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Strategic opportunities in information technology

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ABSTRACT

In an empirical investigation of firms of all sizes within the manufacturing, service, and retail industries, the applications of information technology (IT) with respect to key external and internal strategic areas were examined. It was found that the effectiveness of IT in accomplishing strategic objectives varied among manufacturing, retail, small and medium-size companies, but not between service-oriented and large companies. Furthermore, the level of success in using IT applications, measured in terms of whether it has achieved organizational objectives, was not significantly different among industry sectors nor among organizations of different sizes.

INTRODUCTION

The role of IT within the business community has changed from being merely a supporting tool in the back office to a weapon that can affect an organization's competitive position (Bakos & Treacy, 1986; Cash & Konsynski, 1985; Ives & Learmonth, 1984; Johnston & Carrico, 1988; McFarlan, 1984; Notowidigdo, 1984; Parsons, 1983; Porter & Millar, 1985; Pyburn, 1983). This change in the role of IT requires that executives understand the uses of IT in achieving the strategic goals of the firm. Executives must be able to assess where IT fits into their organization. In some cases IT may play a supporting role and can add only modestly to the value of a firm's products, while in other settings it is at the core of an organization's competitive survival (McFarlan, 1984). Understanding where an organization fits on this spectrum can help executives determine both the proper level of investment and the proper management structure for IT.

Most studies in the area of IT have used anecdotal case evidence to illustrate the strategic accomplishments of IT. In addition, such studies have tended to focus on large firms. Examples of these include American Hospital Supply (Barrett, 1986; Gibson & Jackson, 1987; Ward et al., 1990), Canon (Porter & Millar, 1985), Merrill Lynch (Benjamin, et al., 1984), and Wal-Mart (Barmash, 1984). Unfortunately, the sad truth is that there are few, if any, empirical studies which have comprehensively examined the effectiveness of utilizing IT in different strategic areas.

Wyman, in a 1985 article, coined the words "Technological myopia" to describe a condition of affliction found in organizations. Technological myopia happens when a company fails to comprehend the extent of technological progress thus failing to utilize technology's full power through lack of adoption or inappropriate use of developments. Therefore, a primary objective

of this study was to provide senior executives with insights and knowledge necessary for determining which IT strategic opportunities are most effective and appropriate for their organizations. Furthermore, since the implementation of technical innovation always represents a risk, this paper will examine the evidence concerning the success or failure rates resulting from the use of IT. Finally, IT application success levels among various types and sizes of companies will be compared and contrasted.

LITERATURE REVIEW

"Information technology" is a term used to describe any equipment or mechanism involved in the processing, storage, display or communication of information or data (Wright & Rhodes, 1985). While contemporary literature refers to IT in a variety of ways, IT generally involves the use of equipment, computers and software to implement such technology as management information systems, decision support systems, expert systems, data recognition systems, factory automation, and communications technologies.

"Information technology strategic opportunities," as used here, approximates the concept of a strategic opportunity framework (Benjamin et al., 1984). This concept encompasses two broad areas in which any business can be made substantially better through the use of IT: (1) improving the organization's impact in the marketplace to gain a competitive advantage; and (2) improving key internal operations.

