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MARKETING INFORMATION SYSTEMS USAGE IN TAIWAN'S TOP 1000 COMPANIES

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ABSTRACT

Taiwan is a small nation with not so well endowed natural resources. Its lifeblood lies in international trade. Effective marketing is of the utmost importance to those companies who are facing local or global competition. This paper surveys the marketing executives of the top 1000 companies in Taiwan and reports the status of marketing information systems (MkISs) in their companies. The results are compared with the U.S. status reported in 1995. One hundred and thirty-one companies participated in this study. The data provide insights into the weaknesses of MkISs in Taiwan. Some viable actions are recommended to improve the usage of MkISs and to reshape the future of these systems in Taiwan.

Keywords: marketing, information systems, computer-based information systems, environmental information, marketing mix decisions, marketing management.

INTRODUCTION

The globalization of the marketplace in recent years has intensified business competition throughout the world. Today's marketing executives are facing an ever expanding and rapidly changing marketing environment (30). They are receiving more information from both internal and external sources through the help of improved computer technology and databases (9). There is a definite need for marketing executives to process more data for decision-making at all levels of managerial activities. In order to handle the ever-increasing amount of internal and external information and to improve decision quality, the need to establish an MkIS in one's company is never before so great. This need is felt even greater in the island country of Taiwan.

Taiwan is a small country about one-tenth of the size of California in the U.S. Its population (21.9 million) is about two-thirds of California, concentrating mostly on the western half of its main island. Its natural resources are scarce: thus its national economy depends heavily on foreign trades. In the last decade, Taiwan has gone through dramatic political and economic changes and become a truly democratic society. Its currency, the New Taiwan Dollar (NT\$), has been appreciated over 20% against U.S.

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dollar, from 40:1 to 32:1 exchange rate. The country has been a major trading partner of the U.S. since the early 1950s. During the last 25 years, it has gradually transformed its developing economy into a mature economy (27). Albeit its limited natural resources, Taiwan has raised its per capita GNP (gross national product) over one hundred fold in 40 years, from US\$81 in 1952 to US\$8,742 in 1992 (8, 26). In 1996 and 1998, it reached US\$12,838 and US\$11,982, respectively. The average annual growth of GNP is 8.6% before the recent Asia Pacific economic crisis. Its population was about 0.4% of the world population but its GNP is about 1% of the global GNP. At the end of 1998, its foreign exchange reserve (US\$90.3 billion) was the third largest in the world, only behind Japan and the People's Republic of China. Trading appears to be the lifeblood of this country. Without trading, Taiwan could never have made the transition. Specifically, exports and imports are the major contributors to Taiwan's economy. The former has accounted for over 40% and the latter for over 35% of its GNP. The trade surplus with the U.S. as a percentage of its GNP has been more than 10% since 1983 (28). Taiwan's export to and import from the U.S. in 1999 were 30.90 and 19.69 billion U.S. dollars respectively -giving a surplus of 11.21 billion. All these conditions indicate that Taiwanese companies are strong competitors for their American counterparts. They have been in direct competition with American companies for the goods they sold in the U.S. and around the world.

The purpose of this study is to apply the MkIS model proposed by Li (15) to exploring the current status of MkISs in Taiwan's top 1000 companies. The results are then compared with those of the U.S. study reported by Li (15) in 1995. This allowed us to identify the weaknesses of MkIS usage in Taiwan. The rationale is that the advancement of MkISs in the U.S. does not sit still. If the U.S. companies in 1995 had better achievement than today's Taiwanese companies, by now they should be far better than their Taiwanese counterparts. This condition indicates a major weakness of Taiwanese companies. Such comparison should help the top management in Taiwan to reshape the future of MkISs in their companies.

