

Research

Key information management issues in Taiwan and the US

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Abstract

This work surveyed Taiwanese companies to identify their key issues confronting managers and developers of IS. A sample survey strategy was used with a questionnaire and interviews. The questionnaire was evaluated and pretested; it contained 38 key issues. 748 questionnaires were mailed out and there were 332 effective responses. The top 3 issues were found to be: *top management support*, *communication between the IS department and users*, and *aligning MIS with business goals*. Factor analysis was used to aggregate the issues into seven higher factors. The effects of the various variables on the rankings and ratings of the key issues were analyzed. The rankings were then compared with a 1988 survey in Taiwan; in addition, the results were compared with recent U.S. surveys.

Keywords: Key issues; Key information issues; Critical success factors; Information system management; Information technology management

1. Introduction

During the past thirty years information technology (IT) has played an influential role in business organizations. The overall importance of IS and IT, together with its continuing tremendous changes, demand an ongoing assessment of major issues in the field. A *key issue* is an *opportunity, threat, or problem* associated with the effective use of IT in the organization. It is a *critical success factor*. The key MIS issues keep changing and evolving. There is a need to identify these issues in order to address them adequately. The survey reported here surveyed businesses and government organizations to identify the key issues confronting managers and developers of IS in Taiwan.

The objectives of this paper are: (1) to identify the key IM issues in Taiwan; (2) to aggregate these into a reduced set of underlying factors; (3) to determine how certain demographic variables, such as industry type, organization size, respondent position, etc., affect the perceived importance of IM issues; (4) to compare the Taiwan results with those of recent U.S. surveys. In addition, in order to obtain a historical perspective of IM issues in Taiwan, this paper also compares this research results with a 1988 Taiwan survey.

2. Literature review

Many papers in the survey literature identified key IM issues. Most of the studies were conducted in the United States. Others were conducted in Canada [8, 11], Europe [16], Australia [24], Estonia [7], India

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Table 1
Literature review on key issues

Researchers	Publication/ research time	Participants	Method	Rationale for issues	Final number of issues	Effective sample size	Response rate
Ball and Harris [3]	1982/1980	American SMIS members	Questionnaire, 6 point Likert scale	No	18	417	29.8%
Dickson et al. [9]	1984/1983	High level practitioners who are American SIM members in American companies in St. Louis	Delphi method, 4 rounds, ranking Questionnaire, 4 point scale	Yes	19	52, 102, 62, 54	Not reported
Hartog and Herbert [14]	1986/1985	American Fortune 1000 companies	Questionnaire, 4 point scale	Yes	21	63	59%
Herbert and Hartog [15]	1986/1986	American Fortune 1000 companies	Questionnaire, 4 point scale	Yes	23	600	40%
Brancheau and Wetherbe [4]	1987/1986	American SIM members	Delphi method, 3 rounds, ranking	Yes	20	90, 54, 68	50%, 62%, 76%
Graham [11]	1988/1987	Canadian IPS and DPMA members	Questionnaire, 7 point scale	Yes*	29	253	42.7%
Niederman et al. [19]	1991/1989-90	American SIM members	Delphi method, 3 rounds, 10 point scale	Yes	25	114, 126, 104	47%, 52%, 49%
Caudle et al. [5]	1991/1988	American public sector	Questionnaire, 5 point scale	Yes	37	350	35%
Harrison and Farr [13]	1990/1988	Information Managers Association in Taiwan	Questionnaire, 10 point scale	No	16	94*	39%

Table 2
Top 10 key issues in literature

Ball and Harris [3]	Dickson et al. [9]	Hartog and Herbert [14]	Herbert and Hartog [15]	Brancheau and Wetherbe [4]
1. MIS long range planning and integration	1. Improved IS planning	1. Planning	1. Aligning MIS with business goals	1. Improving IS strategic planning
2. Gauging MIS effectiveness	2. Facilitation and management of end-user computing	2. Aligning MIS with business goals	2. Data utilization	2. Using information system for competitive advantage
3. Impact of communication on MIS	3. Integration of data processing, office automation, and telecommunications	3. Software development	3. Education of senior personnel	3. Facilitation of organizational learning and use of IS
4. The developing role of the information resource manager	4. Improved software development and quality	4. Data utilization	4. Software development	4. Increasing understanding of the role and contribution of IS
5. Decision support systems	5. Measuring and improving IS effectiveness/productivity	5. End-user computing	5. Productivity	5. Aligning the IS organization with that of the enterprise
6. Office of the future management	6. Facilitation of organizational learning and usage of information system technology	6. Data security	6. Planning	6. Facilitating and managing end-user computing
7. Employee training and career path development	7. Aligning the IS organization with that of the enterprise	7. Integration of technology	7. Integration of technology	7. Promoting effective use of the data resource
8. Education of non-MIS management	8. Specification, recruitment, and development of IS human resources	8. Education of senior personnel	8. Telecommunications technology	8. Developing an information architecture
9. Centralization vs. decentralization of MIS functions	9. Effective use of the organization's data resources	9. Quality assurance	9. Quality assurance	9. Measuring IS effectiveness and productivity
10. Employee job satisfaction	10. Development and implementation of decision support systems	10. Telecommunications technology	10. Office automation	10. Integrating data processing, office automation, factory automation, and telecommunications