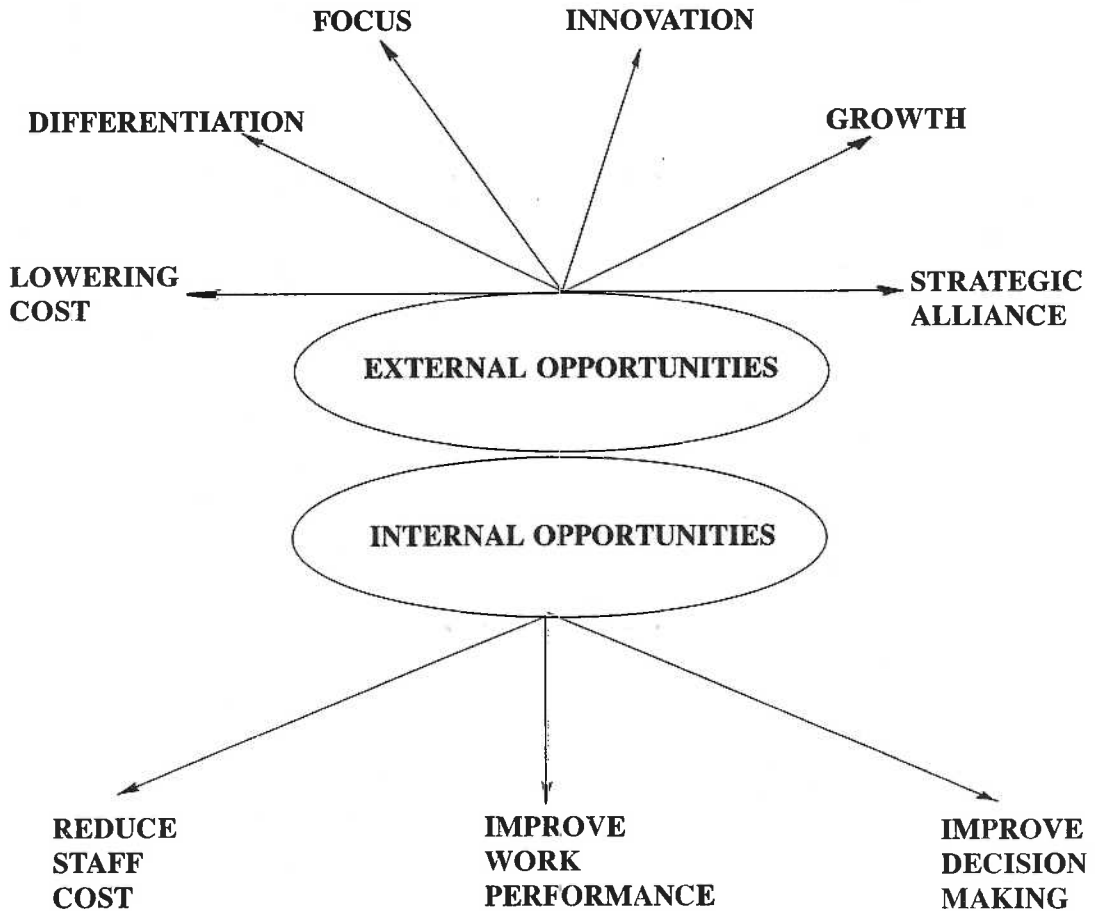
Studies on the use of IT in gaining competitive advantage have drawn primarily upon the ideas of Porter (1985) and Wiseman (1985). Porter theorizes that the three generic strategies to achieving competitive advantage are cost leadership, differentiation, and focus. Although Porter's theories on competitive advantage are not tied directly to IT, researchers have used his framework in their discussion of IT strategy. These researchers have provided checklists of ways which can be used to make strategic use of IT (McFarlan, 1983; Parsons, 1983).

Wiseman (1985), in an attempt to expand on Porter's work coined the term "strategic thrusts" for the moves that companies make to gain or maintain some kind of competitive edge. IT can be used to support or shape one or more of these thrusts. Wiseman expanded Porter's generic strategies from three to five categories, namely, cost, differentiation, innovation, growth and alliance. In this study we will employ Wiseman's extended framework to further our understanding of the external strategic uses of IT.

Besides the potential uses of IT in attaining external strategic objectives, another area of focus in this study is on how IT can help improve key *internal* operations. In this regard, the ideas of Eason (1988) are borrowed, especially his work about IT benefits in the office. Eason classified IT benefits into staff cost reduction, employees' work-performance improvement, and executives' decision-making improvement.

The integrated model used in this study is provided in Figure 1. The following sections will examine both the external and internal opportunities presented by IT. In order to illustrate how companies can apply IT to each of the areas, examples have been drawn from a variety of research studies. It is worthwhile to note that most of the prior works have examined the strategic uses of IT via qualitative case studies on selected successful companies. Few, if any, of these studies were empirical investigations.

Figure 1. Integrated Strategic IT Model



STRATEGIC OPPORTUNITIES

External

Low cost strategy. This strategy attempts to reduce or avoid costs the company would otherwise incur, thus helping suppliers and customers to reduce their costs. As a result of this strategy, a company might receive preferential treatment or some other benefits, or perhaps contribute to increasing the costs of its competitors. General Motors (GM), for example, has experimentally linked its CAD/CAM and order-entry systems to its suppliers' production systems. The systems have helped GM reduce costs through electronic links among organizations and improve efficiency and scale in production and distribution (Cash & Konsynski, 1985).

American Hospital Supply (AHS) was successful in using an order entry-distribution system by linking the majority of its customers to AHS computers. The system has helped AHS simplify ordering processes for customers and reduce costs for both AHS and the customers. This allowed AHS to develop pricing incentives for customers across all product lines and has resulted in increasing customer loyalty and AHS's market share (Barrett, 1986; Gibson & Jackson, 1987; Ward et al., 1990).

