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Information Sytems Management Issues in The Republic of China for the 1990s

Pien Wan
National University of Singapure

Efraim Turban
California State University

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INFORMATION SYSTEMS MANAGEMENT ISSUES IN THE REPUBLIC OF CHINA FOR THE 1990s

Pien Wang, Department of Business Policy, Faculty of Business Administration, National University of Singapore

Efraim Turban, Department of Information Systems, College of Business Administration, California State University, Long Beach

ABSTRACT

This study surveyed the MIS issues for the 90's as perceived by organizations in The Republic of China. Responses were obtained from 297 people, of which 72% were senior IS managers. With respect to management related issues. IS strategic planning, goals alignment, and competitive advantage are currently (and will continue to be) on the top list of IS managers. Respondents also perceive that top management support is (and will continue to be) crucial for the IS department to achieve its mission. They believe that there is a continual need to close the communication gap between end users and the IS department.

In terms of technology related issues, IT infrastructure, systems integration, security and control, and software development quality, are currently important, and they are expected to become even more important in the future. Computerization of routine work was found to be currently important, however its relative importance in the future is expected to decrease. Systems friendliness is (and is expected to be) important for overcoming the resistance to change of both end users and top management.

INTRODUCTION

The idea of a "global village," as envisioned by McLuhan [29] is becoming a reality. Today, multinational corporations and governments increasingly rely on information technology (IT) for conducting international businesses. The level of IT adoption differs from country to country, as are each country's key management information systems (MIS) issues. In order to exploit fully IT for global business expansion, it is imperative that information systems (IS) executives identify and address the key MIS issues not only in their own countries but also in other countries.

The objective of this paper is to investigate MIS issues in the Republic of China (Taiwan) and to call attention to these issues. The results of this study can provide several benefits. Individual IS executives can understand the main MIS issues and interpret trends of IT issues. They can also assess current and future IT impacts on their organizations. Government IT policy makers can fine-tune their nation's strategies to help the private and public sectors further exploit IT potentials. Educators, once aware of the important issues, can equip graduates with the necessary skills to address these issues. Consultants can help accelerate the transfer of technology among their clients. Finally, researchers can guide their inquiry and improve understanding of critical managerial issues.

This paper consists of four parts. First, it describes the IT environment of the R.O.C. Second, the methodology used for this study is discussed. Third, major findings are reported and compared to previous findings of R.O.C studies. Last, conclusions are drawn.

BACKGROUND

Some general observations about the R.O.C. IT environment will help put its key MIS issues in perspective. The R.O.C. government designated in 1979 the information industry as a strategic industry to lead industrial restructuring and spur industrial upgrading. Due to the successful implementation of the "R.O.C. Information Industry Development Plan (1980-1989)", the information industry in the R.O.C. has boasted, by 1990 to a total annual production (mainly hardware products) value in excess of US$ 6 billion, ranking as the world's 7th largest supplier of IT products. Such a success encourages the R.O.C. government to extend the 1980-1989 plan to the year 2000. Furthermore, in the "Six Year National Development Plan (1991-1996)", both the information, telecommunications, and the semiconductor industries were designated as strategic industries [22].

Although the manufacturing of IT products was impressive, the utilization of IT in both the private and public sectors did not advance at the same rapid pace. According to the Institute For Information Industry (III), a quasi-government agency that oversees the government's policy on IT, the national expenditure on IT as a percentage of GNP in 1990, was around 1.0%. This is clearly a low figure when compared with the U.S.A. (3.5%), Japan (2.5%), South Korea (1.3%) and Singapore (1.71%). A considerable portion of the largest 1000 enterprises either depend mostly on PCs, or limit their IS use to transaction processing executed on midrange and mainframe computers. Thus, the potential of IT has not been fully utilized [30].

To promote better utilization of IT, the Industrial Bureau of the Ministry of Economic Affairs appointed in 1990 the R.O.C. Software Association to implement a "Five Year Industrial Computerization Promotion Plan". An industrial computerization service team was organized from reputable software companies. The major mission of the team was to help 480 manufacturing firms (which have not started computerization at that time) to prepare IS strategic planning. In addition, the team provides consulting services for those firms which are already in the process of computerization. The team also conducts seminars on IT for various industries to further promote computerization [22].

The successful implementation of IS strategic plan requires that organizational members, in various management levels, will have adequate understanding of IS and its applications. Thus, the Industrial Bureau offers, through III, in all the major cities and counties, training courses for top and middle level management, functional (e.g. production, marketing) personnel, operation level employees, and IS professionals of both service and manufacturing firms. The government subsidizes 50% of the training cost [22].

The strength of the R.O.C. economy comes mainly from the efforts of its many small and medium sized firms. Thus, it is important that the government assists these firms to computerize their operations. In 1991, the Small and Medium Enterprises Bureau of the Ministry of Economic Affairs appointed IS experts to perform diagnoses regarding computerization for 196 firms. After a preliminary diagnosis is conducted in a firm, the Bureau offers consulting services of IS integrated (strategic) planning to those firms that apply for assistance. Seventy two firms had received such an assistance in 1991. The government offers 50% subsidy if the consulting expense is less than US $6,000. Extremely low interest rate loans are available for smaller firms since 1987 to purchase hardware and software. To save cost and time in developing application software, the government commissioned software companies to develop generic application packages for more than 20 industries [22].

