

## THE TASKS OF INFORMATION SYSTEMS PROFESSIONALS IN PHILIPPINES, THAILAND, INDONESIA AND MALAYSIA

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### ABSTRACT

This paper presents the results of an empirical study into the present and future tasks expected of information systems professionals in a range of organisations in South-east Asian nations. Information was collected using a three round delphi study technique across a period of one year. The views of senior personnel working in information systems positions in organisations in these nations are analysed and compared. The results are related to the present and expected future profiles of these organisations and are of relevance to those responsible for developing IS curricula in academic institutions as well as commercial providers of education and training courses in these important South-east Asian nations. The study also contributes to an emerging body of knowledge concerning the development of the IS profession in the developing nations of South-east Asia.

### INTRODUCTION

A considerable body of literature has developed, particularly in the past ten years, which examines the nature of the IS discipline, IS curricula and the education and training needs of IS professionals in an environment which is dynamic in terms of technological innovations and changing organisational structures. Many studies have focussed on the design of IS curricula and have been influenced by information gathered from IS academics and practising IS professionals. These studies have identified broad areas of skills and knowledge often categorised as Systems Development, Systems Management, Technical and User Support. Some of the major issues identified across these studies include: a perceived gap between IS curricula objectives and the needs of practising professionals; the need for graduates to have high level communication skills; the current balance between the emphasis placed on these four categories of skills, especially the balance in curricula between Systems Management and Technical and User Support skills; the need to distinguish between appropriate curricula content at undergraduate and postgraduate levels; the need to provide problem-based realistic experiences in IS courses and the need to anticipate future developments in IS in order to produce graduates prepared for a dynamic environment.

The majority of studies relating to these issues have been conducted in a range of developed nations. The following sample of references report on studies of this kind and have been selected because they are quite recent, they have been conducted in a range of developed nations, they address the range of critical issues described above and they include comprehensive references which collectively provide the interested reader with a thorough overview of previous related studies (Athey and Wickham (1996), Cassidy (1990), (1992), Crockett et al (1993), DEET (1992), Fabri and Mann (1993), Jones and Dick (1994), Knapp (1993), MIS Quarterly Vol 19, Number 3 (1995), Monin and Deive (1994), Quarstein et al (1994), Richards and Pelley (1994), Sallis (1994)). Studies conducted in developing nations are less numerous and, based on the same selection criteria, include the recent publications by: Ang (1992); Ang and Winley (1993), Ang et al (1993), (1994a), (1994b), (1995); Goodman and Press (1995), Goslar and Deans (1993), Gupta et al (1994), Lu et al (1994), Winley et al (1995), Yusof and Rahim (1994). It is noted that an extensive literature search did not reveal any additional documented studies conducted in developing South-east Asian nations similar or relevant to the study reported here.

The study presented here examines the tasks expected at the present and in the near future of IS professionals in a range of organisations in the developing South-east Asian nations of Philippines, Thailand, Indonesia and Malaysia. This delphi study, with three rounds, involved senior IS personnel in order to obtain an informed view of the role of the IS professional in these organisations. A detailed analysis of the results, including comparisons of the views from these four nations is presented in order to address the current lack of documented information about the IS profession in these important South-east Asian nations and to identify key issues relevant to those responsible for IS curriculum development and commercial providers of education and training courses.

A common approach to the problem of ensuring that IS curricula are in step with the present and future requirements of the profession has been to examine directly the relevance of understandings, knowledge and skills defined in the objectives and content of subjects included in IS courses. This approach has usually involved input from the IS academic community as well as practising professionals. The present study has adopted a different and complementary approach by examining directly the present and future

tasks expected of IS professionals. This information is valuable in ensuring that the objectives and content of IS curricula and training courses are specifically designed to address the tasks expected of practising IS professionals. This approach has been adopted successfully in a recent extensive Australian study (Cassidy (1990)).

### METHODS AND ANALYSIS

Initially forty five tasks were identified as being representative of the range of duties commonly performed by IS professionals. These tasks were developed from the most important tasks identified in the extensive Australian study (Cassidy (1990)). As part of the first round of the Delphi study participants were invited to add any tasks they considered should be included or to delete any tasks they considered were not relevant. Five additional tasks were added and no tasks were deleted at the completion of the first round. Consequently, rounds two and three of the study included fifty tasks.

