CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this study was to obtain and analyze tasks using IT performed by administrative support staff in networked organizations. The frequency and importance of performing each task and its related IT competencies were analyzed. In addition, the level of competence in performing the tasks and related IT competencies was also analyzed. Specifically, such an analysis provided a description of needed IT competencies so that curriculum decisions can be made on the appropriate program content. In addition, differences between importance placed on performing tasks and self-reported level of IT competency could identify training needs so that "up-grading" workshops can be provided for new and experienced workers.

This chapter describes and explains the sampling plan and the instruments used to generate data that answered the research questions outlined in Chapter One. This chapter is divided into three sections. The first section explains the sampling plan, sampling technique, sample size, unit of analysis, selection of respondents, survey return rate and data collection. The second section describes the Modified Delphi Technique that was used in the initial development of the survey instrument subsequently named as Information Technology Competency Questionnaire. The third section provides the survey analysis and an assessment of the reliability and validity of measures taken in the study.

Sampling Plan

The sampling frame was identified from an aggregate list of administrative support staff employed in medium to large service networked organizations in the Klang Valley. Medium to large service organizations are classified according to the number of employees—small organizations have about 200 or less employees and large organizations have more than 200 employees. The literature shows that several studies have defined the size of small businesses with different figures—less than 100 (Cook & Fox, 2000; Faloon, 2000; Winders, 2000), 200 or less (Pollard & Hayne, 1998), and 500 or less (Golhar & Deshpande, 1997). For the purpose of this study, organizations with more than 200 employees were defined as medium to large.

The service sector was selected for this study because this sector is the largest user of information technology in Malaysia (Ng, 1994; Yow, 2000). Paye (as cited in Boreham & Lammont, 2000) states that the knowledge-based economy in the European Union places emphasis in the service sectors. The report states, (Boreham & Lammont, 2000, p. 17): "Service sectors, particularly finance, business and telecommunications, are the primary purchasers of ICT". Large service organizations in the United States were reported to invest in computer-based systems in the 1980s. According to Kling (1996, *Work, Technology and Social Change section, para. 6*): "And many of the earliest commercial computer systems were bought by large service organizations such as banks and insurance companies". The last three decades may have seen widespread use of computers in the workplace; however, large firms are still the main investors in computer systems.

The medium to large service organizations selected for this study were also categorized as networked organizations. Medium and large service organizations that have

deployed networking and Intranet/Internet technologies were classified as networked organizations. It was important to select medium to large organizations because this is where the employment of administrative support staff is mostly concentrated and the processes of dealing with information through networking technologies are performed (Marino, 1993). In a study on Internet/Intranet use among Ohio companies, Batcha and Kunar (1998) found that the size of a company did make a difference in Web site ownership. Batcha and Kunar concluded that the more employees a company has, the more inclined it is to have Web sites to facilitate tasks completed on the Internet/Intranet. According to the Gartner Group about half of large organizations would have developed Intranet projects by 1998 and this projection was supported by a Business Research Group Study (Currid, 1997).

Downey (1999) in a study on E-commerce said that large organizations would become dependent on Web-based technologies both internally and externally for their survival. On the other hand, smaller organizations may not see the necessity of computerizing operations due to lack of resources or support from management. Soon (1999) found that small and medium enterprises (SMEs) in Malaysia are less concerned with IT training. As a result, the adoption of IT among SMEs is slow.

The sampling frame used in this study was drawn from the directory of Malaysia Service Industries Directory (1995) jointly published by the Malaysian Industrial Authority (MIDA) and Business Times. This directory is by far the latest Malaysian service directory available from MIDA (SMIDEC, 2000). In addition, the sampling frame was supplemented by a directory of the Association of Malaysian Banks (2001), a list of graduates from the Faculty of Office Management and Technology, MARA University of Technology, Shah Alam, Selangor and service organizations from the financial, insurance,

telecommunications, transportation, hospitality (hotel and leisure) industries and public administration.

The types of service businesses were classified according to the major divisions determined by the International Standard Industrial Classification (ISIC) (1999). It must be pointed out that this classification was adopted in the Labor Force Survey Report carried out by the Department of Statistics, Malaysia (Labor Force Survey Report Malaysia, 1999). The major divisions of the service businesses are: (a) Electricity, Gas and Water; (b) Wholesale and Retail: wholesale and retail trade, tourist and leisure industries; (c) Transport, Storage and Communications: land, water and air transport and its related services, telecommunications; (d) Financing, Insurance, Real Estate and Business Services; (e) Social and Community Services: health, welfare, recreational and amusement; and (f) Public Administration: government and education.

The population for this study was administrative support staff identified by the Human Resource Manager as having access to a personal computer linked to a network and uses the information processing technologies categorized as word processing, spreadsheet, database, presentation, desktop publishing/graphics, communications, and Internet/Intranet. The Human Resource Manager was requested to provide at least two (2) names of administrative support staff who meet the following criteria: (a) six months or more secretarial experience with the organization, and (b) works with a networked personal computer to perform office tasks (Appendix A).

Sampling Technique

The selection of the sample was based on stratified random sampling technique. Disproportionate sampling was used because even though employment of administrative support staff is mostly concentrated in service organizations, the finance and banking sectors employ the most number of administrative support staff (Marino, 1993; Ng, 1994). Disproportionately selecting samples would result in a proportionate number from each stratum. The researcher obtained the total number of administrative support staff employed in the various sectors from the directory of service businesses listed in Malaysia Service Industries Directory (1995) jointly published by the Malaysian Industrial Authority (MIDA) and Business Times. In addition, the sampling frame was supplemented by the list of businesses from the Association of Malaysian Banks, a list of graduates from the Faculty of Office Management and Technology, MARA University of Technology, Shah Alam, Selangor and service organizations from the financial, insurance, telecommunications, transportation, hospitality (hotel and leisure) industries and public administration.