Table 3
Top 10 key issues in literature (continue-end)

Graham [11]	Niederman et al. [19]	Caudle et al. [5]	Harrison and Farn [13]
1. Data management	1. Developing an information architecture	1. Integration of technologies	1. Maintaining close agreement between the goals of the organization and the goals of the information services group
2. Planning	2. Making effective use of the data resource	2. Comprehensive planning integration	2. Creating and promoting information management activities which provide or enhance competitive advantages for the firm
3. Integration of technologies	3. Improving IS strategic planning	3. Information requirements identification	3. Establishing and/or maintaining effective communications with top management
4. Software development	4. Specifying, recruiting, and developing IS human resources	4. End-user computing	4. IS staff development and the maintenance of attractive career paths
5. Data security	5. Facilitating organization learning and use of IS technologies	5. Office automation	4. Establish and/or maintaining effective communications with end-users
6. Competitive advantage	6. Building a responsive IT infrastructure	6. Data security	6. Accomplishing more complete integration of systems through better interface and interconnectivity standards
7. End-user computing	7. Aligning the IS organization with that of the enterprise	7. Long-term planning mechanisms	7. Improving the productivity of information systems professionals in the development of applications
8. Educating senior personnel	8. Using information systems for competitive advantage	8. Database management system impact	8. Developing standards for information system activities and developing control mechanisms to foster compliance with those standards
9. Telecommunications technology	9. Improving the quality of software development	8. Distributed data processing	8. Improving the productivity of maintenance activities
10. Productivity	10. Planning and implementing a telecommunications system	8. Software maintenance	10. Training end-users to be effective participants in the development of applications

[20], China Mainland [17], Singapore [21], and Taiwan [13, 23]. The important features in the major studies (often cited by researchers) are listed in Table 1. Other studies, e.g., [1, 2, 6, 12, 18, 25], which were conducted in the U.S. or Taiwan, are not included. For those applying Delphi's method, the table lists the sample sizes and response rates in each round. Graham's study is included mainly because its research method was used in our study. His questionnaire provides not only rationale (normative, prescriptive statements) but also descriptive, definitional statements. The study of Harrison and Farn was conducted (in 1988 and published in 1990) in the Pacific Northwest of the U.S. and Taiwan. The table only lists its sample size and response rate in Taiwan. Tables 2 and 3 list the top 10 key issues in each study. For consistency, the tables only list the rankings of

“future” issues (i.e., those predicted as important in the next 2–3 or 3–5 years).

3. Methodology

The sample survey strategy used in this study involved both a questionnaire and follow up interview data collection methods. A six page questionnaire was developed using several instruments from previous studies along with additional issues identified in the literature. The questionnaire was evaluated by six IS experts, and then pretested with seven MIS personnel (two MIS graduate students, five MIS professionals). Its final form included 38 key issues and three sections. The original questionnaire was written in Chinese. A translated version is included as an appendix.

To maximize information quality and response rate, Dillman's “Total Design Method” [10] was employed in designing both the content and the administrative procedures for the questionnaire. 748 questionnaires were mailed to the Top 100 companies, members of the Information Manager Association, small and medium businesses, and government organizations in Taiwan on June 6, 1994. Two follow-up letters were mailed on June 24 and July 13. If respondents provided their phone numbers, telephone interviews were later performed to clarify any unclear answers.

4. Analysis and findings

332 valid questionnaires were eventually obtained from the original mailing, providing a net response rate of 44%.

4.1. Demographic data

Tables 4 and 5 provide the profile of the respondents. In Section 3 of the questionnaire, respondents were asked (Question 3) to pick one of four descriptions that best characterized the overall stage of development of IS in their organizations. Then, in Question 4, respondents gave their degree of assessment of the degree of implementation of IS in their organizations. The purpose was to provide a measure

Table 4
Profile of respondents

Organization type	Number	Ratio
Government agency	38	11.5%
Government-owned business or utility	27	8.1%
Private business	249	75.0%
Non-profit organization	18	5.4%
Total	332	100.0%
Industry type	Number	Ratio
Manufacturing	145	44.2%
Finance: banking, insurance	54	16.5%
Other services industry	103	31.4%
Other business	26	7.9%
Sub-total	328	100.0%
Not disclosed	4	
Total	332	
Growth stage	Number	Ratio
Initial stage	19	5.7%
Expansion stage	44	13.3%
Control stage	184	55.6%
Maturity stage	84	25.4%
Sub-total	331	100%
Not disclosed	1	
Total	332	
History of MIS department	Number	Ratio
No MIS department	8	2.4%
Within 1 year	27	8.1%
1 to 2 years	23	6.9%
2 to 5 years	12	3.6%
5 to 10 years	88	26.5%
10 to 20 years	138	41.6%
20 years	36	10.8%
Total	332	100.0%

Table 5
Profile of respondents (continue-end)