Senior IS personnel were involved in order to ensure a well informed view was expressed. They were asked to rate each of the tasks on a scale from 1 (least important) to 4 (very important) in terms of the duties expected of IS professionals in their organisations at the present and in five years time. The three round Delphi study approach was used to allow participants to reconsider their views in the light of the results indicating the mean ratings for each task from their nation from earlier rounds and this approach also encouraged participants to be involved and more attentive to the study. The results presented are based on the responses obtained at the conclusion of the third round of the study. Each organisation which participated in the study has been provided with the results from this final round.

For each of the four nations (Philippines, Thailand, Indonesia, Malaysia) the mean of the ratings assigned to each task was calculated together with the associated standard deviation. These means were then used to rank all of the fifty tasks from most important to least important. These ranked lists indicate the relative importance of tasks at the present and for the future in relation to all of the other tasks. In addition, each task was categorised into one of the four task categories (Systems Development (SD), Systems Management (SM), Technical Support (TS), User Support (US)) and each task was ranked within each category in relation to the other tasks in the same category again using the means to rank each task within these categories. The allocation of tasks to categories was based on the results of the study by Cassidy (1990) and for convenience the categorised tasks together with their rankings in relation to all other tasks and in relation to other tasks in the same category are included in the Appendix Table A.

Since the mean for a task tells us nothing about the relative importance of that task in relation to other tasks our analysis focusses on the present and future ranked lists for each of the four nations. Consequently, the means for each task are not shown but it is noted that all the associated standard deviations were less than 1 which indicates that for each of the four national groups there was a very consistent view about the rating of each of the fifty tasks.

Analysis of the level of agreement amongst the ranked lists involved Spearman's Rank Order Correlation Coefficient (  $\rho$  ) where only two lists were being compared and Kendall's Coefficient of Concordance (W) where four ranked lists were being compared (Daniel 1978)). Using these techniques the following comparisons amongst ranked lists were made:

- a) Using the ranked lists for the importance of tasks at the present (i) all four nations were compared on their rankings of all fifty tasks and (ii) on their rankings of tasks separately within each of the four task categories.
- b) The same comparisons were made as in a) but using the ranked lists for the importance of tasks for the future.

The five comparisons made in each of a) and b) involved W.

- c) For each of the four nations their ranked list for the present importance of all fifty tasks was compared to their ranked list for the future importance of all fifty tasks. The same comparison was repeated using the ranked lists for each of the four separate categories of tasks.

This involved twenty separate comparisons each involving r.

Further analysis identified for each national group the ten most highly ranked tasks amongst all fifty tasks and compared these for the present and for the future. In addition, tasks are identified which have changed significantly in relative importance by a movement involving 10 or more ranked positions from the present ranked list to the future ranked list for any of the four national groups.

The results of the analyses outlined above together with related discussion are presented in the section on Results and Discussion which follows a description of the profile of the respondents.

## PROFILE OF RESPONDENTS

Prior to the first round of the study a list 100 to 150 organisations in each of the four nations was compiled using the directory of key business enterprises in the Asia Pacific region (Duns and Bradstreet (1992)). In order to involve organisations with a substantial investment and interest in IS those with a high financial turnover or a large number of employees were selected from the directory and each was asked to nominate a senior IS professional in the organisation who would participate in the three rounds of the study. For each nation about 50% responded and were willing to participate. However, as the rounds progressed there was an attrition rate of about 50% for reasons mostly unknown to the researchers. The most reliable group of respondents were from organisations in the Philippines where almost all of those expressing an interest in participating remained involved throughout the study. The results reported here are based on responses from participants who completed all three rounds of the study and involved 45 (Philippines), 25 (Thailand), 24 (Indonesia) and 37 (Malaysia).