Stratified sampling was used to group organizations into three main service industry stratums. Elements from the three groups in the stratified sampling were then randomly chosen.

Figure 3.10 shows the stratified random sampling method used to determine the sample population:

STAGE ONE	Strata	Sampling Units	Total
	A *	1,910	69%
	B *	436	16%
	C *	408	15%
	TOTAL	2,754	100%
STAGE TWO	Strata	Sampling Units	Total
	A *	955	15%
	B *	218	50%
	C *	204	35%
	TOTAL	1,377	100%

Figure 3.10 Stratified Random Sampling Method

A * = Accounting, Insurance, Real Estate, Business and Professional Services, Secretarial Services, Legal and Engineering.
B * = Banking, Finance, Education, Government Agencies, Telecommunications, and Transportation (Storage, Land, Water and Air transport and its related services).
C* = Others – Broadcasting, Freight, Trading (Wholesale and retail), Tourist and Leisure industries, Medical (Consultation, etc.)

Sample Size

In determining sample size for descriptive surveys, the general rule is to obtain 10 percent of the population. Following this rule of thumb, a population of 1,377 provided a sample size of 138. Krejcie and Morgan (1970) produced a convenient table for determining sample size. With a population size of 1,377 the sample size is 302. This

sample size agrees with Roscoe (1975) who stated that there is seldom justification in behavioral research for sample sizes less than 30 or larger than 500.

However, determination of the sample size can be based on the effect size that is estimated for studies that try to explore relationships (Cohen & Cohen, 1977; Hair, Anderson, Tatham & Black, 1998). Welkowitz, Ewen and Cohen (1982) recommend that a medium effect size (0.3) be used in behavioral sciences. At the same time, the researcher needs to consider knowledge of the subject matter in determining effect size. As information technology is a relatively new field, a medium effect size of 0.29 and above is estimated to explain the variance (R^2) in the case of multiple regressions (Bryant, 1997). The required sample size is estimated using the formula put forward by Cohen & Cohen (1977). With a statistical significance of .05 and statistical power of rejecting the null hypotheses at .80 and 45 independent variables, the estimated sample size is 111.

Hair et al. (1998, p. 166) stated that in addition to determining statistical power, sample size can also be determined by the ratio of observations to independent variables.

> As a general rule the ratio should never fall below 5 to 1, meaning that there should be 5 observations for each independent variable in the variate. As this ratio falls below 5 to 1, the researcher encounters the risk of "overfitting" the variate to the sample, making the results too specific to the sample and thus lacking generalizability. Although the minimum ratio is 5 to 1, the desired level is between 15 to 20 observations for each independent variable. When this level is reached, the results should be generalizable if the sample is representative.

Roscoe's (1975) rule of thumb is that the sample size should preferably be 10 or more times the independent variable. With a ratio of 10 observations and 45 independent variables, the sample size was estimated at 450. Therefore, questionnaires were sent to a selection of 545 administrative support staff employed in medium to large, service, networked organizations in Klang Valley in order to obtain the required sample size. The relevant sample size would be adequate to increase the generalizability of the study.

250 organizations were randomly selected from the sampling frame. The researcher requested from the Human Resources Manager of each selected company at least two names of administrative support staff with the selected criteria.

Unit of Analysis

The elements considered for this study comprised administrative support staff with a job title classification of stenographer, secretary, executive secretary, executive assistant, administrative assistant and other titles related to administrative support. The respondents with the said title classifications need to have more than 6 months' work experience related to administrative support work and have access to a PC linked to a network.

The respondents

The respondents of this study were administrative support staff with designated job titles as classified in the unit of analysis. These respondents were identified as end users of information processing and were in a position to provide perspectives on matters of interest in this type of study. Job incumbents were preferred as respondents because studies on task analysis approaches require respondents to estimate frequency of task occurrence. When estimating frequency of task occurrence a memory process is involved and memory researchers hypothesize that accuracy of task frequency ratings are affected by task engagement and experience (Richman & Quiñones, 1996). Therefore, the respondents must be the job incumbents themselves because they are better able to provide information on the tasks that are carried out (Davis & Gonzenbach, 1996; Lightfoot, 1999; Richman &

Quiñones, 1996). McPherson (cited in Hamm, 1997) further strengthens the premise that the job incumbent is the expert.

While studies on the use of IT among administrative support staff have been investigated (Alexander, 1996a; Zhao, 1996) another important consideration is the fact that administrative workers are employed throughout the public and private sector ("Secretaries, Recorders and Transcriptionists", 2002). Administrative offices that cross all organizations exist for the purpose of processing information making it the sector that makes general use of IT (Gonzalez, Gatti & Tagliaferro, 1996; Marino, 1993; Ng, 1994).

Survey Return Rate

The ITCQ was sent via post, e-mail or personal delivery to 545 respondents employed in 250 organizations randomly selected from the Directory of Malaysia Service Industries Directory (1995) jointly published by the Malaysian Industrial Authority (MIDA) and Business Times. Out of 545 questionnaires sent out, a total of 365 questionnaires were returned—three respondents indicated that they did not use a PC linked to a network and 26 respondents were not categorized as administrative support staff resulting in 516 eligible respondents. 14 respondents returned the questionnaire either incomplete or unfilled resulting in 322 usable responses. The response rate of 62% was determined by dividing the number of usable responses by the number of questionnaires sent to eligible respondents.

Data Collection

The data for this study were collected via questionnaires that were mailed, e-mailed or personally delivered to a sample of 545 administrative support staff employed in networked service organizations. A cover letter and a self-addressed stamped envelope (Appendix B) accompanied the questionnaire to respondents. The cover letter included either the name of the respondent or name of officer contacted so that the package was addressed direct to respondents at their respective workplaces. A number that corresponds with the organization and respondent was placed on the top right hand corner of the first page on the questionnaire. In this way respondents could be identified and non-respondents could be contacted for a telephone or personal interview. Four weeks after the first mailing, the researcher sent a follow-up letter or e-mail, a new copy of the questionnaire and a self-addressed stamped envelope to non-respondents as a friendly reminder to fill in and send back the questionnaire (Appendix C). Three weeks after mailing the follow-up letter, follow-up phone calls were made to remind non-respondents.