Respondent position	Number	Ratio
CEO	18	5.5%
CIO	159	48.8%
Middle manager in MIS department	67	20.5%
MIS department personnel (SA, programmer, etc.)	1	12.6%
Other	41	12.6%
Sub-total	326	100%
Not disclosed	6	
Total	332	
Organization size	<i>Number</i>	<i>Ratio</i>
Top 100 business	114	35.5%
Small/medium business	106	33.0%
Other	101	31.5%
Sub-total	321	100%
Not disclosed	11	
Total	332	
Number of employees in MIS department		
Average: 29.3; Median: 11; Maximum: 600		
Total number of employees in organization		
Average: 1908; Median: 508; Maximum: 40000; Minimum: 5		
Time of respondents involved in IS jobs		
Average: 11.2 years; Median: 11 years; Maximum: 33 years		
Annual sales (budget) of organizations (including finance)		
Average: NT\$11030 Million; Median: NT\$2900 Million		
Annual sales (budget) of organizations (excluding finance)		
Average: NT\$8560 Million; Median: NT\$2000 Million		

of reliability for this “perceived IS growth stage.” Analysis of variance (ANOVA) showed that there were significant differences among the second question’s scores of these four stages (F -value=97.27, p -value=0.0001). The Pearson coefficient of correlation between these two questions is 0.678 at the significant level of 0.0001. Therefore, there is high reliability in measuring respondents’ perceived IS growth stages.

4.2. IM issue rankings

The issue rankings were computed as follows: Section 1 scores were merely added for each issue and averaged for all respondents with the highest average first, etc. In Section 2, only the top 10 were ranked by each respondent; therefore, the issues *not* ranked were given a score of 24.5 and the scores for each issue were averaged for respondents with lowest score having the highest rank. A Spearman Rank correlation was performed on this pair of rankings. The coefficient is 0.892 with $p=0.0001$. In addition,

the Kendall Tau τ is high to 0.752 ($p=0.0001$); the Kendall coefficient of concordance W is also high to 0.946 ($\chi^2=70.00$ and p is less than 0.005). Therefore, we conclude that these two rankings are highly related – that is, we can reject the null hypothesis and state that the two data collection methods gave high related rankings. In this case, according to Siegel [22], “the best estimate of the true rankings is obtained by the order of the various sums of ranks.” This is presented as the fourth column of Table 6.

It can be seen that the most important IM issues in Taiwan are getting top management support (rank 1) and improving communication with end-users (rank 2).

Reliability test. In order to provide a measure of reliability, an issue was randomly repeated in the middle of the questionnaire. The coefficient of correlation between these repeated issue scores was 0.665 with $p=0.0001$. Although not a complete test of internal reliability, it did provide a high internal consistency estimate.

Table 6
Key information management issues rank

Key IM issues	Section 1 rank (average)	Section 2 rank (average)	Total rank	Public sector rank
Top management support	1 (6.20)	1 (9.66)	1	1
Improving communication with end-users	2 (6.13)	3 (12.20)	2	2
Goal alignment	4 (5.98)	2 (12.09)	3	5
Creating business competitive advantage	5 (5.95)	4 (13.52)	4	11
IS strategic planning	6 (5.94)	5 (13.96)	5	3
Data security	3 (5.99)	8 (17.75)	5	6
Organizational location of IS department	7 (5.93)	6 (13.99)	7	3
Data resources	8 (5.88)	7 (15.80)	8	7
Integration of information technologies	11 (5.78)	9 (18.14)	9	9
Database management systems	10 (5.83)	10 (18.50)	9	9
Information architecture	13 (5.66)	12 (19.32)	11	8
Improving software development quality	12 (5.68)	14 (19.52)	12	17
Recruiting, training and career development of IS personnel	19 (5.51)	11 (18.59)	13	13
User friendliness of IS	14 (5.64)	17 (19.98)	14	18
Decision support systems	16 (5.60)	16 (19.61)	15	18
Preventing computer viruses	9 (5.86)	23 (21.23)	15	13
Office automation	20 (5.46)	15 (19.53)	17	12
Evaluating IS organizational impact	17 (5.58)	19 (20.25)	18	23
Telecommunication systems	15 (5.63)	22 (21.16)	19	15
Computerization of routine works	21 (5.46)	20 (20.43)	20	20
Business process reengineering	30 (5.11)	13 (19.41)	21	25
IS budgeting and cost/benefit analysis	25 (5.35)	18 (20.08)	21	30
Measuring and improving IS productivity	22 (5.45)	21 (20.69)	21	34
Learning advanced technologies	18 (5.58)	26 (21.59)	24	22
Better software/hardware	24 (5.43)	25 (21.53)	25	16
Chinese computer environment	26 (5.33)	24 (21.47)	26	21
Centralization/decentralization of services	27 (5.30)	27 (21.70)	27	31
Legislating information intellectual property protection	23 (5.44)	32 (22.31)	28	26
Electrical data interchange (EDI)	29 (5.16)	29 (22.08)	29	28
Open systems	28 (5.27)	31 (22.19)	30	27
Information technology standards	31 (5.02)	30 (22.11)	31	28
Factory automation	37 (4.52)	28 (22.05)	32	37
End-user computing	33 (4.77)	33 (22.64)	33	32
Regulations of software/hardware procurement and system outsourcing	34 (4.76)	33 (22.64)	34	23
Computer aided software engineering	32 (4.95)	36 (23.10)	35	36
Regulatory constraints of IS activities	35 (4.76)	35 (22.80)	36	35
Information technology transfer	36 (4.67)	37 (23.23)	37	32
Expert systems and artificial intelligence	38 (4.19)	38 (24.07)	38	38

Representativity test. One concern of surveys is that information collected from respondents might have a non-respondent bias. While this research did not investigate non-respondents directly, a comparison was made between those subjects who responded after the initial mailing and those who responded after the follow-up letters. Using Section 1 of the questionnaire, rankings were constructed for each of these two groups. The Spearman correlation coefficient

was 0.963 with $p=0.0001$. Therefore, the ranking results might safely generalize to the whole population.