In each of the four nations the majority of participants were from organisations designated as Manufacturing/Engineering or Banking/Finance with others representing Wholesale and Retail, Transport and Public Service organisations. In each case participants represented organisations with a very large number of employees, typically one to two thousand, with some having more than nine thousand employees. Each organisation had a very significant investment in IS and the respondents were typically IS managers (or equivalent) responsible for large IS departments most often distributed across several sites.

These organisations use systems based on mainframes, minicomputers and microcomputers with a strong emphasis on minicomputers and microcomputers at the present and an increased emphasis on microcomputers expected for the future. Local area networking is a dominant feature at the present and although wide area networks are used slightly less frequently at the present they were seen as of significant importance in the near future. There was also significant emphasis on open architectures and client server technology.

The majority of organisations currently develop their own applications as well as purchasing systems from vendors although they predicted a decreased emphasis on developing their own systems in the future. They follow standard systems development methodologies when developing their own systems and currently make use of project management and CASE tools as well as 4GL and application generators. They indicated an increased high use of project management tools, 4GL and application generators for the future and an increasingly important role for CASE tools. COBOL and RPG were the most common languages used with a high and uniform continuing use of word processing, spreadsheets and database software packages. All respondents emphasised the present and increased future importance of databases.

## RESULTS AND DISCUSSION

We begin by considering the level of agreement between the four national groups with respect to the rankings of tasks at the present and for the future. Next we compare the present rankings with future rankings of tasks by each national group before examining the tasks that have been highly ranked by the national groups. We conclude with a discussion based on those tasks which have changed significantly in relative importance. Each of the Tables 1 to 4 which follow involve information derived from the rankings of tasks displayed in detail in Appendix Table A.

**Table 1: Comparison of National Groups on the Ranking of Tasks**  
(W = Kendall's Coefficient of Concordance)

<b>RANKINGS COMPARED FOR:</b>	<b>PRESENT (W)</b>	<b>FUTURE (W)</b>
All 50 tasks	0.78	0.85
SD tasks	0.73	0.85
SM tasks	0.78	0.88
TS tasks	0.79	0.94
US tasks	0.78	0.59

\* All values of W are significant at a level of 0.01.

From Table 1 we see that there is significant agreement between the four national groups on their rankings of tasks at the present and also for the future. This agreement occurs with respect to their rankings of all fifty tasks and also with respect to their rankings of tasks within each of the four task

categories. This result is supported by the very consistent responses from all the nations to the issues reported in the previous section relating to the profile of the respondents and indicates that organisations in these four developing nations have very similar expectations of IS professionals at the present and also for the future.

**Table 2: Comparison between each National Group's Present and Future Ranking of Tasks using Rank Order Correlation Coefficients ( ).**

COMPARISON OF PRESENT WITH FUTURE RANKINGS OF:	PHILIPPINES	THAILAND	INDONESIA	MALAYSIA
All 50 Tasks	0.75**	0.74**	0.66**	0.70**
SD tasks	0.56*	0.53*	0.46	0.45
SM tasks	0.76**	0.89**	0.75**	0.86**
TS tasks	0.75*	0.88**	0.68*	0.55
US tasks	0.94*	0.39	0.96*	0.94*

\* significant at 0.05 level.

\*\* significant at 0.01 level.

From Table 2 we see that for all fifty tasks and for tasks within each category there is generally significant agreement between each national group's present and future rankings of tasks. This is particularly true for the rankings involving all of the fifty tasks and those within the Systems Management category. Since the respondents are senior IS personnel, who are most likely heavily involved with tasks in the Systems Management category as part of their workload, this indicates that they have fixed views that the priorities they assign to their current duties will be much the same over the next five years.

With regard to Systems Development tasks there is neither significant agreement (nor disagreement) between the rankings of tasks within this category at the present and for the future by respondents from Indonesia and Malaysia. An examination of the rankings of tasks within this category (see Appendix Table A) reveals that for the future both these national groups have highlighted the increased importance of determining client/user needs, the development of test procedures and the variety of tasks related to the development and maintenance of databases. Also both these groups have highlighted the decreased future importance of the range of programming tasks involving program specification, coding, compiling and maintenance. These changes to the priorities amongst Systems Development tasks are also evident to a lesser extent for the Philippines and Thailand but are emphasised much more by respondents from Indonesia and Malaysia. The changes are commensurate with issues noted in the profiles of the organisations particularly the increased importance of databases, the decreased importance of developing their own applications, the use of 4GL and application generators and the adoption of client server technology.