Development of the Instrument

The instrument used for this study was a survey questionnaire designed for mailing (Appendix D). A mailed questionnaire was used, as access to a larger sample is feasible. Zemke and Kramlinger (1988) state that the questionnaire is the best technique for gathering quantitative data in non-observable situations. "All things considered, though, the survey is and will continue to be the most useful and most used information gathering tool available for tapping the thoughts, opinions, and needs of large populations" (Zemke &

Kramlinger, 1988, p. 158). The instrument designed for this study was based on a review of literature and an examination of other survey instruments.

Initial development

The initial step in the development of the survey instrument involved a review of available literature related to the job functions, tasks and competencies of administrative support staff employed in networked organizations. The researcher developed a list of job functions and IT-related competencies using the following methods:

1. Job functions and tasks were taken from previous related research studies beginning with the study done by McEwen (1996) who addressed job competencies frequently needed in office support roles and Lambrecht and Sheng (1998) who determined content for a Microcomputer Applications Curriculum using the Job Task-Analysis Approach. Occupational Skill Standards related to administrative support staff were examined and added to the master list. Duplicate job functions were discarded.
2. Information technology competencies were taken from related studies beginning with the study done by Batcha and Kunar (1998) who identified Internet/Intranet competencies expected of employees, Erickson (1996) who analyzed office automation competencies needed by office managers, and Wiedmaier and Owens (1998) who determined computer competencies needed for entry-level employment.
3. IT competencies developed by universities and other organizations were also examined and added to the original list.
4. Identification of additional relevant software and network application functions was also based on the researcher's experience as a microcomputer

applications instructor. The same process was applied here—duplicate IT competencies were discarded.

The list of job functions, tasks and IT competencies generated from the literature review was then presented to a selected panel of experts for the purpose of establishing content validity of the instrument.

Modified Three-Round Delphi Technique: Content validity

A modified three-round Delphi Technique was used to establish content validity of the Information Technology Competency Questionnaire (ITCQ) used in this study. The Delphi technique approach uses the consensus method to determine the extent of an agreement over a particular issue being deliberated (Stewart, O'Halloran, Harrigan, Spencer et al., 1999). A panel of experts was asked to identify, clarify, refine, and finally gain consensus on a particular issue over a series of rounds. An advantage of this technique was that the panel does not meet. Therefore, opinions could be expressed without influence from others (Czinkota & Ronkainen, 1997; McGill, 1988; Robbins, 1996; Stewart et al., 1999). The selected experts remained anonymous to one another throughout the technique with only group ratings reported.

The modified three-round Delphi procedure involved a series of questionnaires in which a questionnaire was subsequently formulated and built from responses to the preceding questionnaire (McCoy, 1997). The number of rounds could vary from two to ten but the Delphi process stops when a reasonable level of consensus is achieved and sufficient information is obtained (Delbecq et al., 1975; Lang, 1998; Ludwig, 1997) or the predetermined number of rounds have been completed (Bauder, 1999). Only three rounds of questionnaires were used in this study because differences between the second and third round questionnaires are often negligible (Jones & Reid, 1999; Pollard & Hayne, 1998).

The three-round Modified Delphi Technique used in this study was also consistent with the review of literature that the number of rounds can be flexible and consensus can be reached after the third round. Martino (1972) characterized the basic Delphi as a four-round process, however, a number of experiments have shown that modifying the basic method can shorten the process. As stated by Martino (1972, p. 27): "If time is short, and an initial list of events can be obtained by some other method, two rounds may well be sufficient to clarify the issues, even if not to reach full agreement on the part of the panel".

The technique was defined as Modified Delphi Technique because the design of content for the Delphi technique instrument did not begin with an open-ended or unstructured question where Subject Matter Experts (SMEs) were required to identify and generate items. On the other hand, content for the instrument was based on a review of Business Education literature, research on technological competencies, competency standards for administrative supports positions and IT competencies of universities and organizations. Therefore, face validity for the Round 1 instrument was verified as the items were based on literature review and subsequently confirmed by a Panel of Experts.

With regard to the number of experts, Stewart et al. (1999) stated that the group panel could comprise 7 – 100 experts. Delbecq et al. (1975) described that a Delphi panel size of 3 – 4 is too few but a reasonable group size is between 15 – 20. However, Linstone and Turoff (1975) cited that the ideal number to serve on a Delphi panel is 5 – 10 experts. For the purpose of establishing content validity of the ITCQ, the number of experts is more than 10 because this number is consistent with Dalkey's finding (as cited in Martino, 1972) that the reliability and average group error is a function of panel size. Dalkey found that reliability is maximized and average group error is minimized if Delphi panels had at least 10 members. Dalkey, Rourke, Lewis, & Snyder (1972) reported a definite increase in the reliability of group responses with a group size of 13.

The selection of individuals to serve on the panel of experts was made through peer survey and not through random selection of a population. Because the success of the Delphi Technique depends on informed opinions, it was important that individuals be identified through a nomination process and not random selection (Ludwig, 1997; Wicklein, 1993). For the purpose of this study, an individual was identified as an expert according to the following criteria:

1. The individual has the training, experience and knowledge in the area of office management and end-user computing.
2. The individual has working experience as an administrative support staff or has supervised the work of administrative support staff.
3. The individual was willing to participate in the three-round Delphi Technique.