Despite the aggressive IT policies pursued by the government, very few studies have been conducted to understand the key MIS issues faced by organizations in the R.O.C. In one study, the EDP Center of Directorate-General of Budget, Accounting, and Statistics, Executive Yuan (the highest executive branch of the R.O.C.) identified the ten most important MIS problems encountered by organizations [9]. This study focused mainly on managerial issues. Harrison and Farn [13] surveyed, in 1986-87, 250 IS professionals' opinions about sixteen MIS issues (both managerial and technological).

The purpose of this study is to complement and supplement the previous studies. Specifically, this study explores many more MIS issues and attempts to analyze the results as they relate to several demographic characteristics (such as size of organizations, position of the respondents, and type of industry). About 300 responses are analyzed in this comprehensive survey.

METHODOLOGY

a. Issue List

Key MIS issues have been previously identified in Australia [39], Canada [2], Europe [7], India [36], Singapore [37], the R.O.C. [13,9], and the U.S. [e.g. 1, 8, 14, 33, 34]. The issue list of this study was based on the issues checked in previous studies. Specifically, an initial list of 28 issues was adopted from Niederman et al. [34], the EDP Center [9], and Harrison and Farn [13]. It also contained issues identified by MIS trade journals published in the R.O.C. (e.g. Information & Computers, Information Management Association Communication). The logic for selecting the initial list of issues in this way is: first, the R.O.C. IS community is rather current with IT developments and emerging trends in the U.S., and the technology used is very similar to that of the U.S. Second, the R.O.C. IS executives have their unique concerns due to differences in the business culture and government policies. Thus, the multiplicity of sources provided a good starting list.

Based on the issues identified, a 28 items' questionnaire was developed in the Chinese language. Since the Chinese translation of certain English MIS terminology has not been standardized, it was necessary in some occasions, to add the English terminology to help conveying the most concise meaning of the issues.

b. The Pilot Study

Three rounds of pilot study were conducted using personal interviews. Participants were invited to critique the issues and the wordings, and suggest issues to drop or add. At the first round of the pilot study, four IS professionals and two IS academicians were interviewed. At the second round, a revised list of issues were administrated to three IS professionals. The list was further revised. Finally, the third round of the pilot study was administrated to additional three IS professionals. Each interview lasted one to two hours. As a result, four issues were dropped and six were added to form a final list of 30 issues.

c. The Target Population

In 1991, the Market Intelligence Center (MIC) of III surveyed the largest 1000 manufacturers, the largest 500 service organizations, and the largest 400 financial and distribution enterprises in the R.O.C. The investigators examined the annual EDP expenditure, hardware installation, various mainframe expenditure, and the development status of application systems in these organizations. Based on the combination of the above factors, III prepared a list of the top 700 EDP users [31].

The target population for this study included 608 organizations of the 700 that have had current mailing records. To that we added 290 other companies which were members of the R.O.C. Information Management Association, (the association for IS professionals). Finally, 30 government agencies at the executive branch of the government were added for a total of nine hundred and twenty eight organizations.

d. The Survey

A single round mailed survey approach was chosen for two reasons: first, such a survey is appropriate for the exploratory nature of this study; second, the same approach was used in other surveys [e.g. 7, 13, 14].

The questionnaires were mailed in October 1992 to

either the highest ranked IS manager or to an high rank general manager. Respondents were asked to rate the current and future (the next 3-5 years) importance of the 30 issues, using a 7-points Likert scale. (1 indicates least important and 7 indicates most important). In addition, extra space was provided so that respondents could have added issues.

Respondents were given incentives to fill out the questionnaire. The researcher promised to send a copy of the findings and a demo of Lightship (an Executive Information System Software) to those who will respond to the questionnaires. The incentives worked. Two hundred and ninety seven usable questionnaires were returned, a 32% response rate. The respondents were allowed to remain anonymous, so as to encourage frank answers without their being overly cautious. (12% of the respondents elected to remain anonymous.)

FINDINGS AND DISCUSSIONS

a. Profile of Responding Organizations

The vast majority of the respondents (215) were senior IS managers. The high percentage (72.39%) of senior IS managers adds validity to the study's findings. Several demographic characteristics of the respondents such as sector, sales volume (budget), total number of employees, and number of IS staff are provided in Table 1.

Table 1
Profile of Responding Organizations

Position	Number of Respondents	Percentage
IS managers	215	72.39
IS staff	30	10.10
General managers	30	10.10
Others	22	7.41
Sector		
Manufacturing	175	58.92
Services	92	30.98
Public	22	7.41
Others	7	2.36
Annual Sales Volume (Budget) (in US $Million)		
<= 28	56	19.53
29 - 59	68	22.85
60 - 192	62	20.88
193 - 12,000	48	15.53
Not disclosed	63	21.21
Total Number of Employees		
<= 200	78	26.28
200 - 400	71	23.88
401 - 1,000	82	27.63
1,001 - 27,000	55	18.51
Not disclosed	11	3.70
Number of IS Staff		
<= 3	75	25.30
4 - 7	101	33.95
8 - 20	56	18.88
21 - 300	57	19.19
Not disclosed	8	2.69
Total Annual IS Budget* (in US $Thousand)		
<= 160	69	23.23
161 - 640	78	26.26
641 - 3,200	42	14.14
3,201 - 9,600	9	3.03
9,601 - 51,640	8	2.69
Not disclosed	91	30.64