There is significant agreement between the present and future rankings of tasks within the Technical Support category assigned by all the national groups except for Malaysia where the level of agreement is not quite strong enough to be significant (at 0.05 level). This is mainly due to the marked future importance assigned by the Malaysians to tasks related to consulting with internal and external groups and maintaining networks. They also highlight the decreased future importance of tasks involving the identification, selection and maintenance of hardware. These views are shared by the other national groups but have been emphasised strongly in the rankings of Technical Support tasks by the Malaysian respondents. It may be that the respondents regard the detailed technical aspects of hardware selection and maintenance as being outside of the responsibilities of IS professionals and of greater relevance to specialised technical staff. However, the emphasis on network activities and consultation with related groups on IS issues do conform with the future profiles of IS activities in these organisations.

Tasks within the User Support category are ranked in very much the same order at the present as they are for the future by all national groups except Thailand and where there is agreement between the rankings but it is not significant. This is very much a result of the movement of the task related to analysing training needs being moved from last to first priority by the Thai respondents. The other national groups did not change the priority of this task very much at all but for reasons that are not clear this task was seen to have quite varied future importance being ranked 4, 1, 3 and 2 amongst the five tasks in this category by respondents from Philippines, Thailand, Indonesia and Malaysia respectively.

Many of the previous observations from Tables 1 and 2 are confirmed and highlighted by the following discussion of tasks that were highly ranked (i.e. in the first 10 positions) and those that changed significantly in relative importance (i.e. rankings changed by 10 or more positions).

**Table 3: Highly Ranked Present or Future Tasks**

CATEGORY/TASK	PRESENT				FUTURE			
	P	T	I	M	P	T	I	M
<b>Systems Development</b>								
Determine client/user needs	x				x	x	x	x
Document information needs		x			x	x	x	x
Identify problems in the existing system	x	x	x	x				
Identify user functional requirements	x	x		x		x		
Define data requirements	x	x			x			
Design the data model						x		
Design database	x	x	x	x	x	x	x	x
Code and compile program	x							
Maintain existing programs			x					
<b>Systems Management</b>								
Identify information strategy				x	x	x	x	x
Identify key support systems for business environment				x	x		x	x
Provide advice to management			x	x			x	x
Establish procedures to restore the database after system failure		x		x	x		x	x
Plan for development, implementation and installation phases	x	x	x					
Manage network					x	x	x	
Plan and manage project teams				x		x		x
<b>Technical Support</b>								
Identify and select hardware alternatives			x					
Design local area networks		x						
Maintain network			x		x		x	
Keep abreast on new technologies	x		x	x	x	x	x	x
<b>User Support</b>								
Assist users	x		x	x				

P = Philippines, T = Thailand, I = Indonesia, M = Malaysia.

In Table 3 a cell marked X indicates that the corresponding task was ranked in the first 10 positions by respondents from the identified national group. A blank cell means the task was not ranked in the first 10 positions by that group. It is important to note that when considering these highly ranked tasks none of the fifty tasks in this study were considered unimportant or irrelevant by these IS professionals. For example, assisting users has a high priority for most respondents at the present but not for the future. This however, does not mean that these IS professionals consider that this task is not a duty they will be expected to perform satisfactorily in the future.

From Table 3 in the Systems Development category there is general agreement amongst the national groups that identifying problems in the existing system and user functional requirements together with designing databases are very important tasks at the present. For the future they continue to emphasise the design of databases and assign very much increased emphasis to determining client/user needs and documenting associated information needs. These indications are not unexpected particularly in a predicted organisational environment where many more users are networked and require access to information presented in a form which matches their particular needs. Also with less in-house systems development predicted for the future IS professionals can re-focus some of their attention from dealing with problems in existing systems to meeting satisfactorily the information needs of users.