[LITERATURE REVIEW](#)

The use of information systems to support marketing functions may be traced back to the 1960s. Before there was a term of "marketing information system," marketers were using the computer to run the mathematical models for solving marketing decision problems (14). In the Fall of 1966, Kotler (13) published an article to propose an architecture for building a "marketing information and analysis center" (MIAC) in a business firm. One year later, Cox and Good (6) coined the term "marketing information system" (MkIS). Since then, several more MkIS models have been proposed (1, 5, 12, 16, 17, 20, 21, 13).

A review of MkIS literature reveals that there are various surveys of MkIS usage in the U.S. (2, 4, 9, 15, 16, 17, 20, 21, 22, 30). More recently, Li (15) modified McLeod and Rogers' model (21) and proposed a comprehensive MkIS model as shown in Figure 1. In this model, Li depicts an MkIS as a computer-based system being supplemented by non-computerized systems. The system consists of input, process, and output subsystems to support marketing management activities. Based on his model, we may define an MkIS as an integrated system consisting of several subsystems that gather and process data to produce information about product, price, place, and promotion (i.e., the 4 Ps) in order to assist marketing managers at all organizational levels in making decisions and meeting the needs of customers. The top-level managers include corporate vice presidents of marketing or sales who are responsible for strategic

marketing activities such as analyzing market structure and behavior, customer orientation and advocacy, positioning the company in the value chain, deciding on strategic alliances, etc. the middle-level managers include regional/business unit managers or directors who are responsible for

tactical marketing activities such as market segmentation and targeting, positioning the product, deciding on when and how to partner, etc. the low-level managers include branch/office managers or supervisors who are responsible for operational marketing activities such as responding to customer needs, developing long-term relationships with customers and resellers, sales and sales-force management, implementing and controlling marketing efforts, etc. (29, 33). A successful MkIS is the one that supports the activities at all these three levels of management. Such a system is very complex and has been regarded as the nerve center of a company. However, it is very expensive to build and operate. This is perhaps why very few companies have implemented a complete MkIS.

Li applied the aforementioned model and developed a questionnaire to survey the top 1000 companies in the U.S. The results were compared with a similar survey reported in 1985 by McLeod and Rogers (21). He found that the MkIS support for management levels and for marketing-mix ingredients - product, price, place, and promotion - is becoming more and more balanced. Furthermore, more and more PCs are being used to support MkIS. Information about governments, economy, competitors, and prospects are not computerized as much as we need. The marketing plan, in general, is not integrating with the CBIS plan as much as it should. The results of Li's study will be very helpful to us. We shall compare his results with those of our current study.

RESEARCH METHOD

Subjects

The subjects of this study were the marketing executives from the top 1000 companies in Taiwan (7). A questionnaire concerning the use of MkIS and a letter with instruction for completing the questionnaire were sent to these marketing executives. Six weeks later, a second mailing was sent to the non-respondents. Eventually, 141 executives (14.1%) returned the questionnaire within three months. However, ten of them were unusable due to excessive invalid responses or missing values. This left us with 131 usable samples, giving a response rate of 13.1%. Among these usable samples, 42 were returned in the first wave while 89 were in the second wave. Table 1 displays the characteristics of these respondents. Tables 2 and 3 indicate, respectively, the industry type and the size (in net sales and the number of employees) of the companies in the population and the responded sample.

Questionnaire

For comparison purposes, the questionnaire used in this study was adapted from Li (15). In addition to the questionnaire items, several demographic questions were included in order to validate the representativeness of the subject group.

Analyses of Data Representativeness

In order to examine the representativeness of the data, the demographic distributions (industry type and company size) of the respondents (the sample) were tested against the same distributions of the 1000 companies (the population). No significant difference at the 0.05 level was found in any demographic distribution, indicating the sample is representative of the population. Next, a series of chi-square and Mann-Whitney tests were conducted between the 123 respondents and the eight respondents of unknown industry type and company size. No significant difference at the 0.05 level was found on any question in the questionnaire between the two groups. This allowed us to include the eight respondents in the study, giving us a sample size of 131 in total.