*Total annual IS budget is the sum of hardware, software, and IS staff budget.

b. The Importance of MIS Issues

The rankings of thirty issues for both the current and future (the next 3-5 years) periods are presented in Table 2. The mean value of each issue is also given (on a scale of 1-7). The standard deviations are not given. They were ranged from 1.18 to 1.57 for the current period and from .83 to 1.56 for the future period. Kendall's tau coefficient was calculated to measure the degree of agreement (correlation) between the current and future rankings. The T value, of .75 ($p<.000$), indicates that there was a significant strong and positive correlation between the two rankings. Following the practice of Niederman et al. (1991), the issues are classified as predominantly concerned with either management (M) or with technology (T) factors. Table 3 maps the rankings of the current and future periods.

Table 2
Means and Rankings of MIS Issues in the Current and Future Periods (N=297)

Issue Name	Time Frame of Importance: Current Mean	Current Rank	Future Mean	Future Rank	Increase in Mean	M or T*
1. Communication between the IS department and end users	5.74	1.0	6.14	6.0	.40	M
2. Top management support	5.73	2.0	6.12	7.0	.39	M
3. IS strategic planning	5.66	3.0	6.24	2.0	.58	M
4. Competitive advantage	5.48	4.0	6.51	1.0	1.03	M
5. Goal alignment	5.46	5.0	6.20	3.5	.74	M
6. Computerization of routine work	5.41	6.0	5.59	21.5	.28	T
7. IT infrastructure	5.35	7.0	6.20	3.5	.85	T
8. Systems integration	5.34	8.0	6.15	5.0	.81	T
9. Software development productivity	5.30	9.0	5.86	12.0	.56	T
10. Systems friendliness	5.22	10.0	5.93	10.0	.71	T
11. Security & control	5.21	11.0	6.09	8.0	.87	T
12. Software development quality	5.15	12.5	5.94	9.0	.79	T
13. IS standards	5.15	12.5	5.82	13.0	.67	T
14. Data resource	5.14	14.0	5.91	11.0	.77	M
15. IS funding level	5.10	15.0	5.70	17.0	.61	M
16. IS role & contribution	5.08	16.0	5.73	16.0	.65	M
17. User participation	5.05	17.0	5.81	14.0	.76	M
18. IS staff recruiting, training & promotion	4.97	18.0	5.66	20.0	.69	M
19. Information architecture	4.89	19.0	5.74	15.0	.85	T
20. Placement of IS department	4.88	20.0	5.51	24.0	.83	M
21. Measuring IS productivity	4.62	21.0	5.68	18.5	1.06	T
22. Insufficient human resources	4.62	22.0	5.13	27.0	.51	M
23. Office automation	4.59	23.0	5.68	18.5	1.09	M
24. Organizational learning	4.47	24.0	5.32	26.0	.85	T
25. Open systems	4.44	25.0	5.59	21.5	1.15	M
26. Distributed systems	4.25	26.0	5.42	25.0	1.17	T
27. Telecommunications	4.24	27.0	5.52	23.0	1.26	T
28. End-user computing	3.98	28.0	5.08	28.0	1.10	M
29. CASE	3.70	29.0	5.05	29.0	1.35	T
30. Expert systems	3.51	30.0	4.99	30.0	1.48	T
Mean of means	4.94		5.74		.80	

*M indicates management, and T means technology.

Although there were no significant differences between the means of rank #10 issues and the means of ranks #11-17 issues in the two lists, we elected, due to space limitation, to discuss only the 10 most important issues in both lists (12 issues in total). The 12 issues are presented in descending order of importance in the current period. Based on observations gained from personal interviews and review of literature from R.O.C. MIS journals and reports (in Chinese; search of cross cultural source material in other languages is strongly recommended by Ein-Dor et al. [10] for this type of a study), rationale is offered to explain the findings whenever appropriate.

Table 3
Mapping Issue Rankings of the Current and Future Periods

	Rank Current	Rank Future	
. Communication between the IS department and end users	1.0	1.0	. Competitive advantage
. Top management support	2.0	2.0	. IS strategic planning
. IS Strategic planning	3.0	3.5	. Goal alignment
. Competitive advantage	4.0	3.5	. IT infrastructure
. Goal alignment	5.0	5.0	. Systems integration
. Computerization of routine work	6.0	6.0	. Communication between the IS department and end users
. IT infrastructure	7.0	7.0	. Top management support
. Systems integration	8.0	8.0	. Security & control
. Software development productivity	9.0	9.0	. Software development quality
. Systems friendliness	10.0	10.0	. Systems friendliness
. Security & control	11.0	11.0	. Data resource
. Software development quality	12.5	12.0	. Software development productivity
. IS standards	12.5	13.0	. IS standards
. Data resource	14.0	14.0	. User participation
. IS funding level	15.0	15.0	. Information architecture
. IS role & contribution	16.0	16.0	. IS role & contribution
. User participation	17.0	17.0	. IS funding level
. IS staff recruiting, training & promotion	18.0	18.5	. Measuring IS productivity
. Information architecture	19.0	18.5	. Office automation
. Placement of IS department	20.0	20.0	. IS staff recruiting, training & promotion
. Measuring IS productivity	21.0	21.5	. Computerization of routine work
. Insufficient human resources	22.0	21.5	. Open systems
. Office automation	23.0	23.0	. Telecommunications
. Organizational learning	24.0	24.0	. Placement of IS department
. Open systems	25.0	25.0	. Distributed systems
. Distributed systems	26.0	26.0	. Organizational learning
. Telecommunications	27.0	27.0	. Insufficient human resources
. End-user computing	28.0	28.0	. End-user computing
. CASE	29.0	29.0	. CASE
. Expert systems	30.0	30.0	. Expert systems