In identifying experts, the researcher does not view expertise to exclusively belong to a small group of people while everyone else is considered non-experts (Feridah binti Mohd. Nadzar, 2001). This view is supported by the fact that in organizations where changing functions and cultures are taking place, knowledge does not reside in a group of experts. Instead, useful knowledge is distributed throughout the organization. According to Dixon (1999), there is a shift from an "expert model" to a "distributed model" where transfer of ideas are no longer from the experts to the "less in the know" but between "like people" and not from the "more able" to the "less able". Martino (1983, p. 26) shares a similar view and stated: "An expert is someone who has special knowledge about a specific subject. Each one of us is an expert on something, and all of us are non-experts on most things. There is no subset of society that can be called experts in contrast with everyone else".

A five-level occupational group was selected to serve as SMEs:

1. exemplary job incumbents
2. supervisors
3. academic experts
4. vendor/IT specialists
5. members of a professional body

The researcher met with individuals identified through peer nomination as having expertise in the areas of office management and end-user computing. The researcher met with the identified SME individually for the purpose of sharing ideas and discussing issues in workforce education, retraining and administrative support functions as well as ultimately confirmed the individual's expertise and interest to participate in the Delphi Technique. Three weeks later, a letter was sent via e-mail, post or delivered personally to the 17 identified SMEs explaining the study and the importance of their participation together with a stamped, self-addressed postcard (Appendix E). The SMEs were asked to mark either "Yes, I am willing to participate in the study" or "No, I am not able to participate in the study, however, I recommend". The SMEs who agreed to participate in the study formed the panel comprising representatives for each category of eligible SMEs.

Participation came from the Malaysian Institute of Microelectronics (MIMOS), National Institute of Public Administration Technology Management Center (IMATEC), Petroleum National Berhad, financial institutions, local authority, technology-based companies (Nokia, Celcom, TMTouch) and institutions of higher learning. For Round one, 14 experts agreed to participate in the Delphi process. The breakdown of experts selected for the study is shown in Table 3.2:

Table 3.2

Occupational Group – Delphi Panel of Experts

Participant	Number	Gender		Nomination of Other Experts
		Male	Female	
Exemplary Job Incumbent	3	-	3	-
Supervisor/Administrator	3	1	2	1
Vendor/IT Specialist	5	5	-	2
Academic Expert	3	-	3	-
TOTAL	14	6	8	3

Fourteen experts (82%) returned the agreement form to participate in the 3-round Delphi Technique. A packet consisting of an introductory letter that included a brief explanation of the Delphi method and the instrument was delivered personally, via e-mail or post (Appendix F). Panel members were asked to rate the IT competencies on a Likert-like scale from 1, not required to 6, required. Upon completion of the questionnaire the Panel members were requested to return it via e-mail or post in an enclosed stamped, self-addressed envelope or inform the researcher to collect the questionnaire. Panel members were encouraged to make comments to support their ratings on the competency statements and space was provided after each competency statement for comments.

Delphi Technique Round 1

In the first round of the Delphi procedure a personalized cover letter together with a list of job functions, tasks and IT-related competencies required for administrative support staff employed in networked organizations in the next five years were mailed to the 14 SMEs (Appendix F). The panel was asked to indicate if each task and IT competency

was required for employment of administrative support staff in the next five years using a six-point Likert scale (0 = Not Required, 6 = Required). The panel was allowed to question the inclusion of tasks and relevant IT application features. If any panel member indicated that the tasks or IT competency be revised, they were requested to write the revised statement in the space for comments provided after each item. Any additional tasks and related IT competency were written in the space provided after each section as well as the last section of the questionnaire. In addition, panel members were requested to comment on item redundancy or ambiguity. The panel was given three weeks to respond to the list.

One week after the mailing, 3 questionnaires were received. After the first follow-up call was made 9 questionnaires were received. Two questionnaires were received after the second follow-up call.

Upon receipt of the questionnaires, the researcher compiled the list of comments on specific job tasks and IT competencies. Additional tasks and IT competencies provided by the panel of experts were reviewed. Statistics used were measures of central tendency as the Delphi Technique is qualitative in nature (Sackman, 1975). The responses were then coded and analyzed for frequency of response and measures of central tendency (median, quartile, interquartile range and quartile deviation) using EXCEL and SPSS (version 10.0). The median rather than the mean was used because the median is a measure of central tendency that summarizes a list of opinions and discounts extremely high or low estimates. The median better reflects the opinion of every member and is the most accurate statistical descriptor for group responses (Dalkey et al., 1972; Martino, 1972). Means and standard deviations were not used because the rating scale used in the IT competency list was ordinal and not interval or ratio. According to Schmidt (1997, Phase 3 section, para. 4): "The concept of standard deviation does not apply to ordinal level data. There are no fixed intervals between ranks and no absolute reference point to calibrate ranks between

panelists. Providing such data to the experts, or using it in research reports, is misleading". In order to explain the movement of a group response toward consensus, quartile deviation (QD) and interquartile range (IQR) were calculated to show the spread of opinions by each panel member for each question around the median. A narrow IQR indicates that there is fairly close consensus among respondents.

As a result of Round 1, 25 new IT competencies were added to the Round 1 list (Appendix G).

Delphi Technique Round 2

The results from the Modified Delphi Technique Round 1 were used to develop the questionnaire for Round 2. The Round 2 questionnaire included the 37 IT competencies and 25 new competencies proposed by the panel of experts.

In round 2 of the Delphi procedure, a letter and the second questionnaire consisting of a list of the 37 IT competencies and 25 new competencies proposed by the panel of experts were e-mailed, mailed or delivered personally to the panel of experts who participated in Round 1 (Appendix H). In order to refine consensus of items further, all 37 IT competency statements from Round 1 were relisted in the Round 2 questionnaire for a second rating. Each participant received a questionnaire with the listed items and the median rating for each item indicated. An advantage of the Delphi Technique is that it allows each panel member to compare his/her individual rating with the majority Panel rating. Therefore, the Round 2 questionnaire included the median score for all items. The majority response was indicated by highlighting the rating scale and the individual response was indicated above the rating scale. This allowed each expert to reevaluate his or her ratings relative to the majority response. If the second rating fell outside the majority

response, a reason must be given in the space provided. The panel of experts was requested to return the completed list within 4 weeks.