As for the non-response bias, a series of chi-square and "t" tests were then conducted between the usable samples from the two waves of mailing. Since no significant difference at the 0.05 level was found on any question in the questionnaire between the two waves of samples, we thus concluded that there was no significant late-response bias and the two samples were regarded as coming from the same population. This allowed us to merge the two samples as one for further analyses of frequency distributions and cross tabulations.

ANALYSES AND RESULTS

CIS and Marketing Plans

Most of the responding companies (87%) had company-wide computer-based information systems (CBISs). Many (71.9%) of these companies had formal written CBIS plans. Among the latter companies, 65.9% of them indicated that their CBIS plans were influenced by their marketing strategies. Moreover, 74% of the responding companies had formal written marketing plans. This was significantly lower than the 89.4% of the U.S. companies. Among these Taiwan companies, a surprising majority of them (97.9%) did exploit their information resources in their marketing plans. In other words, 72.3% of the total respondents in Taiwan were integrating their information resources with their marketing plans. This revealed that the top companies in Taiwan not only valued the information resources in their companies but also were incorporating the use of these resources in their marketing plans.

Hardware Usage

Most (87.8%) of the responding companies in Taiwan used the computer to assist their MkISs, somewhat fewer than those in the U.S. (95.1%). The most popular type of computer hardware used by the MkISs in Taiwan was PC or workstation (52%), followed by minicomputer (19%), mainframes (14%), multi-user micros (13%), and supercomputers (1.3%). This might be due to the price performance of a PC being much higher than that of a larger computer. Moreover, the cost of a PC has been dropping dramatically during the recent years, making it more affordable for a user to own one. In addition, the recent advent of client-server computing might have rendered the upswing of PC computing.

Software Usage

The types of computer software being used in Taiwan were very different from those used in the U.S. (Figure 2). Fourth generation languages or integrated software (1%) and conventional 3rd generation programming languages (9%) were not used as much in Taiwan as in the U.S. (13% and 26%, respectively). Moreover, many Taiwan companies were using other software (50%) such as word processors and presentation software. This was probably due to the popularity and affordability of office automation software in Taiwan such as Microsoft Office, Lotus Smartsuite, etc. Not many companies were willing to pay for the high price of 4th generation integrated software running mainly on minicomputers or other larger computers. Neither were they willing to pay for nor rely on application systems written in less-flexible 3rd generation languages. As for the other types of software, there were no significant differences with those in the U.S. One expected outcome was that the use of artificial intelligence (A.I.) technology such as expert system shells and logic programming languages was very minimal in both countries.

Frequency of Computer Usage

Many marketing executives in Taiwan (82%) were using computers daily. This was perhaps due to the newly available access to the World Wide Web on the Internet that has been increasingly popular in Taiwan since 1994. By now, the friendly graphical user interface on the World Wide Web should have attracted more executives to use more of their computers.

Purposes of Computer Usage

The top four purposes of using computers in Taiwan were, in sequence: processing data (83%), producing reports (83%), retrieving data (82%), and storing data (80%). These were identified to the top four purposes reported in the 1995 U.S. survey. The large difference between the two countries was in "responding to inquiry" (U.S. 60% versus Taiwan 41%). It was probably due to the fact that printed reports were more popular than on-line screen output among Taiwan's marketing executives. Nevertheless, this picture would most likely change in the near future; more and more executives would get used to and use more of on-line inquiries.

Communications of Information

Traditionally, office communications in Taiwan were mainly through the phone (or voice mail) system. In addition, most respondents (96.9%) were transmitting data between the organizational units. Surprisingly, most of them were using facsimiles (84.7%) to communicate with their peers. Only 41.2% were using electronic mail systems in Taiwan; compared to 68% in the U.S. four years earlier. The use of computer conferences (9.2%) and videoconferences (6.1%) were limited in Taiwan. As for the more advanced information technologies such as hypertext, hypermedia conferences, they were not much (less than 4%) used. Moreover, many companies in Taiwan (84.1%) routinely routed marketing intelligence information to those managers with a need to know.