1) Communication between the IS department and end users. Establishing and maintaining effective communication between end users and the IS department was ranked #1 in current importance and #6 in future importance. On one hand, end users often can not accurately specify their information needs. They tend to have an unrealistic expectation of computers' capability expecting the IS staff to quickly automate all of their operations [12]. On the other hand, IS employees usually lack a good understanding of the organization's businesses. They do not use the terminology that end users understand [26]. Thus, a communication gap exists between end users and the IS department.

2) Top management support. Acquiring the understanding and support of top management for IS was ranked #2 in current importance and #7 in future importance. Top management support was also found to be important in encouraging the use of microcomputers in the R.O.C. [21]. The successful implementation of a new or modified system may require organizational restructuring and power realignment. Without strong top management endorsement and support, the IS department would have little chance to achieve its mission [4, 23, 25, 30, 38].

3) IS strategic (integrated) planning. This issue was ranked #3 in current importance and #2 in future importance. IS strategic planning is a new approach to many R.O.C IS practitioners, thus a more familiar term, "integrated" (which conveyed similar meaning) was used. The problems created by "islands of automation" make IS practitioners recognize the importance of this issue. IS strategic planning is a difficult task due to the following factors: rapid changes in IT, lack of familiarity with IS planning methodologies, the need for IS planning to relate to corporate goals, short term orientation of R.O.C. business firms, absence of successful domestic planning models to follow, top management's unwillingness to provide adequate funding to implement strategic plans, and lack of support and attention by top management to the IS strategic planning process [22, 25].

Recognizing the importance of IS strategic planning and the difficulties involved, the R.O.C. government offered to assist 480 manufacturing firms with their IS strategic planning between 1990 and 1994. In addition, one of the key objectives in the government sponsored IS seminars is to demonstrate successful examples (e.g. by arranging field trips) to encourage participants to engage in IS strategic planning [22].

4) Competitive advantage. Utilizing IT to improve the competitive advantage of business firms (or the administrative effectiveness of the public sector) was ranked #4 in current importance and #1 in future importance. Some top management and IS professionals of retail/wholesale, transportation, and media firms have begun to build IS that can be utilized to make new inroads, create business opportunities, and enable an organization to differentiate itself in the market place [16, 17, 24, 32]. The aggressive promotion of IT by the R.O.C. government have also raised the IS practitioners' awareness of the importance of competitive advantage brought about by IT, hence the high rating accorded to this issue.

5) Goal Alignment. Aligning the goals of the IS department with those of the organization was ranked #5 in current importance and #3.5 in future importance. IS staff are often interested in developing big scale and technically advanced systems which may not meet the needs of businesses and end users. To assure the alignment, top management needs to clearly communicate the organizational goals, policies, and strategies to IS staff [15].

6) Computerization of routine work. The computerization of routine work was ranked #6 in current importance and it dropped to #21 in future importance. The IS evolution of many R.O.C. organizations are still in Nolan's initiation stage [35]. Thus, automation of routine work is currently viewed as important. However, when organizations move into the matured stage in the next few years, other issues will occupy more of the IS department's attention. For example, new technologies such as DSS and AI could make the automation of routine work, relatively less important in the future.

7) IT infrastructure. Building a responsive IT infrastructure was ranked #7 in current importance and #3.5 in future importance. The technology infrastructure issue is exacerbated by a combination of evolving technology platforms, integration of custom-engineered and packaged application software, and the rigidity of existing application [41]. Many leading R.O.C. IS organizations gradually realize that building an infrastructure that will support existing business applications while remaining responsive to change is a

key to long-term enterprise productivity.

8) Systems integration. This issue was ranked #8 in current importance and #5 in future importance. Many R.O.C. IS managers are recognizing the need to integrate the "islands of automation" (data processing, office automation, factory computerization) into a single entity. The execution of systems' integration had encountered great difficulty due to lack of IS standards, insufficient technical ability, and inadequate coordination among functional departments [11, 22].

9) Software development productivity. Improving the productivity of software development by IS professionals was ranked #9 in current importance and #12 in future importance. Both IS professionals and end users have complained that it takes too long to build systems. The speed of development can not respond in a timely manner to changing business needs. Possible reasons are: insufficient technical skills in the IS department, high IS staff turnover, and inadequate user participation.