Similarly, Canon, in pursuing the low cost strategy, applied a materials-handling and automated parts-selection system to control parts inventory and selection. As a result, Canon has succeeded in building a low-cost copier assembly process (Porter & Millar, 1985).

Differentiation strategy. Differentiation generally refers to the addition of unique features to a product or service that are perceived to be unique by consumers. For instance, Epson, a manufacturer of personal computers and printers, has offered a set of computer-based services to its retailers, distributors and end users. In order to strengthen relationships with their customers, Epson has used IT to implement a differentiation strategy. Epson contracted with CompuServe, Inc. for space on its new videotex network. Callers could connect their computers with CompuServe through a local dial-up number. Only Epson's intermediaries could download technical and pricing information about product lines, read Epson's electronic newsletter, and correspond via electronic mail. Others could access public files for news and feature stories about Epson's products or participate in conference calls to exchange information. These services helped Epson distinguish its product line by expanding it through the use of IT provided by CompuServe (Wiseman, 1985).

Similarly, American Express has successfully developed differentiated travel services for American Express card holders through the use of IT. These services include arranging travel and monitoring of customer expenses. Computers have helped American Express search for the lowest airplane fares, track travel expenses for each customer, and print out monthly statements (Porter & Millar, 1985).

Focus strategy. The focus strategy is usually used in combination with the low cost or differentiation strategy. A firm pursuing this strategy chooses to concentrate on a particular market niche instead of the entire industry. For instance, a consortium of small stock brokerage and investment companies with various specialties developed an IT application system whereby

targeted customers can access their services through a home banking network offered by a major West Coast Bank. The target customer for this product is the investor with a portfolio of \$40,000 or more. Through the IT system the consortium was able to offer a flexible range of integrated services at a lower price than its competitors (Cash & Konsynski, 1985).

Innovation strategy. Innovation involves introducing a new product, service, process or way of doing business that transforms the relationships and competitive forces in the industry. A case in point is Merrill Lynch. In 1977, the company announced a new product, Cash Management Accounting (CMA), which combined charge card, checking account and brokerage services into one product. The product would never have left the idea pad without a complex IT interface of communications and data processing between the Merrill Lynch brokerage offices and Bank One, a bank holding company which acts as the check and credit card processing center for the CMA accounts. With this product-based strategic innovation thrust, made possible by IT, Merrill Lynch preempted the market for four years (Benjamin et al., 1984).

Comp-U-Card International (CUC) is another company which employed IT to implement an innovation strategy. CUC acted as the shopper's agent. Its business provided a telephone-based service to members who want to compare prices of brand name products across the country. The original CUC service kept information on products manually. In 1979, CUC automated its data base of over 60,000 items and introduced the first interactive home computer shopping service, a strategic innovation thrust developed by IT. This innovation helped the company compete successfully in price vis-a-vis its competitors (Wiseman, 1985).

Growth strategy. Growth may come from expansion in volume or geographical distribution, or from product-line diversification. IT can be of considerable help in the management of rapid growth. Wal-Mart is a classic example to illustrate the success in using IT to achieve the growth strategic thrust. The company had plans to double sales every 2 or 3 years and expand geographically to as many as 125 new stores annually. Wal-Mart's past conquests and future prospects combined an aggressive expansion with a state-of-the-art computerized merchandise IT, a strong distribution network and a progressive employee relations program. By using IT, Wal-Mart was able to pressure its suppliers to lower their prices which allowed Wal-Mart to operate as a low-cost discounter and dominate the market wherever it has stores (Barmash, 1984).

Similarly, Yellow Freight, one of the nation's largest trucking companies, employed IT to expand its operations during the recession of the early 1980s. The company invested heavily in the construction of new terminals, increasing its network from 248 in 1980 to 440 in 1983. It also increased investments in information and telecommunication systems. Yellow Freight's success would not have been possible without an elaborate electronic network (Wiseman, 1985).

IT can also help firms develop and implement a global growth strategy by providing the firm with the ability to coordinate its activities worldwide. For instance, Dow Jones developed the page transmission technology that links its 17 U.S. printing plants to produce a truly national newspaper. The advances in communication plants allow Dow Jones to move toward a global strategy. As a result, it started the Asian Wall Street Journal and The Wall Street Journal-

European Edition and shares much of the editorial content while printing the papers in plants all over the world (Porter & Millar, 1985).