Information Content

Based on the number of top-ranking responses, the marketing executives in Taiwan regarded internal accounting/data processing as the most important (54%) source of information for MkISs, following by marketing intelligence (29%), and marketing research (17%). This was consistent with the perception of U.S. managers earlier.

The types of environmental data utilized by an MkIS include data about customers, prospects, competitors, national economy, and governments. Most companies in Taiwan had offices primarily assigned to collect information about customers (88.5%) and competitors (81.7%). Many fewer companies (36.6%) had offices devoted to collecting government information. However, Taiwan companies were not utilizing the environmental data as much as the U.S. companies (Figure 3). Neither did they computerize such data as much as the U.S. companies.

A similar pattern occurred in using the sources of computer information (Figure 4). Taiwan companies were not utilizing as much as the U.S. companies the possible sources of such information. To know their competitors, the companies in both countries were using corporate annual reports most often. While sales call reports were very frequently used in the U.S. (72%), they were least frequently (18%) used in Taiwan. Computerization of sales call reports exhibited the same contrast.

As for preprocessed information, such as sales forecasts, distribution trends, market share, inventory statistics, etc., 51.9% of the responding companies were making them available for real-time access. This was much lower than the U.S. companies (70%). However, many companies in Taiwan (77.1%) were having economic-trend estimates included in their marketing forecasts.

Support for Marketing Management

The U.S. companies were providing balanced support to different levels of managers. Ironically, the MkIS support in Taiwan went mainly to top-level managers (62%) while middle level (25%) and low level (13%) managers received much less support. This was significantly ($p < 0.00003$) different from the situation in the U.S.

In terms of supporting management functions, most support went to planning activities (52%), followed in sequence by controlling (26%), directing (15%), organizing (5%), and staffing (2%). This sequence was consistent with that of the U.S.

Support for Marketing-Mix Decisions

The marketing-mix decisions are related to product, price, place, and promotion. Most MkIS support in Taiwan went to pricing decisions (41%) and product decisions (38%). Promotion decisions (11%) and place/distribution decisions (10%) received much less support from the MkIS.

Use of Decision Models

There are many types of decisions made by marketing managers. The four most frequent decision

models used by Taiwan managers were: computing operating budgets (65%), new product evaluation (63%), pricing strategy (62%), and product decision (53%). This was consistent with the usage pattern of U.S. managers.

Although these decision models were the top four most likely models to be assisted by computers in the U.S., product deletion and new production evaluation were less likely to be computer-assisted in Taiwan (Figure 5). Approving credit, computing economic order quantity, and computing reorder point were more likely to be computer-assisted in Taiwan. In contrast, identifying facility location, selecting advertising media, and assigning salesperson to territories were more likely in the U.S.

Definition of MkIS

In the survey questionnaire, there were five definitions of MkIS given:

1. "A data bank that gathers data from the environment and makes that data available to a model bank of computer programs. The model bank produces output that is communicated to the manager on a display unit."
2. "A group of subsystems that gather information from the environment (customers, competition, government, etc.) and use that information to help the manager answer certain basic questions - What is our current situation, where do we want to be, what are the constraints, and what action should we take?"
3. "A group of subsystems - each representing an area of marketing activity - product, price, distribution channels, and promotion. Each subsystem helps the manager formulate and execute marketing programs."
4. "A group of four subsystems. Three are concerned with gathering data (marketing research, marketing intelligence, internal accounting). One subsystem includes decision models that convert the data into information."
5. "A group of subsystems - some gather data and some process it. The data gathering subsystems are marketing research, marketing intelligence, and internal accounting. The processing subsystems produce information about the major marketing activities - product, price, distribution channels, and promotion."