10) Systems friendliness. This issue was ranked #10 in both current and future importance. Unfriendly systems encounter strong resistance from end users at all managerial levels [40]. Developing friendlier interfaces are critical not only to the success of the software and haredware producers but to the acceptance of any end user.

11) Security and control. Information security and control was ranked #11 in current importance and #8 in future importance. As organizations put more data into their computing systems, use telecommunication networks, and become increasingly dependent on IS for daily operations, there is a greater risk of disclosure, destruction, and contamination of data. This may lead to a disruption of information services and can negatively affect the operations of organizations. Furthermore, the R.O.C. is a small country (only 36,000 square kilometers), and the majority of business firms operate in the capital city, Taipei. The high turnover of IS professionals and other staff causes great concern for IS managers and general managers, because the proprietary information of the firm may be disclosed to its competitors when employees leave firms. Thus, tight security access and control mechanisms, and fault tolerant systems are becoming a necessity. Government agencies generally are doing a better job in security and control, because they have more experiences in using IS and they have more IS budgets than private companies [18].

12) Software development quality. Improving software development quality was ranked #12 in current importance and #9 in future importance. The quality issue is often compromised due to the following reasons: lack of good understanding of organization's business by the IS department employees, inadequate users participation, high turnover of IS staff, and insufficient technical skills in the IS department. Companies are also complaining about the poor quality of outsourced systems, this is because many of the vendors are small, poorly financed, and suffering from high turnover of their IS staff [6, 20, 25].

Other issues. Although the concepts of some newer technologies such as "open systems", "distributed systems", "telecommunications", "CASE", and "expert systems", have been introduced in the R.O.C. for some time, their implementation in many organizations is still in a very early stage. For example, Igbaria [21] found that only 8.2% of the R.O.C. survey respondents used communication packages. During the pilot study, the MIS director of a leading government agency (responsible for the promotion of computerization in other government agencies) commented that CASE and expert systems sound better than what they really are. Thus, these issues were not rated currently as important as other issues, however, they are expected to become more important in the future (the increases of means of these issues between the two periods are larger than the average increase in means, see Table 2).

Currently, "end-user computing" is not a too important issue (rank= 28). However, when employees become more computer literate thanks to the educational and training efforts of the government, schools, and organizations, this issue is expected to become more important (although still rank 28, the increase of its mean, 1.10, is higher than the average increase of all means, which is .8).

c. Comparison With Two Other Recent Studies

Before comparing the findings of this study with those of Harrison and Farn (1990) and of the EDP Center (1991), it is important to point to the similarities and differences in the methodologies used, respondent coverage, and issues investigated. In terms of methodology used, all three studies used a single round mailed survey approach. This study and Harrison and Farn study asked respondents to rate the current and future importance of issues on a 7-points and 9-points Likert scale. The EDP Center study asked respondents to indicate types of problems (MIS issues) encountered, and the issues were ranked according to the frequency of them being mentioned. The sample size of the EDP Center survey was the broadest, because 1,538 organizations responded to the part of the survey relevant to MIS issues. On the other hand, it is logical to assume that the 297 responding organizations of our survey were the most sophisticated EDP users, because the majority of them belong to the top 700 EDP users. The sample size and diversity of Harrison and Farn's survey was rather limited. Only 92 IS professionals responded to their survey. Regarding issues coverage, our survey was the most comprehensive one, because it included 30 issues. Harrison and Farn's survey investigated 16 issues, and the EDP Center study examined only 10 issues. Despite the differences discussed above, it is still useful to look at the major similarities and differences of the findings. Table 4 presents a comparison of the importance of the issue lists of the three studies.

Table 4
Comparison Between the Rankings of This Study And Other Recent Studies (Future Rankings are in parenthesis)

Issue Name	This Study Rank (N=297)	Harrison & Farn (1990) Study Rank (N=92)	EDP Center (1991) Study #(%)* (N=1538)
1. Communication between the IS department and end users	1.0 (6.0)	1.0 (3.0)	
2. Top management support	2.0 (7.0)		
3. IS Strategic planning	3.0 (2.0)		
4. Competitive advantage	4.0 (1.0)	6.0 (2.0)	
5. Goal alignment	5.0 (3.5)	7.0 (1.0)	
6. Computerization of routine work	6.0 (21.5)		
7. IT infrastructure	7.0 (3.5)		
8. Systems integration	8.0 (5.0)	10.0 (6.0)	
9. Software development productivity	9.0 (12.0)	3.0 (7.0)	
10. Systems friendliness	10.0 (10.0)		
11. Security & control	11.0 (8.0)		
12. Software development quality	12.5 (9.0)		
13. IS standards	12.5 (13.0)	11.0 (8.0)	
14. Data resource	14.0 (11.0)		
15. IS funding level	15.0 (17.0)		289 (19%)
16. IS role & contribution	16.0 (16.0)		
17. User participation	17.0 (14.0)	8.0 (10.0)	
18. IS staff recruiting, training & promotion	18.0 (20.0)	4.0 (4.0)	
19. Information architecture	19.0 (15.0)		
20. Placement of IS department	20.0 (24.0)		245 (16%)
21. Measuring IS productivity	21.0 (18.5)		
22. Insufficient human resources	22.0 (27.0)		838 (55%)
23. Office automation	23.0 (18.5)		
24. Organizational learning	24.0 (26.0)		
25. Open systems	25.0 (21.5)		
26. Distributed systems	26.0 (25.0)		
27. Telecommunications	27.0 (23.0)		
28. End-user computing	28.0 (28.0)	13.0 (12.0)	
29. CASE	29.0 (29.0)		
30. Developing expert systems (ES) to enhance functional activities	30.0 (30.0)	15.0 (14.0)	
31. Developing ES to enhance MIS activities		16.0 (15.0)	
32. Communication with top management		2.0 (5.0)	
33. Productivity of maintenance activity		5.0 (9.0)	
34. AI		14.0 (16.0)	
35. Assessing the economics of replacing application systems		12.0 (13.0)	
36. Employees lack of IS concept			663 (43%)
37. Inappropriate coordination among functional department			439 (29%)
38. Unclear needs for automation			408 (27%)
39. High IS staff turnover			371 (24%)
40. Insufficient technical skills			370 (24%)
41. Incomplete IS standards			270 (18%)
42. Lack of consultation channels			213 (14%)