Strategic Alliances. A strategic alliance gains competitive advantage by achieving growth, differentiation, or cost advantages via marketing agreements, joint ventures, or acquisitions. IT may be used to support strategic alliance thrusts through the use of information systems which Wiseman (1985) calls strategic information system (SIS) alliances. Competitive advantage may be achieved by employing the firm's key information system assets, those of the firm's ally, or those that will be developed as a result of the alliance.

An example is the alliance between IBM and Computervision Corp., a leader in CAD/CAM software. Computervision formed an alliance by offering its information system and hardware system to IBM, whereby the former became a value-added remarketer of certain IBM computer models. Although at that time Computervision was one of IBM's competitors in the marketplace, IBM realized that it could not satisfy the needs of customers in every niche. Forming the alliance has resulted in increased sales for both companies (Wiseman, 1985).

In another instance, American Express acquired Investors Diversified Services (IDS) from Allegheny Corporation to leverage existing information system assets. In the past, American Express has penetrated its markets only through direct mail. The acquisition allowed American Express to tap into IDS's vast market of over 1.1 million customers. This example shows how an SIS alliance can help a firm create new channels of distribution for its products or services.

Internal

Staff cost reduction. This can be perceived in terms of reduction of the number of employees in the organization. Inncorp, a manager of hotels and conference centers in New England, illustrates the effective use of IT in this area. The company used IT to centralize and integrate its activities. Previously, it had allowed each hotel to operate independently with its own accounting staff and purchasing department. However, with the development of an IT system, Inncorp reduced the number of local staff required to run a hotel and cut its normal operating expenses (Wiseman, 1985).

Employees' work-performance improvement. Rather than reduce the cost of staff, companies may choose to seek higher work-performance among their employees. Xerox has succeeded in this area by utilizing a field work support system to help its customer service representatives serve their customers. The system supported its representatives with computerized access to customer information and previous call histories, thereby aiding a representative's ability to solve any problems which might occur. As a result, Xerox improved customer satisfaction through faster and high quality response time. Also, the number of calls which each representative was able to make has increased (Benjamin et al., 1984)

Executives' decision-making improvement. Decision-making is one of the important elements in business success. Today the use of IT can substantially aid decision-making through a variety of systems such as executive information systems (EIS), decision support systems (DSS) and expert systems. Fisher-Price, a manufacturer of toys and juvenile products, has applied EIS to help its executives make better decisions. The system provides the executives immediate access to the company's status reports, as well as the ability to seek answers to any questions with access to the appropriate information from an on-line system. As a result, EIS provides Fisher-Price with the ability to respond to rapidly changing markets (Volonino & Drinkard, 1989).

SUCCESS OR FAILURE?

Some studies have investigated the success rates that result from using IT applications. Mowshowitz (1976), for example, studied the impact of IT systems in North America. He found that 20% of the systems implemented achieved their intended objectives, 40% failed and the remaining 40% made only a marginal impact on the organization. McCosh (1984) reported on 15 small-scale decision support systems which he was personally involved in designing. He estimated that only 5 of the 15 (33%) were successful. In a survey of 92 systems, Pomfrett et al. (1985) reported a failure rate of about 23%. Wroe (1986), who examined 10 systems implemented by small builders, found that 4 were rated as successful, 4 were discontinued even before implementation and in 2 of the cases the companies continued to struggle with implementation even after a long period of time. Of the 20 Office Automation projects sponsored by the Department of Trade and Industry, only 15 were continued when the trial period was over (DTI, 1986). Some that were continued, however, failed to achieve their planned objectives. All these studies demonstrate that the implementation of IT systems is a high risk process. Complete failure is not unusual and marginal impact with unwanted and negative results is common.

HYPOTHESES

Based upon the foregoing discussion, the following hypotheses were tested in this study:

- H1: The degree of effectiveness in IT utilization varies among the different strategic opportunities.
 - H1.A: The degree of effectiveness in IT utilization varies among the different strategic opportunities in manufacturing companies.
 - H1.B: The degree of effectiveness in IT utilization varies among the different strategic opportunities in service companies.
 - H1.C: The degree of effectiveness in IT utilization varies among the different strategic opportunities in retail companies.