The executives were asked to select one of these five definitions or to give their own. The fifth definition was selected as the most popular in both countries (Taiwan 36% and U.S. 37%) and the second definition was significantly less popular in Taiwan (8%) than in the U.S. (23%). In fact, quite a few Taiwan managers (20%) indicated that their MkISs were simple systems that allow users to inquire or update data in the systems and require no decision modeling capability of the systems.

Perception Toward MkIS

When the executives were asked to think of their MkISs, 30% of them first thought of reports while 19.2% thought of data retrieval. This was consistent with their U.S. counterparts (31%). Significantly ($p < 0.01$) different from the U.S. executives, Taiwan executives thought of less data storage (0%) and different managers' information needs (13%), but more of computer equipment (11%) and data/file processing (14%).

Performance of MkIS

Li, McLeod and Rogers ([17](#)) suggested that the performance of MkIS be measured by both user's satisfaction with the MkIS and the competitive advantage created by the MkIS. Figure 6 reveals that more Taiwanese (69%) than American (55%) marketing executives thought that their MkISs had created some sort of competitive advantage for their companies. In addition, more Taiwanese (53%) than American (32%) marketing executives were satisfied (somewhat to very satisfied) with their MkISs. Almost all these satisfied executives in both countries (91% in Taiwan and 94% in the U.S.) agreed that their MkISs had given them competitive advantage. Many of the somewhat or

moderately dissatisfied executives also thought that their MkISs had created competitive edge. Those who were very dissatisfied did not think so at all. The latter was consistent with, but the former was different from, the perception of U.S. managers.

DISCUSSION

Contrary to our expectation, the current status of MkISs in Taiwan was quite laudable, comparing to the 1995 U.S. status. Although the MkISs in Taiwan had some significant weaknesses, it was encouraging to see that many marketing managers were experienced computer users. They were using computers (especially PCs) or terminals on a daily basis, primarily for storing, retrieving, processing data and producing reports. They utilized and computerized many decision models necessary for marketing function. These included allocating budgets, new product evaluation, product deletion, and pricing strategy. They were using mostly facsimiles to communicate or transmit data between different remote offices. They also were routinely routing marketing intelligence information to those managers with a need to know and included economic-trend estimates in their marketing forecasts.

Similar to the U.S. companies, the sources of marketing information in Taiwan included internal accounting/data processing, marketing intelligence, and marketing research. However, marketing research and marketing intelligence sources were not used as much as internal accounting/data processing source. Many Taiwanese companies had offices dedicated to maintain data about customers, competitors, and government. This was perhaps due to the low cost of labor that made having a dedicated office more affordable in Taiwan.

The two most commonly used software products in Taiwan were word processing, spreadsheet, and data management software. Many of them had company-wide CBISs as well as formal written CBIS plans. They also had formal written marketing plans that were linked with the CBIS plans - a sign of a mature CBIS growth stage (18, 25). Many marketing managers were satisfied with their MkISs. Comparing with the 1995 status of the U.S. companies, the companies in Taiwan seem to have the following weaknesses.

1. Some structured decision tasks in marketing such as approving credit, computing economic order quantity, and computing reorder point were more likely to be computerized in Taiwan than in the U.S. These tasks are routine, repetitive, and tedious. They are the basic MkIS applications and perfect candidates for automation. It seems that Taiwan companies emphasized on automating immediate cost saving low-level marketing management activities, much more than the U.S. companies.
2. Taiwan companies used and computerized environmental data much less than the U.S. companies. Specifically, data about competitors and economy were not entered into computerized databases as much as that in the U.S. not many companies were collecting data about economy and governments. This indicates that the companies in Taiwan were not using the available information efficiently and effectively. They should enter more marketing information into computerized databases and use more information technologies to make the needed information readily available at their fingertips.
3. The companies in Taiwan used less external clipping and reporting services for competitor information than those in the U.S. Such kinds of services were neither prevalent nor highly regarded in Taiwan. This is perhaps due to the value of information being very difficult to estimate. Taiwanese managers appeared to prefer the free information provided by newspapers, magazines, competitors' publications, or competitors' customers. They even preferred conducting their own market research activities than paying some outsiders for the needed information. Such mentality might not change until the information service providers in Taiwan earned their credibility and the cost of time and effort became too much to spare for the companies.
4. The MkIS support for management and marketing mix decisions in Taiwan companies was less balanced than that in the U.S. The support of MkIS in Taiwan went mostly to top management for planning activities such as allocating budgets, new product evaluation, product deletion, and pricing. Based on Li, McLeod, and Rogers (17) and Li (15), a