For the Systems Management tasks at the present most agreed emphasis amongst the national groups focusses on providing advice to management, establishing procedures to restore the database after systems failure and planning the phases of systems development. Advising management, database activities, identifying information strategies and key business support systems together with managing networks are the agreed major activities for the future. We note that for the future there is increased agreement amongst the national groups as to which Systems Management tasks are most important. This reflects increased emphasis on networking, a continuing emphasis on databases and the resulting need for strategic planning for the future development of distributed IS resources.

The Technical Support task of keeping abreast on new technologies is predictably very important at the present and for the future and again we note the continued emphasis on networking related tasks in this category.

At the present there is general agreement that assisting users is a very important task. However, none of the national groups ranked any User Support tasks amongst the most important 10 tasks for the future. As noted above, this does not mean that such tasks are unimportant or irrelevant but that amongst competing priorities these tasks are not included amongst the most important future tasks.

Table 4 identifies tasks which have either increased (I) or decreased (D) significantly in relative importance across the present and future ranked lists for any of the national groups. A significant movement corresponds to a change in rank of 10 or more positions. Where necessary in Table 4 the notations i(d) have been used to complete the cells in a row of the table and indicate a slight increase (decrease) in relative importance respectively with n representing no change in relative importance.

**Table 4: Significant Changes in Relative Importance**

CATEGORY/TASK	Philippines	Thailand	Indonesia	Malaysia
<b>Systems Development</b>				
Determine client/user needs	n	i	I	i
Document information needs	I	d	i	i
Identify problems in the existing system	D	D	D	D
Write functional specifications	D	d	d	D
Prototype systems, including screens and reports	i	I	d	I
Design the data model	d	i	i	I
Review structure of database	i	I	i	I
Write program specifications	d	i	D	D
Code and compile program	D	D	D	D
Prepare and run test data	d	D	d	d
Maintain existing programs	D	D	D	D
<b>Systems Management</b>				
Identify information strategy	I	i	I	i
Identify key support systems for business environment	I	i	I	d
Identify and prepare overall technical architecture plan	i	I	I	i
Define human, equipment or machine resource requirements	D	D	d	i
Provide advice to management	i	I	i	d
Write cost/benefit analysis	i	i	I	i
Plan a preventative maintenance program	I	I	i	i
Manage network	I	I	i	I
Negotiate contracts with vendors	d	d	D	D
Audit computer systems	i	i	I	I
Plan cost reduction programs	i	I	I	I
Write a request for proposal from vendors and suppliers	d	i	D	d
<b>Technical Support</b>				
Act as a technical consultant for internal or external groups	I	d	d	I
Identify and select hardware alternatives	d	d	D	d
Identify systems software alternatives	d	D	d	i

Identify and select software application alternatives	d	D	i	i
Maintain existing equipment	d	D	D	D
Design wide area networks	i	I	I	I
Design local area networks	i	D	i	I
Maintain network	I	d	i	I
Quote the cost of an item of equipment	d	D	d	D
Keep abreast on new technologies	i	I	i	d
<b>User Support</b>				
Identify other business units affected by project	i	i	I	I
Prepare and/or maintain user documentation	I	d	i	D
Assist Users	D	D	D	D
Analyse training needs	i	I	i	i

Amongst the Systems Development tasks in Table 4 we see significantly increased importance being assigned to reviewing the structure of databases and the adoption of prototyping as an approach to systems development. This is in line with the continuing importance of other database activities and the increased use of 4GL and application generators identified in the profile of these organisations. Programming tasks related to specification, coding, compiling, testing and maintenance have decreased significantly in relative importance along with writing functional specifications and the identification of problems in existing systems. As noted earlier, this is in accordance with less in-house development of systems and more emphasis on strategic planning and management tasks for IS professionals in the future.