* #(%) indicates number of respondents and percentage

Comparison with the EDP Center study. Insufficient human resources" was considered moderately important in our survey (#22), while 838 (55%) respondents to the EDP Center study cited this issue as the top problem. The difference may be explained by three factors. First, our study surveyed leading EDP organizations which usually provide more promotion and training opportunities as well as better salaries for their IS staff [4, 19]. Such companies probably have less difficulty in recruiting and maintaining IS staff than the respondents of the EDP Center study. Second, the R.O.C. government's emphasis of IS related education programs in colleges and universities have narrowed much of the gap (at least in terms of quantity) between the supply and demand for IS professionals in recent years [22]. The gap is further narrowed because many IS related majors are returning to the R.O.C. for employment after finishing their education in American universities due to a tight job market in the U.S. This view is supported by Madu et al. [27], who suggested that there is adequate skilled manpower to develop custom designed computer packages in the R.O.C. Third, the economic recession has considerably slowed down the IS budget growth rate (forecasted to be between 10% and 12% in 1992, whereas the actual growth rate of 1991 was about 18%-20%) [30]. Thus, in 1992, companies would have probably hired fewer IS staff than before. The other two issues that appeared in both studies, the "IS funding level" and "placement of IS department", were considered to be a problem by only 18.9% and 15.9% of respondents in the EDP Center study, similarly, these two issues were ranked as only moderately important in our study.

Comparison with Harrison and Farn (1990) study. The rankings of all comparable issues, except one, are more or less the same in the two studies. The exception is: "IS staff recruiting, training, and promotion". This issue was ranked in our study as #18 in current importance and #20 in future importance. It was ranked #4 in both current and future importance in Harrison and Farn's survey. IS staff recruiting probably has become less difficult in recent years due to the three factors discussed in the previous section. In addition, the high turnover discourages many organizations to invest in staff training. Instead, they prefer to recruit more sophisticated IS professionals from other organizations [5]. As a result, the percentage of people who receive training through self-study in the R.O.C. is greater than the U.S. [21]. Harrison and Farn suggested that promotion is a more serious problem in firms with small IS department. The average number of IS employees in our survey was 19 and in Harrison and Farn study it was 9. Thus, promotion was considered to be a more important issue by the respondents to Harrison and Farn's study.

"Communication between the IS department and end users", "competitive advantage", and "goal alignment" were ranked high in both the current and future lists of the two studies. Two similar issues, "management support" and "communication with top management", also ranked high in both studies. "Systems integration" is expected to become more important in the future in both studies, however, the importance of "software development productivity" is expected to slightly decrease in the future in both studies. "IS standards" and "user participation" were ranked moderately important in both studies. "End-user computing" and "expert systems" were ranked near the bottom in both studies. Overall, the findings of the two studies are quite consistent with each other.

d. Analysis by Industry

Respondents were divided into three sectors: manufacturing, services, and public. Kendall's tau coefficients were computed to find the degree of correlations of rankings between any two of the three sectors (Table 5). Furthermore, differences in mean scores of each issue among the three sectors were examined by using ANOVA and Scheffe tests (Table 6).

Table 5
Kendall's tau Coefficients of 30 Issues By Sector In The Current and Future Periods

	C/F*	Manufacturing	Public
Service	C	.84***	.79***
	F	.79***	.65***
Manufacturing	C		.76***
	F		.58***