successful MkIS should have a balance of MkIS support for marketing management and mix ingredients. Certainly, any level of marketing management (e.g., top level) is as important as any other level (i.e., middle or low level). Likewise, any marketing mix ingredient (e.g., product) is as critical as any other ingredient (i.e., price, place, or promotion). The total success of a marketing system relies on the performance of all management levels and all mix ingredients. Therefore, the companies in Taiwan should strive for a balance of MkIS support in these two areas.

5. Not many managers in Taiwan (13%) thought of "different information needs" as their first impression about MkIS support, much fewer than the U.S. managers (23%) do. As the CBIS professionals are being trained to accept meeting users' requirements as the most important factor of CBIS success, most marketing managers, and perhaps all other users, in Taiwan are not used to this concept. They tend to take whatever information their MkISs can provide for granted. This calls for a nation-wide educational program to change the way the MkIS users evaluate both their information needs and the information systems that meet these needs.
6. Many more companies in Taiwan than in the U.S. lacked formal written marketing plans. For many years, corporate America has been criticized by its Japanese counterparts for making a decision so quickly that it usually takes a very long time to implement the decision because of unforeseen obstacles (32). If this is true then many top companies in Taiwan appear to be worse. They might act even without proper planning. This is evidenced by over one-fourth (26%) of the top companies in Taiwan not having formal written marketing plans. It is vital for these and other companies in Taiwan to know that planning is as important as implementation. A formal written plan is an indispensable communications tool. As marketing teams and staff are often changing, the plan can be easily reviewed and understood by those who follow. The plan also serves as the guidelines for implementation. Without this plan, neither implementation nor communications will be effective, and the project will most likely fail.
7. Taiwan companies used less 4th GL/integrated and 3rd GL software than those in the U.S. Relatively speaking, 4th GL software is very expensive in Taiwan. In addition, 3rd GL software requires special programming skills that a typical marketing manager does not have. This reveals that the companies in Taiwan were investing on information technology and providing programming support to marketing managers much less than those in the U.S.

CONCLUSIONS AND RECOMMENDATIONS

This study reveals that the MkIS status of top companies in Taiwan was somewhat similar to 1995 U.S. status, despite some obvious weaknesses. As time goes by, the MkISs in Taiwan are likely to become more balanced in supporting marketing management activities, similar to their U.S. counterparts. Environmental information would be more utilized and computerized. More marketing managers would regard information as a precious corporate resource. More investment would be placed on information technology, its related resources, and user education to foster the effectiveness of MkISs and the quality of marketing decisions.

As information technology innovation is susceptible to changes in government policy and institutional factors (3, 10, 11, 19, 22), the future of MkISs in Taiwan might be affected by the changes of policies, regulations, and economic conditions in that nation. In August 1994, Taiwan's government began establishing its "national information infrastructure" (NII) - an information superhighway across the island. A network comprising of ATM (asynchronous transfer mode) switches, fiber optic lines, and Ethernet-to-ATM hubs, was completed in February 1996. The latter devices serve as the "on-ramps" to the information superhighway for the existing myriad of Ethernet local area networks on the island. At the end of 1998, Taiwan's Internet service subscribers have reached 3.01 million, up 700 times from 4300 in June of 1995. Today, the network has direct broadband Internet connections with Australia, Hong Kong, Japan, Korea, Singapore, and the U.S. (24). Moreover, Taiwan's national legislature in January 1996 demolished the monopoly of Chunghwa Telecom, the only state-run telecommunications provider in the past. New foreign or domestic companies are venturing into the market installing networks with high-speed hybrid fiber coaxial