- H1.D: The degree of effectiveness in IT utilization varies among the different strategic opportunities in small-size companies.
- H1.E: The degree of effectiveness in IT utilization varies among the different strategic opportunities in medium-size companies.
- H1.F: The degree of effectiveness in IT utilization varies among the different strategic opportunities in large-size companies,
- H2: The level of success in using IT applications is significantly different among manufacturing, service and retail companies.
- H3: The level of success in using IT applications is significantly different among small-size, medium-size and large-size companies.

METHODOLOGY

Sample

Three hundred companies were randomly selected from Standard and Poor's Register of Corporations (1993). The sample was taken from 3 different types of industries; that is: (a) manufacturing (SIC 2011-3999); (b) service (SIC 7011-8999), and (c) retail (SIC 5211-5999). This set of industries was selected in order to represent the range of diversity in IT utilization.

Data Collection

A survey instrument was used for data collection. Presidents or chief executive officers were asked to rate their organizations' current uses of IT. The survey contained 6 questions relating to the use of IT for achieving competitive advantage in the marketplace, 3 questions on the use of IT for improving key internal operations, and a final question regarding the level of success experienced in using IT applications to achieve the organization's objectives. This "level of success" question was used instead of the traditional ROI measure because the latter is not always the correct criteria to apply when considering the strategic impact of IT investments (Parsons, 1983).

The responses to the questions were scored on a 7-point Likert scale, with 1 indicating that the respondent strongly disagrees with the statement concerning IT, and 7 denoting that the respondent strongly agrees with the statement.

Despite follow-up attempts, only 65 questionnaires were returned. Of those returned, 27 represented manufacturing companies, 24 service companies and 14 retail companies. A total of 25 were small companies (1 to 100 employees), 19 were medium-size companies (101 to 500) and 21 were large companies (over 500).

Statistical Techniques

The degree of effectiveness in IT utilization was measured by the mean of responses on each strategic variable. One-way analysis of variance (ANOVA) was used to determine the existence of differences among the means of the different types of IT applications. If the results indicate that there is a significant difference among such means, it can be assumed that IT applications in at least one of the strategic areas is more or less effective than in the other areas. The Tukey pairwise comparison test was then used to determine which pairs of variable means were significantly different. This method was employed to group together those strategic areas which showed the same degree of effectiveness of IT application. Because of the presence of collinearity in the data set (see Table 1), multiple regression was deemed not suitable in this study and hence was not used. Collinearity usually results in the signs of some estimated regression parameters to be opposite of what is expected and thus may lead to false conclusions (Aczel, 1989).

Table 1. Descriptive Statistics and Intercorrelation Matrix

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Lower cost of product/service	5.28	1.52		*0.69	*0.67	*0.35	*0.50	*0.45	*0.48	*0.51	*0.33	*0.56
2. Differentiation	4.66	1.75			*0.67	*0.49	*0.53	*0.52	*0.30	*0.48	*0.24	*0.42
3. Focus	5.00	1.56				*0.23	*0.50	*0.37	*0.47	*0.46	*0.32	*0.51
4. Innovation	4.55	1.87					*0.46	*0.38	*0.20	*0.44	*0.18	*0.41
5. Growth	5.25	1.61						*0.43	*0.38	*0.39	*0.25	*0.40
6. Alliance	4.38	1.79							*0.34	*0.24	0.02	*0.26
7. Staff cost reduction	5.42	1.54								*0.66	*0.50	*0.57
8. Employees' work-performance improvement	5.62	1.32									*0.49	*0.64
9. Executives' decision-making improvement	5.66	1.38										*0.50
10. Success in using IT applications	5.58	1.27										

*Significant at $p < .05$.

ANALYSIS AND DISCUSSION

Table 1 presents the comparison of the mean of each variable for the entire sample. The results show that the use of IT in each area appeared to be effective, with the mean score greater than 4.00 for all variables. In order to be able to conclude with any degree of certainty that these means were not equal to each other, ANOVA was applied. Table 2 contains the results of the ANOVA test. The resulting F-ratio has a p-value less than .05; hence, it can be concluded that there were statistically significant differences in the effectiveness among the IT applications. Hypothesis H1 is therefore supported.