* C/F indicates current (C) or future (F).
*** p <.0005

Table 6
Results of ANOVA and Scheffe Tests by Sector

Issue Name & Demographics	C/F[a]	ANOVA df	ANOVA F ratio	Scheffe Means: Service	Manufacturing	Public
1. Telecommunications	C	2,279	4.69**	4.41 P>M[b]*	4.05	4.91
	F	2,277	5.10**	5.71 P>M*	5.36	6.14
2. Insufficient human resources	C	2,281	3.95*	4.91 S>M[c]*	4.45	5.05
	F	2,273	3.21*	5.39 S>M*	4.98	5.48
3. Office automation	F	2,274	2.97*	5.88 S>M*	5.55	5.95
4. CASE	F	2,276	3.81*	4.99 P>M*, P>S*	4.98	5.90
5. Organizational learning	F	2,276	4.60*	5.42 P>M*	5.19	5.95
6. End-user computing	F	2,277	3.37*	5.22 P>M*	4.92	5.67
7. Distributed systems	F	2,275	5.42**	5.60 P>M*	5.25	6.14
8. Information architecture	F	2,277	2.54+	5.78 P>M*	5.66	6.29
9. Hardware budget[d]	C	2,225	5.29**	$1.19 P>M*, P>S*	$.51	$3.32
10. Software budget	C	2,211	7.05***	$.3 P>M*, P>S*	$.19	$2.42
11. IS staff budget	C	2,222	2.80*	$.52 P>M*	$.30	$.92
12. Total IS budget[e]	C	2,195	7.94***	$2.24 P>M*, P>S*	$1.07	$7.44
13. Total number of employees	C	2,275	10.25***	1,065 P>M*, P>S*	594	3,799
14. Number of IS staff	C	2,278	14.03***	30.4 P>M*, P>S*	10.7	44.8

[a] C/F indicates current (C) or future (F).
[b] P indicates public organizations, and M indicates manufcaturing firms.
[c] S indicates services organizations.
[d] All budget is in US $million.
[e] Total IS budget is the sum of hardware, software, and IS staff budget.
+ p<.1
* p<.05
** p<.005
*** p<.0005

Regarding the issue rankings, significant positive and strong correlations were found among all three sectors in both the current and future periods. In other words, they basically rank the importance of the issues in a similar manner.

Although the respondents of three sectors were in close agreement concerning the rank order of the issues, they disagreed with one another regarding the mean scores of some lower ranking issues. Public organizations rated "telecommunications" more important than manufacturing organizations did in both periods. This is probably because the designation of telecommunication industry as a strategic industry and the construction of national telecommunication infrastructure, have raised the awareness of the importance of telecommunications among the public organizations which are mostly government agencies.

Service organizations rated "insufficient human resources" as more important than manufacturing organizations did, in both periods. This is probably because the former have greater need for IS staff (as evidenced by greater number of IS staff, see Table 6) than the latter. Having larger offices and more transactions to automate, service organizations expected "office automation" to be more important in the future than manufacturing firms.

In order to justify their much larger investment in IS (see Table 6), public organizations considered "CASE" as potentially a more important tool to increase their software development productivity, than services and manufacturing firms did (see Table 6). Simlarly, public organizations considered a related issue, "organizational learning", more important than manufacturing firms. Public organizations also perceived "end-user computing" to be more important in the future than manufacturing firms, this is probably because the former employ more people than the latter (see Table 6).

"Distributed systems" was perceived to be more important in the future by public organizations than by manufacturing firms. This is probably due to the fact that public organizations in this study are more service oriented and their clients are in many locations, thus they have greater need for distributed systems. Likewise, a related issue, "information architecture", was also considered to be more important by public organizations than by manufacturing firms.

e. Analysis by the Position of the Respondents

Respondents were divided into three groups: general managers, IS managers, and IS staff. The results of Kendall's tau coefficients (Table 7) suggest that these three groups have considerable degree of agreement with each another regarding the issue rankings currently and in the future. However, results of ANOVA and Scheffe (Table 8) reveal significant differences of mean scores of four issues: "CASE", "top management support", "communication with end-users", and "data resource". The differences may be explained by the following reasons:

Table 7
Kendall's tau Coefficients of 30 Issues By Position In The Current and Future Periods

	C/F[a]	IS Managers Managers	IS Staff Staff
General Managers	C	.70***	.62***
	F	.73***	.62***
IS Managers	C		.76***
	F		.73***

[a] C/F indicates current (C) or future (F).
*** p<.0005

Table 8
Results of ANOVA and Scheffe Tests by Position

Issue Name	C/F[a]	ANOVA df	ANOVA F ratio	Scheffe Means: General Managers (1)	IS Managers (2)	IS Staff (3)
1. CASE	C	2,263	3.17*	3.21 3>1[b]*	3.73	4.17
2. Top management support	C	2,263	2.43+	5.18 2>1[c]*	5.77	5.70
3. Communication between the IS department and end users	F	2,260	3.03*	5.69 2>1*, 3>1*	6.16	6.27
4. Data resource	F	2,261	3.08*	5.97 2>3*	5.96	5.47

[a] C/F indicates current (C) or future (F).
[b] 3 indicates IS staff, and 1 stands for general managers.
[c] 2 indicates IS managers.
+ p<.1
* p<.05

First, being much more technical oriented and probably more familiar with specific technologies, IS staff gave "CASE" higher rating than general managers did. Second, "top management support" was perceived to be more important by IS managers than by general managers. This is probably because IS managers must deal with difficult tasks such as resistance to change of end users and of functional departments as well as with the funding need of the IS department. Thus, IS managers recognize the importance of "top management support" for overcoming these difficulties. In contrast, general

managers seem to downplay the problems encountered by the IS department in building and implementing systems, as well as the importance of their own support in overcoming those problems. Third, IS managers and staff are on the frontline of systems building, implementation, and maintenance, and they are in constant interaction with end users. Thus, IS managers and staff can appreciate the importance of communication between end users and the IS department better than general managers do. Fourth, IS managers must be able to demonstrate to top management that data resource is more effectively utilized if they want to continue to get adequate funding for the IS department. In contrast, IS staff show less concern about the importance of making effective use of data resource, because they are more narrowly focused and technically oriented and they do not have to directly worry about the funding problem.