cable. The other change in the field is the cable TV network. According to the Government Information office, the proportion of Taiwan's households connecting to cable networks soared from 25% to 75% since cable TV was legalized in 1993 (31). Such big and fast strides in technological advancement would not be possible if Taiwan's geographic size were not small. All these conditions might allow Taiwan to become an intelligent, networked island capable of accessing, transmitting, and conferencing hypermedia information across the island and around the world sooner than we thought. Its companies might have better competitive edge against their American counterparts in the future. To cope with this pressure, it is imperative for corporate America to stay at the forefront of decision and information technologies, especially of network connectivity and accessibility. Nevertheless, as noted by Li (16), implementing latest reformation technologies is not enough to achieve a successful MkIS. Most of all, we must effectively manage and utilize information resources to gather, manage, and process information needed by marketing managers during their decision making processes. If the companies in both countries could follow this practice, we might see some increasingly intense but healthy competition between them in the years to come.

TABLE 1 Profile of Respondents

Legend for Chart:

A - Category

B - N(*)

C - %

A	B	C
Industry Type		
Services	28	22.8
Products	95	77.2
Job Title		
General Manager	6	5.0
Assistant Vice President	9	7.4
Manager	48	39.7
Assistant Manager	13	10.7
Section Chief	24	19.8
Marketing Specialist	21	17.4
Length of Employment in the Functional Area:		
0 to less than 5 years	62	52.1
5 to less than 10 years	40	33.6
10 to less than 15 years	9	7.6
15 to less than 20 years	6	5.0
20 years and over	2	1.7
Length of Employment in this Industry		
0 to less than 5 years	27	23.5
5 to less than 10 years	37	32.2
10 to less than 15 years	23	20.0
15 to less than 20 years	10	8.7
20 years and over	18	15.7
Length of Employment in the Company		
0 to less than 5 years	34	29.1

5 to less than 10 years	37	31.6
10 to less than 15 years	24	20.5
15 to less than 20 years	10	8.6
20 years and over	12	10.3

(*) Due to missing response, the total of each category might not equal 131.

TABLE 2 Industry Types of the Population and the Sample Companies

Legend for Chart:

- A - Type of Industry
- B - Population N
- C - Population %
- D - Sample N
- E - Sample %

A	B	C	D	E
Food processing	72	7.2	9	7.3
Textile and apparel products	77	7.7	8	6.5
Petroleum, chemicals, plastic, rubber products	97	9.7	13	10.6
Electronic, electrical, and computer related products	202	20.2	30	24.4
Steel, metals, and machines	122	12.2	12	9.8
Transportation equipment	34	3.4	7	5.7
Paper, cement, lumber, wood, leather, and other manufacturing	73	7.3	9	7.3
Transportation	36	3.6	3	2.4
Wholesale, retail, and general merchandise stores	32	3.2	3	2.4
Import and export trade	76	7.6	6	4.9
Banking, insurance, and investment	38	3.8	5	4.1
Construction and engineering	38	3.8	2	1.6
EDP service, auto dealer, and other services	104	10.4	16	13.0
Total:	1000	100.0	123 (*)	100.0

(*) Due to missing mail-ID numbers, the industry types of eight participating companies could not be identified.