**Table 2. ANOVA on All Companies (Variable 1 - Variable 10)
 Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	65	343	5.28	2.30
2. Differentiation	65	303	4.66	3.07
3. Focus	65	325	5.00	2.44
4. Innovation	65	296	4.55	3.50
5. Growth	65	341	5.25	2.59
6. Alliance	64 *	280	4.38	3.19
7. Staff cost reduction	65	352	5.42	2.37
8. Employees' work-performance	65	365	5.62	1.74
9. Executives' decision-making	65	368	5.66	1.91
10. Success in using IT applications	65	363	5.58	1.62

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	128.04	9.00	14.23	5.75	0**	1.89
Within Groups	1580.20	639.00	2.47			
Total	1708.24	648.00				

* Variable 6 has count = 64 (instead of 65) because of one missing value

** Comparison is significant at $p < .05$

The Tukey pairwise comparisons indicate that the group of IT applications which had the highest degree of effectiveness were those used in lowering the cost of product or service, reducing staff costs, improving employees' work performance and improving executive decision-making. On the other hand, the group of IT applications which showed the lowest degree of effectiveness included those used for achieving strategic alliance, differentiation and innovation.

Further analysis was focused on each company by industry type and size to determine whether the results would be similar to those derived from the entire sample. Table 3 presents the ANOVA analysis for manufacturing firms. The results indicate that there were significant differences among the effectiveness of IT applications within the manufacturing industry; therefore, hypothesis H1.A is supported. The Tukey pairwise comparisons indicate that all of the IT applications relating to improving key internal operations were the most effective, while the use of IT to obtain strategic alliance and differentiation were less effective.

**Table 3. ANOVA on All Manufacturing Companies (Variable 1 - Variable 10)
Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	27	141	5.22	2.41
2. Differentiation	27	126	4.67	3.00
3. Focus	27	129	4.78	2.10
4. Innovation	27	132	4.89	3.79
5. Growth	27	143	5.30	1.91
6. Alliance	27	112	4.15	3.21
7. Staff cost reduction	27	152	5.63	1.86
8. Employees' work-performance	27	152	5.63	1.32
9. Executives' decision-making	27	161	5.96	1.11
10. Success in using IT applications	27	150	5.56	1.41

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	74.21	9	8.25	3.73	0*	1.92
Within Groups	575.26	260	2.21			
Total	649.47	269				

* Comparison is significant at $p < .05$

Among the service companies, IT's effectiveness was very high, with all but one variable mean exceeding 5.00. However, the comparison of the differences between IT areas was not significant at the .05 level (see Table 4). Hence, hypothesis H1.B was not supported. It can therefore be concluded that none of the IT strategic applications was less effective than the others. This finding may have resulted from the fact that service companies comprise those whose products and processes focus on information. Therefore, most of the IT patterns of utilization can be applied to the company's strategies (Jarvenpaa & Ives, 1991).

**Table 4. ANOVA on All Service Companies (Variable 1 - Variable 10)
 Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	24	134	5.58	1.73
2. Differentiation	24	119	4.96	2.74
3. Focus	24	122	5.08	2.95
4. Innovation	24	120	5.00	2.61
5. Growth	24	137	5.71	1.43
6. Alliance	23 *	116	5.04	2.13
7. Staff cost reduction	24	127	5.29	2.22
8. Employees' work-performance	24	138	5.75	1.76
9. Executives' decision-making	24	125	5.21	2.35
10. Success in using IT applications	24	137	5.71	1.35

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	22.31	9	2.48	1.17	0.32**	1.92
Within Groups	486.91	229	2.13			
Total	509.22	238				

* Variable 6 has count = 23 (instead of 24) because of one missing value
 ** Comparison is significant at $p < .05$

Retail companies were found to have low IT utilization means with respect to the attainment of innovation and alliance strategies, having a variable mean of less than 4.00 in each case (see Table 5). The Tukey comparisons indicated that IT's role in achieving innovation and alliance strategies was less effective than in the other areas, whereas IT's role in achieving the focus strategy as well as improving employees' work performance and executives' decision making was the most effective in this company type. The results lend support to hypothesis H1.C.

**Table 5. ANOVA on All Retail Companies (Variable 1 - Variable 10)
Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	14	68	4.86	3.05
2. Differentiation	14	58	4.14	3.82
3. Focus	14	74	5.29	2.37
4. Innovation	14	44	3.14	2.29
5. Growth	14	61	4.36	5.17
6. Alliance	14	52	3.71	4.07
7. Staff cost reduction	14	73	5.21	3.87
8. Employees' work-performance	14	75	5.36	2.71
9. Executives' decision-making	14	82	5.86	2.44
10. Success in using IT applications	14	76	5.43	2.73

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	94.44	9	10.49	3.23	0*	1.95
Within Groups	422.79	130	3.25			
Total	517.22	139				

* Comparison is significant at $p < .05$

In analyzing firms of different sizes, the ANOVA and Tukey results indicated that for small companies IT was not helpful in the areas of strategic alliance, innovation and differentiation, but was very helpful in improving executives' decision making and employees' work performance (see Table 6 for ANOVA results). Hence, hypothesis H1.D was supported.