4.3. Factor analysis

An exploratory factor analysis was conducted to determine a reduced set of underlying factors. With the rule counting the eigenvalues greater than 1, the

lower bound is four factors ($n=4$, eigenvalue=1.02). In order to find the upper bound, the Maximum Likelihood method was used to test the hypothesis: n factors are sufficient (vs. the alternative hypothesis: more factors are needed). At $n=15$, it has $\chi^2=284$,

$p=0.0222$. At $n=16$, it has $\chi^2=244$, $p=0.0843$. Therefore, the upper bound is set at 16 factors.

Within the upper and lower bounds, this research used the SMC (Squared Multiple Correlation) as the prior communality estimate, the Principal Component

Table 7
Factor structure (correlations)

Key IM issues (their rankings in the parentheses)	Communalities	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Evaluating IS organization impact (18)	0.551	0.732						
IS strategic planning (5)	0.695	0.800						
Goal alignment (3)	0.599	0.753						
Organizational location of IS department (7)	0.509	0.697						
Information architecture (11)	0.607	0.753						
Creating business competitive advantage (4)	0.438	0.649						
Business process reengineering (21)	0.401	0.578						
Top management support (1)	0.628	0.682						
Recruiting, training and career development of IS personnel (13)	0.591	0.639						
Improving communication with end-users (2)	0.569	0.633						
Information technology standards (31)	0.769		0.851					
Regulatory constraints of IS activities (36)	0.538		0.724					
Information technology transfer (37)	0.648		0.725					
Open systems (30)	0.567		0.664					
Legislating information intellectual property protection (28)	0.471		0.556					
Expert systems and artificial intelligence (38)	0.534		0.591	0.585				
End-user computing (33)	0.510			0.707				
Office automation (17)	0.536			0.696				
Factory automation (32)	0.333			0.485				
Electrical data interchange (EDI) (29)	0.519			0.653				
Centralization/decentralization of services (27)	0.471			0.627				
Telecommunication systems (19)	0.490			0.654				
Decision support systems (15)	0.562			0.618				
Computer aided software engineering (35)	0.518			0.604				
Computerization of routine works (20)	0.319			0.461				
Regulations of software/hardware procurement and system outsourcing (34)	0.462				0.541			
Preventing computer viruses (15)	0.634				0.782			
Chinese computer environment (26)	0.619				0.752			
Better software/hardware (25)	0.620				0.771			
Data security (5)	0.628				0.722			
Measuring and improving IS productivity (21)	0.602					0.750		
Improving software development quality (12)	0.598					0.745		
IS budgeting and cost/benefit analysis (21)	0.532					0.670		
User friendliness of IS (14)	0.480					0.615		
Learning advanced technologies (24)	0.650						0.727	
Integration of information technologies (9)	0.547						0.636	
Data resources (8)	0.630							0.691
Database management systems (9)	0.706							0.677
Variance explained by each factor ignoring other factors		9.540	7.070	9.341	8.974	8.427	4.571	3.081
Average rankings of the issues in each factor		8.5	32.4	26.5	21	17	16.5	8.5

method for extracting factors, and both the Orthogonal Varimax and Oblique Promax as the rotation methods to try different cases. The final factor structure is shown in Table 7 with $n=7$ and Oblique Promax. It satisfies several criteria – total variances explained as 96.8%, variances explained by each factor greater than “average variable” (1/38), and scree test criterion.

These seven aggregated factors are named as the following:

1. **Strategic planning, organization and communication.** As shown, this includes the top 5 issues and other important issues (the average ranking of the issues in this factor is the highest): it is considered the most important.
2. **Information regulations and laws.** All the rankings of the issues in this factor are below 27; thus most organizations seem to feel that they were not able to change or improve them. Therefore, this factor is the least important.
3. **Information technology applications.** The issues in this factor rank all from 15 to 38. It therefore seems that this technology factor is also less important.
4. **Software and hardware environments.**
5. **IS productivity and quality.**
6. **New and integrated information technology.**
7. **Data management.** This factor considers both management and technology aspects related to corporate data. It is as important as the first factor.