Five questionnaires were received after ten days and follow-up calls as well as reminder e-mails were made to the panel of experts. After the first reminder, two questionnaires were received. Seven questionnaires were received after the second reminder was made.

Delphi Technique Round 3

The third and final round was used to confirm the rating of the 25 new competencies suggested by the panel of experts. It is necessary to carry out the Delphi Round 3 as it provides feedback from the second round regarding the majority responses and comments made. The third round provides the opportunity for each expert to re-rate the new items, if desired and to justify the rating if it deviated from the majority responses.

The Round 3 questionnaire relisted the 25 new IT competencies for a second rating. A cover letter that reports the findings of the two rounds and the Round 3 questionnaires were posted to the 14 panel of experts who participated in Rounds 1 and 2 (Appendix I). Four questionnaires were received a week after posting and three other questionnaires were returned by the specified deadline. Seven or 50% of the experts responded to the Delphi Round 3 while the previous ratings of those who did not respond were maintained as their Round 3 rating.

Delphi Technique data analysis

After the questionnaires were returned, the data were analyzed and summarized for frequency, median, quartile, interquartile range (IQR) and interquartile deviations (IQD) (Appendix J). IT competencies were analyzed to determine if they were required for employment in the next five years using the following rating scale:

Highly required	5.50	-	6.00
Moderately required	3.50	-	5.49
Not required	1.00	-	3.49

IT competencies were ranked as highly required when the median score were more than 5.50, while IT competencies with a median score between 3.50 – 5.49 were moderately required. IT competencies that were ranked in the lower half of the rating scale (less than 3.49) were not required. The panel of experts was of the opinion that all the 38 IT competencies were highly required and 24 IT competencies were moderately required for employment of administrative support staff in the next five years. Table 3.3 shows that all IT competencies were rated as required.

Table 3.3

IT Competencies Required for Employment

Level of Requirement	No.
Highly required	38
Moderately required	24
Not required	
TOTAL	62

Consensus of items

It was observed that although all 62 IT competencies were required for employment in the next five years, the level of consensus for some IT competencies varied among the panel of experts. By the third round, the ratings had converged towards consensus where forty-three (43) competencies received high or moderate consensus while nineteen (19) competencies did not achieve consensus. Table 3.4 shows the breakdown of IT competencies into high, moderate and no consensus.

Table 3.4

Breakdown of IT Competencies

	Round 1	Round 2		Round 3	
Level of Consensus	Original list	Original List	New Items	New items	All Items
High	22	27	6	8	35
Moderate	3	6	6	12	8
No Consensus	12	4	13	5	19
TOTAL	37	37	25	25	62

The IT competencies were then ranked according to the highest median score and smallest quartile deviation (QD) score. The researcher determined that all IT competencies with quartile deviations of less than 1.00 were considered as items that achieved high or moderate consensus. Items with quartile deviations more than 1.00 were items that achieved no consensus. The level of consensus used in this study was adapted from a study on identification of database competencies using the Delphi method (Wiedmaier, 1997) and McNeil's (n.d.) study on computer competencies for entry-level employment:

High consensus - Quartile Deviation less than or equal to .60

Moderate Consensus - Quartile Deviation more than .60 but less than 1.00

No Consensus - Quartile Deviation more than 1.00

Therefore, 43 IT competencies were considered as items that were highly required or moderately required for employment of administrative support staff in the next five years and achieved high or moderate consensus. Although the other 19 items were highly or moderately required for employment, the items did not achieve consensus among the panel of experts. Table 3.5 lists the high and moderate consensus items while Table 3.6 lists the items that achieved no consensus.

Table 3.5

IT Competencies that Achieved High And Moderate Consensus

Rank	IT Competencies	Median	QD
1	Create e-mail messages	6	0
2	Retrieve and manage e-mail messages and addresses.	6	0
3	Transmit and receive fax documents.	6	0
4	Create slides (use text, pictures, charts/graphs, organization charts).	6	0
5	Create slide show.	6	0
6	Use scanner to insert images and other documents into slide show.	6	0
7	Manage computer-related records.	6	0
8	Back up hard disk files to floppy disks.	6	0
9	Create documents (input, save, print, retrieve, text editing features).	6	0
10	Use formatting features.	6	0
11	Import other files into document.	6	0
12	Use spell & grammar check and templates.	6	0
13	Use proper keyboarding technique (at least 35 words per minute).	6	0
14	Manage calendar, schedules and planners (create, modify).	6	0.125
15	Use calendaring features	6	0.125

(table continues)

Rank	IT Competencies	Median	QD
16	Connect/disconnect to a server.	6	0.125
17	Create spreadsheet.	6	0.125
18	Perform basic maintenance.	6	0.5
19	Soft skill competencies.	6	0.5
20	Format cells in spreadsheet.	6	0.5
21	Create charts from spreadsheet.	6	0.5
22	Export spreadsheet charts/portions to other applications.	6	0.5
23	Access Web site (URL, address, links, home page).	6	0.5
24	Use bookmarks (create, save, organize).	6	0.5
25	Online travel arrangements, banking and purchase.	6	0.5
26	Use different types of search engines to locate information	6	0.5
27	Connect PC to projector.	6	0.5
28	Produce report from database (sort, search, and query)	6	0.5
29	Follow security regulations of organization (passwords, codes).	6	0.5
30	Create tables, manipulations and modifications.	6	0.5
31	Protect PC against viruses (check, scan and remove)	5.5	0.5
32	Create multimedia slide show presentations.	5.5	0.5
33	Understand security requirements of the organization.	5.5	0.5
34	Access and download various media forms.	5	0.5
35	Convert hardcopy documents into electronic documents.	5	0.5
36	Subscribe/unsubscribe to a listserve.	6	0.625
37	Create database (multiple fields and records, use layout).	5.5	0.625
38	Knowledge of software application packages relating to work.	5.5	0.625
39	Customize desktop display setting (screen, sound, date, time).	5	0.625
40	Use self-help resources to solve hardware and printing problems.	5	0.625
41	Create newsletters (integrate text, graphics and layout).	5	0.625
42	Use basic security features in PC.	5	0.625
43	Run operating system tools (recycle, clock, calculator).	4.5	0.625