**Table 6. ANOVA on All Small Companies (Variable 1 - Variable 10)
 Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	25	133	5.32	1.81
2. Differentiation	25	114	4.56	2.59
3. Focus	25	122	4.88	2.44
4. Innovation	25	108	4.32	3.39
5. Growth	25	123	4.92	2.49
6. Alliance	24*	98	4.08	3.38
7. Staff cost reduction	25	131	5.24	2.77
8. Employees' work-performance	25	142	5.68	1.81
9. Executives' decision-making	25	152	6.08	1.16
10. Success in using IT applications	25	142	5.68	0.98

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	91.76	9	10.2	4.47	0**	1.92
Within Groups	544.63	239	2.28			
Total	636.39	248				

* Variable 6 has count = 24 (instead of 25) because of one missing value
 ** Comparison is significant at $p < .05$

Medium-size companies found IT to be very useful in improving employees' work performance but not useful in strategic alliances (see Table 7 for ANOVA results). Hence, hypothesis H1.E was supported.

**Table 7. ANOVA on All Medium-Size Companies (Variable 1 - Variable 10)
Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	19	105	5.63	2.49
2. Differentiation	19	97	5.11	3.65
3. Focus	19	104	5.47	2.04
4. Innovation	19	87	4.58	4.48
5. Growth	19	104	5.47	3.26
6. Alliance	19	83	4.37	3.58
7. Staff cost reduction	19	111	5.84	1.36
8. Employees' work-performance	19	113	5.95	0.94
9. Executives' decision-making	19	108	5.68	1.56
10. Success in using IT applications	19	108	5.68	1.78

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	47.47	9	5.27	2.1	0.03*	1.93
Within Groups	452.74	180	2.52			
Total	500.21	189				

* Comparison is significant at $p < .05$

As for the large companies, there were no statistically significant differences among the effectiveness of IT applications in each area of strategic opportunity (see Table 8 for ANOVA results). Thus, hypothesis H1.F was rejected. This finding is consistent with the study by Dearden (1987) which indicates that most large companies have been successful in exploiting IT for both internal purposes and gaining external competitive advantage in the marketplace.

Finally, in regard to the all-important question of whether IT investment was justified in terms of achieving corporate objectives, the findings show that 66% of the respondents answered "agree" or "strongly agree" (score of 6 or 7), 29% indicated they made only marginal gains (score of 3, 4, or 5) while only 5% failed in their utilization of IT in attaining objectives (score of 1 or 2). It is worthwhile to note that the success rate of IT found in this study is much higher than the one found in an earlier study by Mowshowitz (1976) which reported only a 20% success rate.

**Table 8. ANOVA on All Large Companies (Variable 1 - Variable 10)
 Summary**

Variable	Count	Sum	Mean	Variance
1. Lower cost of product/service	21	105	5.00	2.80
2. Differentiation	21	92	4.38	3.15
3. Focus	21	99	4.71	2.71
4. Innovation	21	101	4.81	2.96
5. Growth	21	114	5.43	2.16
6. Alliance	21	99	4.71	2.71
7. Staff cost reduction	21	110	5.24	2.79
8. Employees' work-performance	21	110	5.24	2.29
9. Executives' decision-making	21	108	5.14	2.83
10. Success in using IT applications	21	113	5.38	2.35

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	21.95	9	2.44	0.91	0.52*	1.93
Within Groups	535.05	200	2.68			
Total	557	209				

* Comparison is significant at $p < .05$

Surprisingly, however, the results indicate that the success level in using IT applications to achieve a company's objectives was not significantly different among manufacturing, service and retail companies (see Table 9). Hence, hypothesis H2 was rejected. In other words, even though companies in different industries may have applied IT applications in different ways, each of them can still successfully exploit IT to achieve its objectives in its own ways.