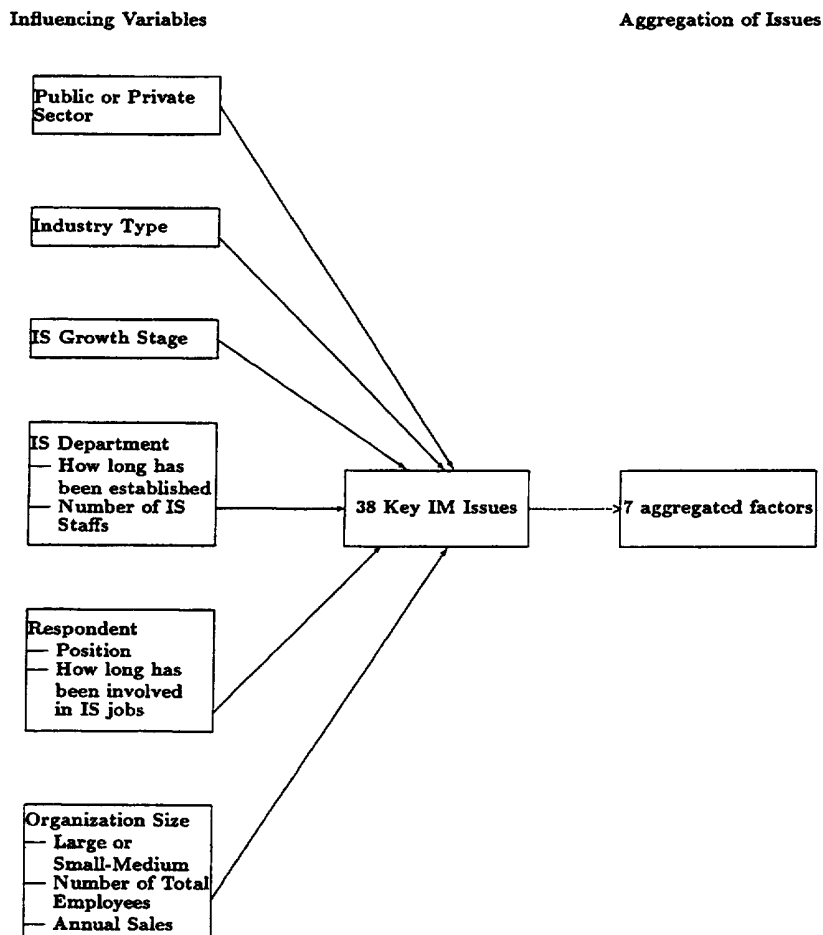


Fig. 1. Demographics and IM issues.

According to the average rankings of the issues in each factor, the importance order of these factors are as follows: (1) (also (7)), (6), (5), (4), (3), and (2).

4.4. Analysis by demographic variables

Previous studies have observed the issue ranking or importance varies according to industry categories, size of companies and many other variables. The boxes on the left in Figure 1 represent variables that are expected to affect a given organization's prioritization of the issues. Based on the relationships shown in that figure, the influence of several demographic variables on the perceived IM rankings and ratings were explored. The group dichotomy in the last four rows of Table 8 is based on the related statistical median values. From these, it appears that IM issue rankings do not result in significant differences for different demographic variables. Our next step was therefore to apply ANOVA to test the influence of different demographic variables on each IM issue rating. Owing to the space limitations, we do not report the detailed ANOVA tables, but only those with statistically significant differences ($p < 0.05$).

1. The public sector perceived the following to be more important: regulations of software/hardware

procurement and system outsourcing, information technology transfer, information technology standards, electrical data interchange (EDI), end-user computing, office automation, and Chinese computer environment.

2. The service industry perceived the following to be more important: recruiting, training and career development of IS personnel, information technology standards, learning advanced technologies, and electrical data interchange (EDI). But, the manufacturing industry considered factory automation important.
3. Those in the maturity stage felt that creating business competitive advantage and goal alignment were more important than those in the earlier stages.
4. Those having IS departments with long history felt that measuring and improving IS productivity, user friendliness of IS, and factory automation were more important than those with a short history.
5. Organizations having more employees in IS department appreciated the importance of the following issues: creating business competitive advantage, goal alignment, business process reengineering, recruiting, training and career development of IS personnel, improving software development quality, learning advanced technologies, electrical data interchange (EDI), data security, and IS strategic planning.
6. The MIS professionals saw learning advanced technologies as more important than CEO did.
7. Experienced IS respondents appreciated the importance of business process reengineering, but, novice respondents felt that database management systems were more important.
8. Small-scale businesses felt the following were more important: IS budgeting and cost/benefit analysis, information technology transfer, information technology standards, legislating information intellectual property protection, expert systems and artificial intelligence, the Chinese computer environment, regulations of software/hardware procurement and system outsourcing, computerization of routine works, and preventing computer viruses. But, large-scale business appreciated the importance of IS strategic planning.

Table 8
Spearman rank correlation coefficients

Sample categories according different factors	Spearman rank correlation
Public sector vs. private	0.872
Manufacturing vs. service industries	0.942
Initial stage vs. expansion, control, and maturity stages	0.681
Immaturity stages vs. maturity stage	0.970
No IS department vs. having IS department	0.655
CEO vs. MIS professionals	0.885
Top 100 business vs. small/medium	0.924
More employees in IS department vs. few	0.939
Experienced respondents (regarding IS jobs) vs. novice	0.963
Many employees in organization vs. few	0.950
High annual sales vs. low	0.913