f. Analysis by Size of the Responding Organizations

Pearson correlation coefficients were calculated to find any significant associations between the importance of each issue and sizes of the organizations. Sizes are measured in three ways: total IS budget, number of total employees, and number of IS staff. Table 9 presents all the significant positive correlations (there are no significant negative correlations). The table indicates that the importance of 16 issues increases as the size of the organization increases, while the importance of 14 issues is not affected. Table 10 suggests that the strength of the correlations are the greatest in the public sector, followed by the service and manufacturing sectors.

Table 9
Significant Correlations Between Issues and Total IS Budget[a], Total Number of Employees, and IS Staff in the Current and Future Periods (N=297)

Issue Name	C/F[b]	Total IS Budget	Total Number of Employees	Number of IS Staff
1. IS strategic planning	C		.12*	
2. Goal alignment	C		.13*	
3. IS standards	C			.19**
	F			.12*
4. Systems friendliness	C	.14*		
	F			.12*
5. Telecommunications	C	.21*		.22**
	F			.15*
6. Distributed systems	C	.20**	.13**	.16**
	F	.19**	.12*	.13*
7. CASE	C	.14*		
	F	.19*	.13*	.18*
8. IS staff recruiting, training, & promotion	C	.15*	.12*	.14*
9. Software development productivity	C		.16**	.16**
	F			.13*
10. Top Management support	C	.17*		
11. End-user computing	C			.12*
	F	.15*		
12. Information architecture	C		.14*	
13. Data resource	C	.18*		
14. Software development quality	C	.19**		
15. Placement of IS department	C	.16*		.12*
16. IS funding level	C	.16*		.12*

[a] Total IS budget is the sum of hardware, software, and IS staff budget.
[b] C/F indicates current (C) or future (F).
* p<.05
** p<.01

Table 10
Significant Correlations Between Issues and Total IS Budget[a], Total Number of Employees, and IS Staff in the Manufacturing, Service, and the Public Sectors in the Current and Future Periods

Issue name	C/F[b]	Total IS Budget	Total Number of Employees	Number of IS Staff
Manufacturing Sector (N=175)				
1. Telecommunications	C		.22**	.20*
2. Distributed systems	C	.18*	.19*	
Service Sector (N=92)				
1. Goal alignment	C		.22*	
2. IS role & contribution	C	.29*	.21*	
3. IS standards	C		.21*	.32**
4. Telecommunications	C			.26*
5. Distributed systems	C	.28*		
6. CASE	F			.22*
7. IS staff recruiting, training, & promotion	C		.23*	
8. Software development productivity	C		.27*	.22*
			.22*	
9. Top Management support	C	.27*		
10. User participation	C		.30**	.22*
	F		.25*	.22*
11. Data resource	C		.26*	
12. Software development quality	C	.35**	.25*	.24*
	F			.23
13. IS funding level	C		.29**	.21*
Public Sector (N=22)				
1. Computerization of routine work	C	.54*	.51*	
2. IS Standard	C	.54*		
3. Open systems	F	.55*		
4. Telecommunications	C	.59*		
5. Expert systems	F		.48*	
6. Software development productivity	C		.45*	
7. IS funding level	C	.57*		

[a] Total IS budget is the sum of hardware, software, and IS staff budget.
[b] C/F indicates current (C) or future (F).
* p<.05
** p<.01

CONCLUSION

The purpose of this study was to investigate the status of key MIS issues in the R.O.C. The results of this study help IS managers to understand the major problems challenging their colleagues. The study also provides useful information to those who serve the IS community as to where they should be directing their resources. While it is believed that this investigation is quite representative of the views of leading EDP users, it should be remembered that a mail survey is a snapshot of opinions and changing circumstances can quickly alter IS departments' priorities. New issues, for example, CASE and open systems, can emerge as more important very quickly. Thus, the results should be used with caution and a careful watch should be maintained for emerging concerns.

IS managers are equally concerned with managerial and technology related issues both currently and in the future. With regard to management related concerns, improving IS strategic planning, aligning the goals of the IS department with those of the organization, and utilizing IT to gain competitive advantage, are currently (and will continue to be) on the top agenda of IS managers. IS managers also perceive that top management support is (and will continue to be) crucial for the IS department to achieve its mission, and there is a continual need to close the communication gap between end users and the IS department.

In terms of technology related issues, establishing an adaptive IT infrastructure, integrating "islands of automation", maintaining information security and

control, and improving software development quality, are currently most important, and they are expected to become even more important in the future. Computerization of routine work was found to be currently important, however its relative importance in the future is expected to decrease. Systems friendliness is (and is expected to be) important for overcoming the resistance to change of both end users and top management.

The top ten issues identified in this study address equally both management and technology related concerns. To be successful in this environment, IS professionals must develop adequate technical skills, business knowledge, and interpersonal skills. They also need to have the flexibility to learn new information technologies.

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