TABLE 3 Size of the Population and the Sample Companies

Legend for Chart:

- A - Size of Company

B - Population N
 C - Population %
 D - Sample N
 E - Sample %

A	B D	C E
Annual Net Sales (in NT\$):		
Less than 999 million	101 19	10.1 15.4
999 million to less than 1.15 billion	99 13	9.9 10.6
1.15 billion to less than 1.364 billion	100 5	10.0 4.1
1.364 billion to less than 1.5963 billion	100 10	10.0 8.1
1.5965 billion to less than 1.9475 billion	100 9	10.0 7.3
1.9475 billion to less than 2.4605 billion	100 8	10.0 6.5
2.4605 billion to less than 3.12 billion	100 11	10.0 8.9
3.120 billion to less than 4.4105 billion	100 19	10.0 15.4
4.4105 billion to less than 7.71 billion	100 14	10.0 11.4
7.71 billion or more	100 15	10.0 12.2
Total:	1000 123 (*)	100.0 100.0
Number of Employees:		
Less than 100	129 6	12.9 4.9
100 to 146	70 9	7.0 7.3
147 to 219	98 7	9.8 5.7
220 to 299	102 8	10.2 6.5
300 to 390	100 18	10.0 14.6
391 to 516	101	10.1

	16	13.0
517 to 670	97	9.7
	13	10.6
671 to 950	102	10.2
	15	12.2
951 to 1626	101	10.1
	17	13.8
1627 or more	100	10.0
	14	11.4
Total:	1000	100.0
	123 (*)	100.0

(*) Due to missing mail-ID numbers, the sizes of eight participating companies could not be identified.

DIAGRAM: FIGURE 1 Framework of a Marketing Information System

FIGURE 2 Computer Software Usage in MKIS

Legend for Chart:

- A - Type of Computer Software
- B - US 1995 (N = 72)
- C - This study (N = 131)

A	B	C
Expert system shells	0.2	0.1
A.I./logic programming	0.3	0.3
4th G.I./integrated	13	1
Statistical analysis	8	6
Conventional/3rd G.I.	26	9
Database management	21	15
Modeling/spreadsheet	26	18
Other	6	50

FIGURE 3 Environmental Data Collected by MKIS

Legend for Chart:

- A - Type of Environmental Data
- B - US 1995: Utilized
- C - US This study: Computerized
- D - This study: Computerized
- E - This study: Utilized

A	B	C	D	E
Customers	93	100	66	84
Prospects	35	65	25	51
Competitors	37	77	15	51
National economy	17	41	8	12
Government	11	37	8	12

FIGURE 4 Sources of Competitor Information

Legend for Chart:

A - Type of Environmental Data
 B - US 1995: Utilized
 C - US This study: Computerized
 D - This study: Computerized
 E - This study: Utilized

A	B	C	D	E
Corp. annual reports	9	74	7	60
Purchased reports	24	71	8	42
Clipping service	8	54	5	25
Sales call reports	25	72	2	18

Chi-square test for Utilized: $p < 0.01$:
 for Computerized: $p < 0.05$

FIGURE 5 Computer-Assisted Decision Models

Legend for Chart:

A - Type of Decision Model
 B - US 1995 (N = 102)
 C - This study (N = 131)

A	B	C
Operations budgeting	42	40
Pricing strategy	43	35
Approving credit	9	31
Economic order qty.	15	27
Reorder point	8	26
Product deletion	30	22
New product evaluation	32	17
Routing deliveries	9	8
Facility location	17	5
Ad. media selection	14	5
Salesperson assignment	22	5

Chi-square test $p < 0.0001$

FIGURE 6 Satisfaction with Marketing Information Systems

Legend for Chart:

A - Categories of Satisfaction Scale
 B - US 1995: Satisfaction
 C - US 1995: Competitive Edge: Yes
 D - This study: Satisfaction
 E - This study: Competitive Edge: Yes

A	B	C	D	E
1 = Very dissatisfied	7	0	11	0
2 = Moderately dissatisfied	16	3	18	8
3 = Somewhat dissatisfied	29	11	18	13
4 = Neutral	17	11	1	0
5 = Somewhat satisfied	19	18	37	33
6 = Moderately satisfied	12	11	15	14
7 = Very satisfied	1	1	1	1

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