Table 9
Issue rankings in Taiwan – 1994 vs. 1988

Key issues	1994 rank	1988 rank (Harrison and Farn [13])	Rank difference
Top management support	1	3	–2
Improving communication with end-users	2	6	–4
Goal alignment	3	1	+2
Creating business competitive advantage	4	2	+2
Integration of information technologies	5	5	0
Improving software development quality	6	7	–1
Recruiting, training and career development of IS personnel	7	3	+4
IS budgeting and cost/benefit analysis	8	12	–4
Measuring and improving IS productivity	8	8	0
Better software/hardware	10	10	0
Information technology standards	11	8	+3
End-user computing	12	11	+1
Expert systems and artificial intelligence	13	13	0

5. Comparison with previous studies

To facilitate comparisons with previous research, tables were prepared showing only those major issues in common with prior studies. If some issue names were not the same, the author made a judgement to establish the mapping. Several related issues in previous studies could also be merged to make a comparison with our results. In that case, the original ranks were averaged to compute a new “corresponding” rank.

5.1. IM issues trend in Taiwan

As shown in Table 9, the 1988 vs. 1994 rankings of the majority of the issues in Taiwan differ only slightly. Issues concerned with *intra-organizational communications*, such as, improving communication with end-users, getting top management support, have increased in importance. Similarly, *internal IS management issues*, such as, IS budgeting and cost/benefit analysis, and improving software development quality have become more important. It seems that in order to utilize IS as a strategic weapon, the organizations in Taiwan have become more concerned with their internal communications and IS management. There are five new major issues; three of them are data-related (data security, data resources, and database management systems), the fourth is the need to locate MIS department appropriately in the organization, the fifth is IS strategic planning.

Partly because of the Taiwan government’s emphasis on IS related education programs, the human resources issue is becoming less important. IT standards are ranked quite low (31 out of 38) and perceived to be less important (rankings difference: plus 3).

5.2. Comparison with the issues in the U.S.

5.2.1. Comparison with Niederman et al. 1991

In the *MIS Quarterly*, there have been a number of attempts at identifying IM issues of concern in American organizations. The study of Niederman et al. [19], is the most recent one; it was conducted in 1989–90 and published in 1991. One should note that our research method was different from that of Niederman et al. [19] (who used a Delphi method).

As shown in Table 10, the differences of rankings are substantial. The greatest differences are for data security (minus 13) and integrating IT (minus 11). Both were seen to be more important in Taiwan. We should note that integration of IT was ranked as third in the 1983 study of Dickson et al. [9]; data security was ranked as the sixth in the 1985 study of Hartog and Herbert [14]. It seems that earlier American organizations were also very concerned with these two issues. An indicator is that a number of respondents (55.6%) in Taiwan perceived that they are in the control stage.

The third greatest difference in rankings is for computer aided software engineering (CASE) tools

Table 10
Issue rankings in Taiwan compares with U.S. (Niederman et al. [19])

Key issues	Taiwan rank	Rank in (Niederman et al. [19])	Rank difference
Creating business competitive advantage	1	6	-5
IS strategic planning	2	2	0
Data security	3	16	-13
Organizational location of IS department	4	5	-1
Data resources	5	1	+4
Integration of information technologies	6	17	-11
Information architecture	7	3	+4
Improving software development quality	8	7	+1
Recruiting, training and career development of IS personnel	9	4	+5
Decision support systems	10	14	-4
Evaluating IS organizational impact	11	9	+2
Telecommunication systems	12	8	+4
Measuring and improving IS productivity	13	13	0
Centralization/decentralization of services	14	10	+4
Electrical data interchange (EDI)	15	10	+5
End-user computing	16	15	+1
Computer aided software engineering	17	10	+7

(plus 7). It was ranked much higher in the U.S. In fact, because most CASE tools have been expensive and most of the organizations and IS projects in Taiwan have been relatively small, system developments in Taiwan probably adopts “no methodology” and seldom uses CASE tools.

Some reasons for other, less important, discrepancies may be: (1) to organizations in Taiwan, “utilizing IT to create competitive advantage” has just been a fashionable idea; (2) Taiwan’s technology learning lags behind the U.S.; (3) given the diverse hardware, software, and information overload, the U.S. organizations have been shifting toward an increasingly, integrated data-oriented view to look for ways to increase IS effectiveness; (4) issues concerned with telecommunication systems and centralization/decentralization were ranked much lower in Taiwan. In fact, the communication laws in Taiwan have placed many restrictions on value-added networks. In addition, Taiwan is a small island.

5.2.2. Comparison with Caudle et al. 1991

The study of Caudle et al. [5], the first attempt identifying IM issues of concern to American public sector, was conducted in 1988 and published in 1991. Although our research is not exclusively to public sector in Taiwan, a new set of rankings was prepared

by extracting only the public sector – government agencies and government-owned business or utilities from our total database. The new set of rankings is listed in the rightmost column of Table 6.

As shown in Table 11, there are major differences of rankings between Taiwan and the U.S. in the public sector. The first is in the rankings of end-user computing (plus 13): the public sector users in Taiwan mainly rely on their MIS departments. A similar phenomenon occurs in office automation though the difference (plus 3) is not great.

Two issues had large differences: top management support (minus 11) and measuring and improving IS productivity (plus 11). The first, ranked more important in Taiwan, indicates the problem in all its organizations: a need to improve the intra-organizational communication. The second, dealing with a need “to find ways of improving productivity in software maintenance,” might differ because U.S. public sector agencies began their computerization relatively earlier, and thus have much more to be maintained.