Table 3.6

IT Competencies That Achieved No Consensus

Rank	IT Competencies	Median	QD
1	Create documents by using mailmerge and boilerplates.	6	1
2	Aware of Data Protection Act.	5.5	1
3	Knowledge of hardware.	5	1
4	Use and manage computer conferencing.	5	1
5	Awareness and knowledge of various aspects of Internet security.	5	1
6	Access online databases for basic business information (company information, share prices, exchange rates)	5	1
7	Save pictures/graphics on existing Web page.	5	1
8	Use a scanner to scan pictures and insert into Web pages.	5	1
9	Create forms for internal use (e.g. vouchers, leave forms).	5	1
10	Create a homepage or Web page using Internet authoring tools.	4	1
11	Maintain or update Web pages.	4	1
12	Access Web sites to conduct business of buying and selling.	3.5	1
13	Install/uninstall and upgrade applications.	4	1.125
14	Manage online inventory and stock.	4	1.125
15	Set up computers, printers and load application software.	5	1.5
16	Knowledge of the roles of system administrator.	4	1.5
17	Use accounting software.	4	1.5
18	Use statistical software to solve statistical problems.	4	1.5
19	Input statistical data for analysis using SPSS and SAS.	4	1.625

Several modifications were made to the items included in the ITCQ that was used to identify IT competencies required of administrative support staff employed in networked organizations. The "soft skill competencies" were left out of the ITCQ because the study was delimited to measure technical and not soft skill competencies. Although two IT competencies namely, "Create a homepage or Web page using Internet authoring tools" and "Maintain or update Web pages" were not included in the list of competencies that achieved high or moderate consensus, the researcher decided to include both items in

the ITCQ. It is the researcher's contention that the task of creating and maintaining Web pages is rapidly becoming an administrative support function and the study needed to determine this fact.

Comments for rating outside the majority response

The Delphi Rounds 1, 2 and 3 provided each SME an opportunity to give his or her opinion on the IT competencies required for employment of administrative support staff in the next five years. Any ratings that fell outside the majority response were re-rated, if desired, or maintained with reasons provided. Appendix K lists the reasons that SMEs provided for maintaining their ratings outside the majority response.

Survey Instrument

The information obtained from the Delphi Technique was used to develop a semi-structured questionnaire designed for mailing in order to obtain answers to the research questions. The completed questionnaire was named Information Technology Competency Questionnaire (ITCQ).

Information Technology Competency Questionnaire (ITCQ)

The first section of the survey requested demographic information of respondents. Demographic information elicited from respondents concerned highest level of education attained, type of organization, age, current job title, length of employment in current position, and years of related experience.

Information concerning use of computers was requested of respondents in the second section of the questionnaire. Respondents were required to state their experience in the use of computers in a workplace setting and the type of computer used.

In the third section of the questionnaire, the researcher generated questions for identification of training needs and preference for instructional delivery. Information on IT training received in the past five years and preferences for learning IT were also requested. The three methods of IT training were based on literature, which suggests that even though instructor-led training is the most popular method of delivery, technology-based method of delivery is expected to grow in the next five years (Compeau, Olfman, Sei & Webster, 1995; Jordan, 1999; "International Training Trends", 2002). Technology-based training methods include self-study with multimedia and non-multimedia computer-based training and videocassettes, distance learning via satellite, Internet, and corporate Intranet and facilitated learning that combines the benefits of computer-based training with the advantages of having an instructor (Allen, 1997; McGee, 1998; Ouellette, 1999; Saltzman, 1998; Trepper, 1999).

The fourth section of the questionnaire contained tasks and IT-related competencies along with three rating scales designed to measure the respondents' perceptions on three constructs (Bryant, 1997; Erickson, 1996; Fidler, 1997; Kawasaki, 1994; Reynolds, 1993):

1. task performance
2. task importance
3. self-reported level of competence (task ability)

Such measures were used to assess administrative support staff's frequency of task performance, perceived level of task importance and self-reported level of competence in performing tasks using IT and finally result in a list of IT competencies required of

administrative support staff. At the same time, a match between the task importance and self-reported level of IT competence represented a needs assessment of the IT competencies required for successful performance. The congruence between what the respondent should be able to do and what the respondent can do was determined.

The 45 IT competencies were divided into 10 categories as determined by the National Skills Standards of Administrative Support Occupations ("National Skills Standards", 1996):

1. Word processing (7 competency statements)
   1.1. Create documents (enter text, cut, copy, paste, save, print)
   1.2. Use formatting features (e.g. font size, spacing, margins)
   1.3. Advanced editing features (find, replace, paste special, macros to automate tasks)
   1.4. Create forms (insert and modify tables)
   1.5. Insert documents (e.g. files, graphics)
   1.6. Proofread documents (spell & grammar check)
   1.7. Keyboarding technique (at least 35 words per minute).
2. Communications (5 competency statements)
   2.1. Create e-mail messages (insert text, address, reply)
   2.2. Send e-mail (cc, forward, attach files)
   2.3. Organize e-mail addresses (add, edit, delete).
   2.4. Log on to a file server
   2.5. Join a listserve (e.g. discussion group)
3. Presentation (4 competency statements)
   3.1. Create slides (insert text, pictures, organization charts)
   3.2. Create slide shows (e.g. use layout, transition effects, timing sequence)
   3.3. Connect PC to projector for slide show