The majority of tasks in the Systems Management category have increased in relative importance and in most cases the increase is significant. Tasks related to defining human or equipment requirements and preparing and negotiating proposals with suppliers and vendors have decreased in relative importance. In fact activities related to dealing with vendors and suppliers are relegated to almost last priority by all the national groups for the future. This may reflect the often difficult and risky nature of such tasks and the need for such negotiations to be carried out by some other functional group within the organisation. It is noted, however, that determining equipment and other resource requirements are tasks that these IS professionals continue to see as important aspects of their duties. The Systems Management tasks that have increased significantly in relative importance relate to strategic planning issues and increased management control rather than emphasising technical systems development and implementation issues. These strategic planning and management control tasks include planning cost reduction and preventative maintenance programs, identifying key business support systems and business wide information strategies as well as auditing systems and managing networks.

The previous comment is supported by the significant decrease in the relative importance of Technical Support tasks related to identifying hardware and software alternatives and the maintenance of existing equipment. Keeping abreast of new technologies is of significantly increased future importance and the future importance of networking is highlighted by the increased importance assigned to the tasks of designing and maintaining wide and local area networks. These key issues have already been detected in previous results and in the profiles of the organisations. It is interesting to note that for Thailand only there is a significant decrease in the relative importance of designing local area networks (but not wide area networks). From Appendix Table A we see that at the present this task has a much higher priority in Thailand than in the other nations but in the future all groups have this task amongst those in the top 16 positions. It would appear that local area networking in Thailand may be receiving much more attention at the present than in the other nations and that within five years Thailand will be comparable to the other nations in terms of their local area networking requirements.

Assisting users is a very important User Support task at the present in all of the nations. The fact that this task decreases significantly in relative importance for the future for all national groups has been commented on previously and it must be remembered that it still has a reasonably high priority for the future. The User Support tasks related to analysing training needs and identifying business units affected by a system development have significantly increased future importance and this supports some earlier comments about the general tendency for important IS tasks in the future to reflect the need for IS professionals to take a broader view of the organisation's information needs in terms of strategic planning, management and support. From Appendix Table A we see that for the present respondents from Philippines, Thailand and Indonesia have ranked the User Support task related to preparing and maintaining user documentation quite lowly at about position 36 out of 50 while for Malaysia it has a much higher priority at position 21. Respondents from the Philippines and Indonesia indicate that this task will be more important in the future and moved it upward while Malaysian respondents moved it

downward to about the same relative position as all the other nations except for Thailand who actually decreased its importance even further giving it very low priority for the future compared to the other groups. Thus, perhaps with the exception of Thailand, it is reasonable to argue that this task is seen to be an important IS task for the future but probably not as important as one might have expected.

### CONCLUSION

This study has focussed on the relative importance assigned to a wide range of IS professional tasks related to Systems Development, Systems Management, User and Technical Support by respondents from organisations with considerable investments in information systems in the developing South-east Asian nations Philippines, Thailand, Indonesia and Malaysia. The relative importance of these tasks at the present and in five years time is presented and provides insights into the stage of development of the IS profession in these developing South-east Asian nations as well as the key areas where present and future curriculum planning and training should focus in order to foster that development.

The main issues that have emerged from the analysis and discussion of the results indicate that in these nations there is a strong need to support the increased development and management of wide and local area networks, databases, prototyping approaches to systems design, an awareness of new technologies, training for users and techniques and tools to assist the IS professional to strategically plan, manage and control the information needs of an organisation's business units. There was clear and consistent evidence based on the responses from each of these nations that key IS professional tasks in the future will move away from detailed technical aspects of programming, systems design, implementation and maintenance and focus on strategic planning, management and control of the whole organisation's information needs.

Systems development tasks will not be abandoned but instead will hopefully be done more efficiently and effectively through the use of prototyping methodologies, CASE tools, 4GL's and application generators in an environment where projects are better managed and wherever possible applications are purchased from vendors rather than being entirely developed in-house. It is noted that the same issues have been identified in other studies relating to so-called developed nations (e.g. Cassidy (1990)) and if possible these developing nations should endeavour to learn from the experiences and the approaches that have been adopted in these developed nations.

Those readers interested in particular tasks or categories of tasks are referred to the section on Results and Discussion for detailed comment as well as the information in Appendix Table A. It is hoped that this information, especially the identification of tasks that have a high priority at the present or for the future, will be of assistance to those designing IS curricula and training programs.