The U.S. public sector ranked improving software development quality and information technology transfer more important. Caudle et al. [5] have suggested that there was a difficulty in the public sector: they have multiple and intangi-

Table 11
Issue rankings in public sector of Taiwan vs. U.S. (Caudle et al. [5])

Key issues	Public sector in rank in Taiwan	Rank in (Caudle et al. [5])	Rank difference
Top management support	1	12	-11
IS strategic planning	2	2	0
Data security	3	5	-2
Data resources	4	14	-10
Integration of information technologies	5	1	+4
Database management systems	5	9	-4
Office automation	7	4	+3
Preventing computer viruses	8	18	-10
Recruiting, training and career development of IS personnel	8	17	-9
Telecommunication systems	10	10	0
Improving software development quality	11	6	+5
Decision support systems	12	19	-7
Regulations of software/hardware procurement and system outsourcing	13	16	-3
IS budgeting and cost/benefit analysis	14	12	+2
Centralization/decentralization of services	15	7	+8
End-user computing	16	3	+13
Information technology transfer	16	11	+5
Measuring and improving IS productivity	18	7	+11
Regulatory constraints on IS activities	19	15	+4
Expert systems and artificial intelligence	20	20	0

ble criteria, multiple and conflicting interest groups, and some lack of feasible solutions. Maybe, in Taiwan the same kinds of public sector problems exist. On the other hand, it seems that U.S. public sector agencies have a more cooperative attitude.

6. Conclusions

IM issues research is valuable. It can provide overall guidance to managers, researchers, and educators, etc. This research found that issues concerned with strategic planning, organization and communication, especially internal communications with top management and end-users, are most important in Taiwan. Some data-related issues, such as, data security, data resources, and DBMS are also very important. Different demographic variables do not significantly change the IM issue rankings though they have some significant influences on several issue ratings. There are somewhat great differences between the rankings in Taiwan and the U.S. Further research is needed to assess the possible reasons.

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Appendix A. Questionnaire sample (translated from Chinese)

Section 1

38 MIS issues are listed below. After reading each, please estimate its degree of importance for your organization over the next 3-5 years by circling the corresponding number. Example: *If you feel your organization will allocate substantial resources, or will urge some other organization to improve the effectiveness of the issue, you should circle 7. If you feel your organization will not allocate any resource to certain issue, you should circle 1. All these were graded from 1 (not important) from 7 (extremely important).*

Organizational Location of IS Department

Locating MIS appropriately within the organization.

Creating Business Competitive Advantage

Utilizing IS techniques to create business competitive advantage in order to find the opportunity and take action first.

Evaluating IS Organizational Impact

Evaluating the impact of IS to business organization structure, ways of working, personnel and use countermeasure to deal with it.

IS Strategic Planning

Integrating IS resource plan with business overall plan and strategy.

Goal Alignment

Assuring that the IS goal aligns with business global goal.

Business Process Reengineering

Changing business decision and working process dramatically to improve competing ability of the organization.

Information Architecture

Developing business integrated information architecture to assure the major information requirements and system structure of business processes.

Regulations of Software/Hardware Procurement and System Outsourcing

Defining reasonable software/hardware procurement and system outsourcing regulations to eliminate tedious or unreasonable limitations.

Recruiting, Training and Career Development of IS Personnel

Recruiting, training appropriate IS personnel, and providing them adequate career development and promotion path.

Top Management Support

Affecting business top manager to know the importance of IS, to be involved and to promise to the IS development.

Improving Communication with End-Users

Users being involved in IS development and operation, having good communication with IS personnel, and getting technique problems solved.

IS Budgeting and Cost/Benefit Analysis

Considering the tangible or intangible costs and benefits of IS development to determine the most appropriate investment.

Measuring and Improving IS Productivity

Measuring existing IS performance, improving or updating obsolete systems.

Improving Software Development Quality

Increasing efficiency of software development, trying best to satisfy business's information needs.

Computerization of Routine Works

Computerization of existing routines or boring works.

User Friendliness of IS

The user-friendly design of IS to make it easy-to-use.

Information Technology Transfer

The government or related organizations finding ways to promote, consult, or transfer information technology to increase sharing of applications and technique assistance.

Information Technology Standards

Urging government or related organization to establish information industry software, hardware, data, and communication standards.

Regulatory Constraints on IS Activities

Urging government to eliminate the regulatory constraints on IS activities (e.g., Telecommunication Law).

Legislating Information Intellectual Property Protection

Legislating and implementing laws to prevent information intellectual properties from being plagiarized, copied, or imitated.

Integration of Information Technologies

Integrating data processing, telecommunications, office automation, multimedia and other technologies.

Learning Advanced Technologies

Learning advanced technology (e.g., multimedia, object-oriented, client-server techniques) and adapting it in IS.

IS Strategic Planning

Integrating IS resource plan with business overall plan and strategy.

Data Resources

Managing business data resource so that they can be accessed and utilized appropriately.

Database Management Systems

Using database management systems to manage a large amount of data in business.

Decision Support Systems

Planning and implementing decision support systems and executive information systems to support manager decision processes.