Similarly, the results also indicate no significant differences in success level across company size (see Table 10). Thus, hypothesis H3 was rejected. This supports the conclusion that IT can be equally effective (or ineffective) in accomplishing the objectives of small, medium or large companies. This finding, however, is inconsistent with the prior study by Wright and Rhodes (1985) which noted that large companies were more successful in utilizing IT than smaller companies because of greater experience and understanding of IT and its applications. The results of the present study may be explained by the fact that today there are many sophisticated systems available in the marketplace which can be used by medium-sized and even small companies.

**Table 9. ANOVA on Level of Success in Using IT Applications
(Grouped by Company Type)
Summary**

Groups	Count	Sum	Mean	Variance
Manufacturing	27	150	5.56	1.41
Service	24	137	5.71	1.35
Retail	14	76	5.43	2.73

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.73	2	0.37	0.22	0.8*	3.15
Within Groups	103.05	62	1.66			
Total	103.78	64				

* Comparison is significant at $p < .05$

**Table 10. ANOVA on Level of Success in Using IT Applications
(Grouped by Company Size)
Summary**

Groups	Count	Sum	Mean	Variance
Small	25	142	5.68	0.98
Medium	19	108	5.68	1.78
Large	21	113	5.38	2.35

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.29	2	0.64	0.39	0.68*	3.15
Within Groups	102.5	62	1.65			
Total	103.78	64				

* Comparison is significant at $p < .05$

CONCLUSION

The results of this empirical study have provided executives with insights into the potential benefits of utilizing IT in their organization. Tables 11 and 12 provide a comparison of the effectiveness of IT applications by company type and company size. Note that there were only 3 IT strategic opportunities, viz., strategic alliance, innovation and differentiation, which showed a low degree of effectiveness in this study. This does not imply that IT cannot be used to achieve these objectives. One explanation for the low ratings may be that some of the respondents in this study did not form any alliance with other companies. In the case of strategic innovation and differentiation, the findings here are consistent with Clemons and Kimbrough's (1986) study which suggested that although IT can help an organization execute the innovation and differentiation thrusts, competitors can also exploit IT to imitate these new or distinguished products in a short period of time. Therefore, many organizations feel that these two IT strategies seldom confer competitive advantage.

Table 11. The Degree of Effectiveness of Each IT Strategic Opportunity (by Company Type)

IT Strategic Opportunity	Company Type		
	Manufacturer	Service	Retailer
Lower cost of product/service	*	*	*
Differentiation	Lower	*	*
Focus	*	*	High
Innovation	*	*	Lower
Growth	*	*	*
Alliance	Lower	*	Lower
Staff cost reduction	High	*	*
Employees' work-performance improvement	High	*	High
Executives' decision-making improvement	High	*	High

NOTE: * indicates no statistically significant difference in the degree of effectiveness at $p < .05$.

Table 12. The Degree of Effectiveness of Each IT Strategic Opportunity (by Company Size)

IT Strategic Opportunity	Company Size		
	Small	Medium	Large
Lower cost of product/service	*	*	*
Differentiation	Lower	*	*
Focus	*	*	*
Innovation	Lower	*	*
Growth	*	*	*
Alliance	Lower	Lower	*
Staff cost reduction	*	*	*
Employees' work-performance improvement	High	High	*
Executives' decision-making improvement	High	*	*

NOTE: * indicates no statistically significant difference in the degree of effectiveness at $p < .05$.

Furthermore, it should be noted that although many past and current studies have indicated that IT can be applied to achieve competitive advantage in the marketplace, the majority of the companies in this study have indicated that IT was still most useful for improving key internal operations. Perhaps, as pointed out by Lucas and Turner (1982) and McFarlan et al. (1983), many companies have failed to utilize IT's full power, and many executives do not have enough knowledge about IT and therefore have not paid much attention to the external strategic opportunities. In consequence, some of the external strategic opportunities presented by IT may have been neglected.

Although this study has shown that some IT strategies may be less appropriate or helpful for companies of a certain type or size, the level of success in using IT applications to achieve the company's objectives was not significantly different among firms of different industry backgrounds and sizes. It may be concluded that although each company has effectively exploited IT applications in different ways, each of them can successfully utilize IT to accomplish their objectives in their own ways.

In general, this study suggests that some IT strategies may be potentially less feasible within some particular types or sizes of companies. But it is important to note that the effectiveness of IT in taking advantage of internal and external strategic opportunities is not determined only by company type or size. The organizational environment and management structure also exert influences over the choice of IT strategies (Miller, 1988). This study, nonetheless, provides useful insights for senior executives in assessing the appropriateness of particular IT strategic applications for their organizations.

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