3.4. Create multimedia slide show presentations (insert video, graphics and sound)

4. Manage files and records (6 competency statements)

   4.1. Manage files (create, copy, rename, delete)

   4.2. Make backup copies of files.

   4.3. Search database for specific information

   4.4. Produce report from database

   4.5. Create database

   4.6. Scan documents

5. Monitor activities and events (2 competency statements)

   5.1. Use electronic calendar to set appointments and reminders

   5.2. Use electronic calendar to follow-up activities

6. Perform financial functions (5 competency statements),

   6.1. Create spreadsheet (enter data, cut, copy, move paste)

   6.2. Format cells (currency, date, time, percent, and fixed decimal)

   6.3. Use formulae (+, -, x, ÷)

   6.4. Create charts

   6.5. Insert spreadsheet into word processing documents

7. Internet research (5 competency statements)

   7.1. Access Web site (URL, address, links, home page)

   7.2. Use bookmarks (create, save, organize)

   7.3. Online travel arrangement

   7.4. Locate information (use search engines e.g. Yahoo)

   7.5. Download from the Internet (files, pictures, graphics)

8. Basic computer maintenance, security and troubleshooting (7 competency statements)

8.1. Perform basic maintenance (change printer cartridge, clean computer components, care for floppy disks)

8.2. Protect PC against viruses

8.3. Customize desktop display setting (screen, sound, date)

8.4. Use self-help resources to solve computer problems

8.5. Run operating system tools (e.g. scan disk, recycle)

8.6. Use security features in PC (password to log off, control access to files and folders)

8.7. Train new staff on the use of related softwares

9. Produce desktop publishing documents (2 competency statements)

9.1. Create newsletter (enter text)

9.2. Use graphic files (paint, draw, scanned files, clip art)

10. Develop Web page (2 competency statements)

10.1. Create a homepage or Web page (insert text, hyperlinks, graphics)

10.2. Upload files to Web server

Section Four of the instrument was also based on the Borich Needs Assessment Model (Borich, 1980) that was designed to assess the beginning teachers' perceived level of importance and self-reported level of competence in 50 professional competencies. Garton and Chung's (1997) meta-analysis of previous research found that the Borich Model is supported for two reasons. The first reason is the model's major strength in attempting to determine the congruence between what should be and what is and the second reason is the model's ability to identify important topics for curriculum development.

The overall design and layout of the ITCQ was also based on the questionnaire developed by Erickson (1996) for analyzing office automation competencies needed by office managers. Permission to use the questionnaire was obtained from the author

(Appendix L). The detailed tasks and IT competencies were generated from the Modified Delphi Technique and a review of related literature as suggested by the National Skills Standards of Administrative Support Occupations ("National Skills Standards", 1996) and related IT competencies frequently needed in office support roles (McEwen, 1996).

In order to determine how often a task is performed respondents were asked to circle a number indicating the frequency of task performance shown in Figure 3.11:

Rating	Scale
1	Never
2	Rarely
3	Sometimes
4	Often
5	Very often

Figure 3.11 Rating scale to indicate level of task performance

Respondents were then asked to assign a score indicating their judgment as to the importance of each task and IT competency in relation to their current position as in Figure 3.12:

Rating	Scale	Explanation
1	Not important at all	Skill is not required on the job
2	Little importance	Lack of skill does not affect job performance
3	Average importance	Lack of skill affects job performance
4	Important	Skill contributes to job performance
5	Extremely important	Skill is critical for job performance

Figure 3.12 Rating scale to indicate level of task importance

The respondents were also asked to indicate their level of competence in performing tasks using IT according to the scale in Figure 3.13.

Rating	Scale	Explanation
1	Unacceptable	Cannot do at all
2	Marginal	Satisfactory but sometimes unacceptable
3	Acceptable	Meets job requirements
4	Proficient	Exceeds job requirements
5	Exceptional	Exceeds job requirements and can train others

Figure 3.13 Rating scale to indicate level of competence in task performance

The rating scale for measuring the respondent's level of ability or competence was adopted from the research instrument developed by Erickson (1996) in her study on office automation competencies needed by office managers.

The instrument used in Erickson's study was subjected to three reviews in order to determine the length, suitability of language and format, overall design and layout, clarity of instructions and content appropriateness. The reviews involved academicians, business educators and individuals from the private sector with a background of research in business education and office management education. Among the changes that were made to the research instrument included a review of labels that describe behaviors and a reduction in the number of competency statements. A systematic and thorough approach had been utilized to develop the research instrument. Therefore, the rating scale used for measuring the level of ability was appropriate for measuring the respondent's level of competence.

Pilot Test

The results obtained from the Delphi process were used to design the questionnaire administered to the respondents selected for this study. A pilot test was administered on 10% of the population not selected for participation in the research. Forty-three persons responded to the pilot study. The purpose of the pilot test was to further validate the instrument for content and clarity of instructions, determine whether the chosen statistical methods were appropriate and to estimate the expected response rate.

The construct validity of the ITCQ scores from the pilot test was examined using a factor analysis. A principal components analysis was used to evaluate the structure of the 45 items. The decrease in Eigen values leveled off at 11 factors each with an Eigen value greater than 1. Pattern coefficients greater than .40 were used to determine relationships between the items and the factors. The two categories, "Perform financial functions" and "Internet research", were placed in the first factor. Only one out of the five "Word processing" items did not belong in its intended factor. One item from the "Communications" category and two items from the "Basic computer maintenance, security and troubleshooting" category were not placed in their intended factors. A Cronbach Alpha of 0.941 was obtained for the questionnaire used in the pilot test.