Expert Systems and Artificial Intelligence

Applying expert systems or other artificial intelligence techniques (e.g., neural networks).

Telecommunication Systems

Linking software and hardware in the organization as a network to communicate messages and share resources.

Open Systems

Establishing software, hardware common standards or protocols to achieve compatibility among different supplier products.

Electrical Data Interchange (EDI)

Exchanging inter-organization data in predefined format through telecommunication systems.

Centralization/Decentralization of Services

Determining whether the data processing is distributed to user departments or centralized to MIS department.

End-User Computing

Supporting end-users to develop and manage IS by themselves to solve their own problems.

Office Automation

Planning and implementing office automation to increase the productivity of white-collar personnel.

Computer Aided Software Engineering

Using computer aided software engineering technique to help IS development.

Factory Automation

Planning and implementing factory related information techniques, such as CAD, CAM, warehousing, robot, etc.

Chinese Computer Environment

Designing, integrating and establishing Chinese systems and operating environments.

Better Software/Hardware

Providing IS personnel with better software development tools or hardware.

Data Security

Protecting software and hardware to prevent information from being changed, destroyed or stolen by illegal users.

Preventing Computer Viruses

Inventing and applying appropriate procedures and methods to prevent computer viruses.

Section 2

The 38 MIS issues listed below are those you have just evaluated in Section 1. Please decide which are *the top 10 issues* by attaching “1” to the most important, “2” to the second, etc. If you feel the issue is not in the top 10 leave a blank behind it. Feel free to reference the more detailed descriptions in the preceding section. Issues that you feel should be in the top 10 but not included, can be written at the bottom and ranked accordingly.

Organizational Location of IS Department
 Creating Business Competitive Advantage
 Evaluating IS Organization Impact
 IS Strategic Planning
 Goal Alignment
 Business Process Reengineering
 Information Architecture
 Regulations of Software/Hardware Procurement and System Outsourcing
 Recruiting, Training and Career Development of IS Personnel
 Top Management Support
 Improving Communication with End-Users
 IS Budgeting and Cost/Benefit Analysis
 Measuring and Improving IS Productivity
 Improving Software Development Quality
 Computerization of Routine Works
 User Friendliness of IS
 Information Technology Transfer
 Information Technology Standard
 Regulatory Constraints on IS Activities
 Legislating Information Intellectual Property Protection
 Integration of Information Technologies
 Learning Advanced Technologies
 Data Resources
 Database Management Systems
 Decision Support Systems
 Expert Systems and Artificial intelligence
 Telecommunication Systems
 Open Systems

Electrical Data Interchange

Centralization/Decentralization of Services

End-User Computing

Office Automation

Computer Aided Software Engineering

Factory Automation
 Chinese Computer Environment
 Better Software/Hardware
 Data Security
 Preventing Computer Viruses
 Others

Section 3

The following questions are needed to help us perform some statistical analysis on the data. Please write the appropriate answer in front of the questions according to you or your organization's current status.

1. Which of the following best describes your organization's type?

- (1) Government Agency
- (2) Government-Owned Business or Utility
- (3) Private Business
- (4) Non-Profit Organization
- (5) Other type (Please describe)

2. Which of the following best describes your organization's major business?

- (1) Manufacturing
- (2) Finance: Banking, Insurance, etc.
- (3) Services Industry other than (2)
- (4) Other business (Please describe)

3. The four stages listed below describe the level of development of the IS in an organization. Please choose the stage that best represents your organization's current status.

(1) Stage 1: **Initial Stage** – there are very few users using basic IS application.

(2) Stage 2: **Expansion Stage** – the number of users is increasing; experimentation with and adoption of computers is done by many departments; cost increases rapidly.

(3) Stage 3: **Control Stage** – information system planning is given increased emphasis; organization control mechanisms are established; efficiency is a major consideration.

(4) Stage 4: **Maturity Stage** – well established planning makes the IS and organization integrated.

4. Do you agree that "Information Systems in your organization have been established and applied to a substantial extent?" Please choose one of the following that best describes your degree of agreement:

- (1) Very disagree
- (2) Disagree
- (3) A little disagree
- (4) No opinion

(5) A little agree

(6) Agree

(7) Very agree

5. How long has the MIS department in your organization established?

- (1) No MIS department
- (2) Within 1 year
- (3) 1 to 2 years
- (4) 2 to 5 years
- (5) 5 to 10 years
- (6) 10 to 20 years
- (7) Above 20 years

6. How many employees are there in your MIS department?

7. In which of the following categories would you place your current position?

- (1) CEO
- (2) CIO
- (3) Middle manager in MIS department
- (4) MIS department personnel (System Analyst, Programmer, Network Manager, etc.)
- (5) Other (Please describe)

8. How many years are you involved in IS-related jobs?

9. About the organization size, which of the following categories would your organization belong to?

- (1) Top 100 business
- (2) Medium or small scale business (according to the government's definition)
- (3) Other

10. What is the total number of employees in your organization?

11. How much (in NT dollars) annual sales are there in your organization? (If your organization does not have "sales," please write your budget amount.)

Finally, thanks again for your filling of this questionnaire!

If you would like to receive the results of this research, please write your name and address here.

Name:

Address:

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