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#### APPENDIX

Table A indicates the rankings of tasks in relation to all other tasks (ALL) and in relation to tasks in the same category (WITHIN). Where necessary tied ranks have been untied in the usual manner with ranks of 1 through to 50 corresponding to a decrease in relative importance.

TABLE A: Rankings of Tasks

CATEGORY/TASK	PRESENT						FUTURE									
	Philippines		Thailand		Indonesia		Malaysia		Philippines		Thailand		Indonesia		Malaysia	
	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within
Systems Development																
Determine client/user needs	1	1	14	7.5	19	13	15	6.5	1	1	14.5	1.5	7	2	7	1
Document Information needs	25.5	11.5	1.5	1.5	11	4	11	4	7.5	3	6.5	3.5	2	1	9	3
Identify problems in the existing system	8	5.5	7.5	5	1	1	5	1	19	8	23.5	10.5	12	4	20	7
Identify user functional requirements	5.5	4	1.5	1.5	26	8	10	3	12.5	6	8	5	25.5	7	18.5	5.5
Write functional specifications	20.5	9.5	26.5	13.5	34.5	11	15	6.5	31	10	29.5	14.5	37.5	11	33	9.5
Prototype systems, including screens and reports	20.5	9.5	33	15	34.5	11	46	15	17	7	17	7.5	43	13.5	33	9.5
Prototype systems, including screens and reports	20.5	9.5	33	15	34.5	11	46	15	17	7	17	7.5	43	13.5	33	9.5
Define data requirements	2	2	3.5	3	23	6	18	8	9	4	11.5	6	20.5	5.5	13	4
Design the data model	10.5	7	14	7.5	23	6	34	13	11	5	6.5	3.5	20.5	5.5	18.5	5.5
Design database	4	3	5.5	4	4	2	6.5	2	4	2	4.5	1.5	10	3	8	2
Review structure of database	38	15	46.5	16	42.5	15.5	47	16	29	9	21	9	34	10	30.5	8
Write program specifications	25.5	11.5	22.5	11	34.5	11	31	11	32	11	17	7.5	45.5	15	41.5	14.5
Code and compile programs	8	5.5	10.5	6	30.5	9	19.5	9	37	15	23.5	10.5	48	16	46	16
Write program testing plan for entire system or individual programs	41	16	26.5	13.5	42.5	15.5	31	11	35	13	29.5	13	43	13.5	37	11
Develop test procedures	36.5	14	25	12	40	14	43.5	14	36	14	26.5	12	30.5	8.5	41.5	14.5
Prepare and run test data	27.5	13	19	9.5	23	6	31	11	33.5	12	29.5	14.5	30.5	8.5	39.5	12.5

CATEGORY/TASK	PRESENT						FUTURE									
	Philippines		Thailand		Indonesia		Malaysia		Philippines		Thailand		Indonesia		Malaysia	
	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within
<b>Systems Management</b>																
Maintain existing programs	14	8	19	9.5	7.5	3	12	5	40	16	49	16	40.5	12	39.5	12.5
Maintain existing programs	14	8	19	9.5	7.5	3	12	5	40	16	49	16	40.5	12	39.5	12.5
Identify information strategy	12.5	3	10.5	3.5	14.5	6	8.5	5	2.5	1	2	2	2	1.5	1	1
Identify key support systems for business environment	16.5	5	14	5	14.5	6	1	1	5	2	11.5	4.5	2	1.5	3	3
Identify and prepare overall technical architecture plan	16.5	5	37.5	11	44.5	13.5	24	9.5	12.5	5	23.5	9.5	34	13	22	10.5
Define human, equipment or machine resource requirements	10.5	2	19	7	19	8.5	13	6	27	10	19.5	7.5	14.5	7	15.5	8.5
Provide advice to management	23.5	8	37.5	11	7.5	1.5	2.5	2.5	19	8	26.5	11	7	4.5	4.5	4
Write a feasibility study	50	17	48.5	15.5	49	17	43.5	16.5	50	17	44.5	15.5	45.5	16	43.5	16
Write cost/benefit analysis	45.5	15	37.5	11	46	15	40	15	43.5	14.5	34.5	13	25.5	11	30.5	13
Establish procedures to restore the database after system failure	16.5	5	7.5	2	11	3.5	2.5	2.5	7.5	4	15	6	7	4.5	2	2
Plan a preventative maintenance program	34	10	45	14	26	10	15	7	21	9	32.5	12	22.5	10	11	6.5
Plan for development, implementation and installation phases	8	1	5.5	1	7.5	1.5	17	8	14.5	6.5	11.5	4.5	12	5	22	10.5
Manage network	29.5	9	16	6	11	3.5	26	11	6	3	1	1	5	3	11	6.5
Negotiate contracts with vendors	35	11	41	13	19	8.5	24	9.5	43.5	14.5	50	17	40.5	15	35	14

