	1	0.5991	0.4389
Q4G	1	0.0317	0.8587
Overall Performance	1	0.2408	0.6236

Note. The seven-point Likert scale was divided into two groups: (a) No Agreement (scale 1 – 4) and (b) Agreement (scale 5 – 7). The size of a company was divided into two groups: (a) Small- and Medium-sized companies and (b) Large-sized companies.

Table F22

Chi-Square Statistics to Validate the Results of Spearman Correlation for Hypothesis 4

B2C Activities Variables	df	Chi-Square	Significance
Financial Performance	1	2.8931	0.0890^
Q4A	1	1.5861	0.2079
Q4B	1	1.5378	0.2149
Q4C	1	1.5378	0.2149
Q4D	1	1.3502	0.2452
Non-Financial Performance	1	5.3971	0.0202*
Q4E	1	0.5367	0.4638
Q4F	1	0.6698	0.4131
Q4G	1	4.8208	0.0281*
Overall Performance	1	2.0571	0.1515^

Note. * significance level $\alpha = 0.05$

^ shows inconsistent results with the results of Spearman correlation analysis. The seven-point Likert scale was divided into two groups: (a) No Agreement (scale 1 – 4) and (b) Agreement (scale 5 – 7). The number of B2C activities were divided into two groups: (a) Five or less and (b) Six or more.

Table F23

Chi-Square Statistics to Validate the Results of Spearman Correlation for Hypothesis 5

Frequency of Web Site Modification Variables	df	Chi-Square	Significance
Financial Performance	1	0.2767	0.5989
Q4A	1	0.0108	0.9172
Q4B	1	0.0044	0.9471
Q4C	1	0.5658	0.4519
Q4D	1	0.0204	0.8864
Non-Financial Performance	1	4.0394	0.0444*
Q4E	1	1.1123	0.2916
Q4F	1	0.3304	0.5654
Q4G	1	2.0560	0.1516
Overall Performance	1	0.7825	0.3764

Note. * significance level $\alpha = 0.05$
The seven-point Likert scale was divided into two groups: (a) No Agreement (scale 1 – 4) and (b) Agreement (scale 5 – 7). The frequency of Web site modification was divided into two groups: (a) Once a year or more and (b) Once or more in six months.

APPENDIX G

BOX PLOT

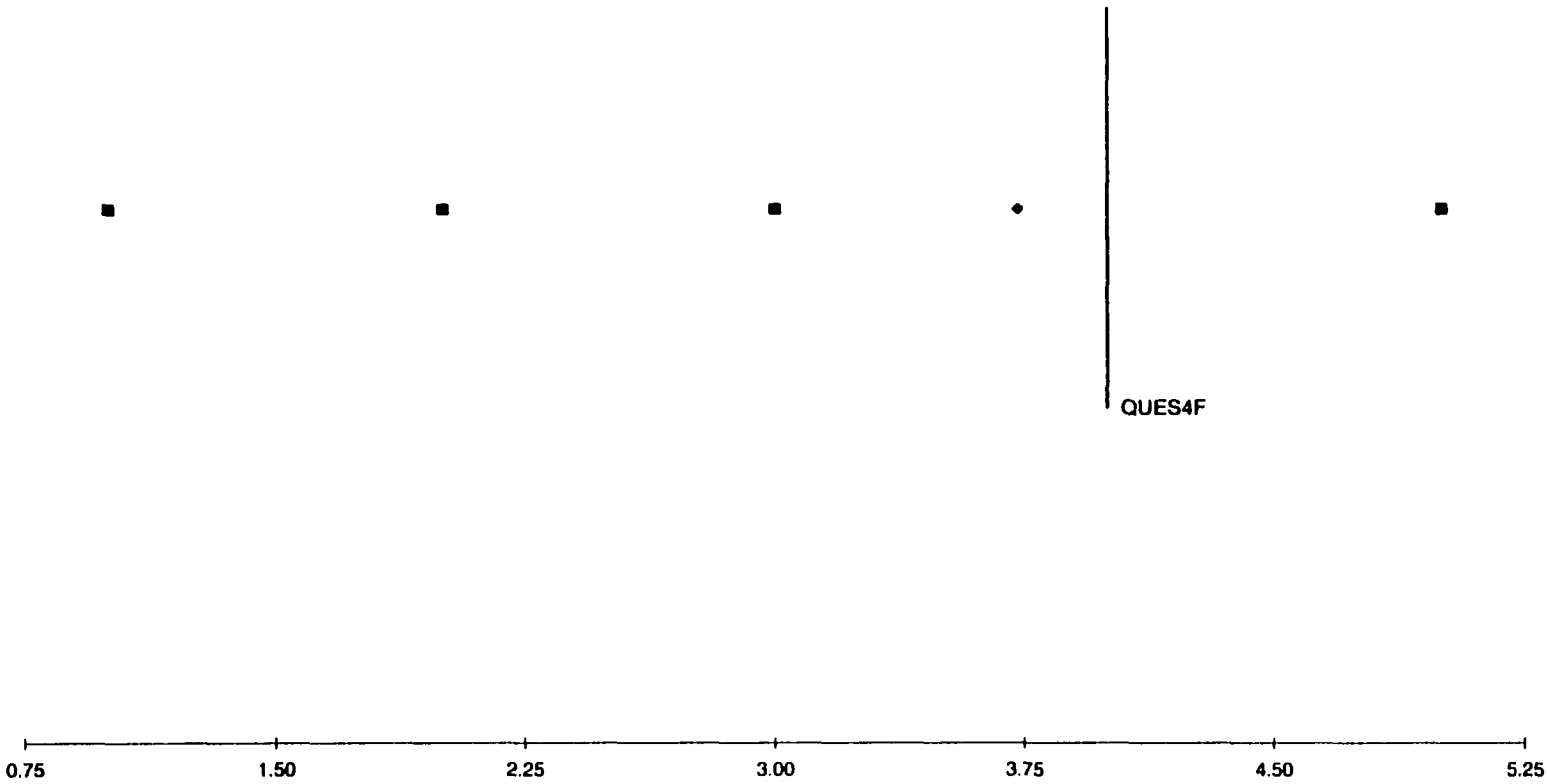

Figure 2. Box plot of responses for Question 4F of the questionnaire.

Note. Solid squares represent strong outliers, the diamond shows the mean, and the vertical line shows the mode.