Feedback obtained from the pilot test data analyses was used to amend the questionnaire prior to the second pilot test. The amended questionnaire was delivered to the 43 persons who responded to the first pilot test. Twenty-two persons responded to the second pilot test. The second pilot test data analysis was used to amend the questionnaire in preparation for the final instrument.

As a result of the Delphi process, the survey instrument used for this study consisted of job tasks and IT competencies that reflect current practices of administrative support staff employed in networked service organizations in Klang Valley, Malaysia.

Validity and Reliability of ITCQ

The purpose of this study was not to design the ITCQ; however, the questionnaire used for this study was tested for validity and reliability. While the panel of experts from the Modified Delphi Technique assessed the instrument for content and face validity, reliability was measured through the Cronbach Alpha test. The 45 competency statements were categorized into 10 competency categories and the alpha coefficient was calculated for the 10 categories and for the questionnaire in its entirety. The level of significance for items was established at .05. Table 3.7 shows that the Alpha score obtained for all 10 categories are above .89 that is well above the .70 level generally acceptable for field research (Hair et al., 1998):

Table 3.7

Cronbach Alpha Scores for the Information Technology Competency Questionnaire (ITCQ)

Competency Categories	No. of Items	Alpha
Word processing	7	.9206
Communications	5	.9345
Presentation	4	.9439
Manage files and records	6	.9341
Monitor activities and events	2	.9545
Perform financial functions	5	.9629
Internet research	5	.9508
Basic computer maintenance, security & troubleshooting	7	.9412
Desktop publishing	2	.9127
Develop Web page	2	.8914
TOTAL	45	.9827

Data Analysis

The collected data were keyed into the SPSS Version 10.0 statistical package and explored to detect for errors and inconsistencies. The package was used to test for several statistics such as t-test, Chi-square test, and ANOVA. The probability level for all statistical analyses was set at .05.

The research questions were designed for the purpose of determining the tasks and related IT competencies required for administrative support staff employed in networked organizations. A list of 45 IT competencies were grouped into 10 categories in Section four of the Information Technology Competency Questionnaire (ITCQ). Research question one requested respondents to indicate the frequency of task performance according

to the following scale: 5 = Very often, 4 = Often, 3 = Sometimes, 2 = Rarely, 1 = Never. Research question two required respondents to rate the importance of task performance according to the following scale: 5 = Very important, 4 = Important, 3 = Average importance, 2 = Little importance, 1 = Not important at all. For research question three, respondents were required to self-rate their ability to perform the task using IT according to the following scale: 5 = Exceptional, 4 = Proficient, 3 = Acceptable, 2 = Marginal, 1 = Unacceptable. To answer the three research questions, the data needed to be grouped into 10 competency categories and analyzed by computing for mean scores and standard deviations for performance, importance and ability of each IT competency. Frequencies and percentages were also used to answer research questions one, two and three.

The weighted discrepancy score (WDS) was used to measure the in-service training needed to close the gap between competencies perceived as important and the respondents' self-reported level of competency required in research question 4. The competency gap or discrepancy scores for each respondent on each IT competency was computed by taking the difference between the importance rating and the self-reported competency rating. A weighted discrepancy score was calculated for each respondent on each of the IT competency by multiplying the discrepancy score by the mean importance rating.

A mean weighted discrepancy score (MWDS) for each IT competency was calculated by taking the sum of the weighted discrepancy scores and dividing by the number of responses. Finally, the IT competencies were ranked according to the mean weighted discrepancy scores (Borich, 1980; Edwards & Briers, 1999, Garton & Chung, 1997). IT competencies that obtained weighted discrepancy scores above 0 were determined as high priority competencies that require retraining. Higher discrepancy scores mean that rated items are higher in importance than in competency—indicating that these

are high priority items that must be included in curriculum content. On the other hand, low discrepancy scores would mean that items are more closely aligned resulting in a lower priority for development or suggest a program for retraining or updating.

In addition to descriptive statistics, analysis of variance and post hoc tests were used to analyze data related to research questions five, six and seven. The ANOVA and post hoc tests allowed for the determination of significant differences in mean scores of task performance, task importance and task ability across the demographic and situational variables of level of education, job title, age, years in current position, years of related work experience, IT training attended in the past 5 years, preference for IT training, method of learning IT and method of acquiring IT competency.

The Pearson product moment correlation coefficient was used to check the degree of relationship between the perceived task importance and level of task performance for the 10 competency categories. A scatter diagram to show correlation between the two variables was produced and the *r*-square value was used in addition to the *r*-value. According to Salkind (1997) a sounder method of interpreting the correlation coefficient is to square the *r*-value. The *r*-square value or often referred to as the coefficient of determination estimates the proportion of variance in the dependent variable based on the proportion of variance in the independent variable (Salkind, 1997; Sekaran, 1992). A higher correlation value indicated that the IT competency needs to be included in a program for training of administrative support staff.

Types of Errors

Any research would try to minimize errors to ensure greater reliability and validity of findings. However, due to constraints in research design, some errors are inevitable. The two most common error types are sampling and non-sampling errors that make up total errors in research (Engel & Palit, 1999; Malhotra, 1993).

Every sample used for research is different and no two can be the same. When a sample is randomly selected from a population the sample will not be exactly representative of the population. Sampling errors occur because individuals making up the samples would be different due to sampling effects. However, the use of stratified selection of respondents for this research was expected to reduce sampling error (Beldin, 1998). Engel and Palit (1999) reported low response rates with mail survey. Therefore, there would be potential bias due to a low response rate.

One of the most important potential sources of non-sampling errors is non-response. Non-response errors occur if the persons not responding to the survey are different from the persons responding to it. Increasing the response rate will minimize the potential effect of non-response, while increasing the sample size will minimize the potential effect of sampling error. Therefore, the response rate and a measure of sampling error were used as a measure of the quality of the data.