CATEGORY/TASK	PRESENT						FUTURE									
	Philippines		Thailand		Indonesia		Malaysia		Philippines		Thailand		Indonesia		Malaysia	
	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within
<b>Systems Management</b>																
Plan and manage project teams	20.5	7	10.5	3.5	14.5	6	6.5	4	14.5	6.5	9	3	18	9	6	5
Audit computer systems	47	16	50	17	44.5	13.5	37.5	13.5	41.5	12.5	43	14	28	12	26	12
Present reports and demonstrations	39.5	12.5	33	9	47	16	43.5	16.5	41.5	12.5	23.5	9.5	37.5	14	37	15
Plan cost reduction programs	44	14	29.5	8	38	12	35.5	12	33.5	11	19.5	7.5	16	8	15.5	8.5
Write a request for proposal from vendors and suppliers	39.5	12.5	48.5	15.5	32	11	37.5	13.5	46	16	44.5	15.5	47	17	45	17
<b>Technical Support</b>																
Acts as a technical consultant for internal or external groups	32	8	33	9	34.5	8	43.5	10	22	5	40.5	8.5	43	9	26	6
Identify and select hardware alternatives	20.5	4	29.5	7	7.5	3	27	5	29	8	38	7	30.5	7	29	8
Identify system software alternatives	23.5	5	22.5	5	19	5.5	31	7	24	6	37	6	25.5	6	26	6
Identify and select software application alternatives	12.5	2	19	3.5	26	7	22	3	19	4	32.5	5	22.5	5	17	4
Maintain existing equipment	31	7	29.5	7	14.5	4	19.5	2	39	9	40.5	8.5	37.5	8	43.5	9
Design wide area networks	33	9	29.5	7	40	9	35.5	8	25.5	7	17	4	14.5	4	26	6
Design local area networks	16.5	3	3.5	1	19	5.5	24	4	16	3	14	3	12	3	11	2
Maintain network	27.5	6	10.5	2	3	1	28	6	10	2	11.5	2	9	2	14	3
Quote the cost of an item of equipment	48	11	37.5	10	48	10	39	9	48.5	10.5	48	11	49	10	50	11
Write technical reports	45.5	10	46.5	11	50	11	50	11	48.5	10.5	46.5	10	50	11	48	10

CATEGORY/TASK	PRESENT						FUTURE									
	Philippines		Thailand		Indonesia		Malaysia		Philippines		Thailand		Indonesia		Malaysia	
	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within	All	Within
Technical Support	5.5	1	19	3.5	5	2	4	1	2.5	1	3	1	4	1	4.5	1
Keep abreast on new technologies																
User Support	29.5	2	37.5	2.5	28.5	2.5	41	4	29	3	36	3	18	1.5	37	4
Identify other business units affected by the project																
Prepare and/or maintain user documentation	36.5	3	37.5	2.5	37	5	21	2	25.5	2	40.5	4.5	34	5	33	3
Assist users	3	1	24	1	2	1	8.5	1	23	1	34.5	2	18	1.5	22	1
Analyse training needs	42	4	43	5	28.5	2.5	31	3	38	4	29.5	1	25.5	3	26	2
Prepare and maintain material for training	49	6	43	5	40	6	49	6	47	6	40.5	4.5	37.5	6	49	6
Conduct training sessions	43	5	43	5	30.5	4	48	5	45	5	46.5	5	30.5	4	47	5