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FACULTY OF GRADUATE STUDIES

MASTER IN BUSINESS ADMINISTRATION

TECHNICAL SUPPORT HELPDESK PERFORMANCE in The ACADEMIC ENVIRONMENT:
A CASE STUDY at BIRZEIT UNIVERSITY'S TECHNICAL SUPPORT HELPDESK

أداء قسم الدعم الفني في البيئة الأكاديمية : قسم الدعم الفني في جامعة بيرزيت كحالة دراسية

Prepared by

Nour M. Sharkasi

Supervised by

Dr. Bassem Al-Sayrafi

Birzeit University – Palestine
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A thesis submitted in partial fulfillment of the requirements of the Master degree in Business Administration with emphasis on IT Services Management

Prepared by: Nour M. Sharkasi

Supervised by: Dr. Bassem Al-Sayrafi

Approved by:

Dr. Bassem Al-Sayrafi ---

Dr. Grace Khoury ---

Dr. Samer Baidoun ---

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I certify that except as noted above, this study is my own work and all references are accurately reported.

Nour M. Sharkasi

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Acronyms

ART: Average Resolution Time

BZU: Birzeit University – www.birzeit.edu

CRM: Customer Relationship Management

DFD: Data Flow Diagram

FCR: First Contact Resolution

Inc. : Incorporation

IT: Information Technology

SLA: Service Level Agreement

QoS: Quality of Service

Abstract

Although often underestimated, helpdesk can be of great value to organization. The helpdesk acts as the front line to provide IT services to users, it is one of the most important criteria when it comes to user satisfaction with overall IT services. However, helpdesks today are faced with growing user demands and high expectations, complex IT systems and resources' constraints, in addition to other factors that are making it difficult for the helpdesk to provide good service quality and maintain user satisfaction.

Helpdesks in the academic environment are no exceptions. Regular performance monitoring can aid helpdesk to ensure that quality of service is maintained, it also highlight areas in need for improvement. This master thesis focuses on developing a methodology for measuring helpdesk performance in the academic environment that considers internal and external measures. This research takes the form of a holistic single-case revelatory study, using Birzeit University Helpdesk as a case to deploy the proposed performance matrix.

From literature, the matrices most important to helpdesk performance are found to be service quality, customer satisfaction, employee satisfaction and various statistical service related matrices, such as average resolution time and first contact resolution. The overall performance of Birzeit University's helpdesk was measured by using various data collection methods. Two questionnaires were administered in this study: the first, is the user satisfaction and service quality questionnaire, based on the SERVPREF instrument, a version of SERVQUAL instrument which is used to measure users' perceived service quality that reflects their satisfaction, the second, is helpdesk staff job satisfaction questionnaire, based on the Abridged Job Descriptive Index 'AJDI', which is used to measure job satisfaction of BZU helpdesk staff; interviews were also administered with helpdesk staff and management to capture more reliable data.

Secondary data from BZU helpdesk call management system is captured and analyzed to compute the statistical service related metrics. The relationship, if exist, between users' satisfaction and their perceived service quality performed by the helpdesk is closely examined for hypothesis testing because of its heaviest weight on the proposed performance matrix.

The results of measuring overall BZU helpdesk performance revealed that the level of users' perceived service quality is very close to that of their overall satisfaction. The findings also indicated that there is a positive relationship between users' perceived service quality and their satisfaction level. It is also found that BZU helpdesk staff job satisfaction also reflects on helpdesk performance and thereof, on users' satisfaction. Moreover, analysis of statistical matrices are related to perceived service quality and users' satisfaction in a positive way; when statistical measures are found to be problematic, we can simply conclude that other performance measures are also problematical.

The Thesis also entails designing a road map solution for the helpdesk system to logically model the function of the helpdesk by the mean of Data Flow Diagrams DFDs. The model proposes a knowledgebase-centric design; and its baseline assumption is that helpdesk support lifecycle starts on level-zero support which is self-learning and self-help stage made possible by the use of a knowledgebase. By the proposed road map solution, the research study attempts to enhance helpdesk service quality not only through periodic evaluation of performance measures, but also by providing the best service delivery practices. The study advices Birzeit University's helpdesk to act more proactively to gradually make a cultural transition in the academic environment.

ملخص الرسالة

على الرغم من عدم إعطاء قسم الدعم الفني حق قدره، يبقى قسم الدعم الفني ذا قيمة عالية في المؤسسات التي يتواجد بها، حيث يعتبر قسم الدعم الفني الواجهة الأولى لتقديم الخدمات التكنولوجية للمستخدمين، والتي تعد من أهم المؤثرات على رضى المستخدمين عن الخدمات التكنولوجية عموما . لكن، وللأسف، يواجه قسم الدهم الفني هذه الأيام العديد من التحديات المرتبطة بالعديد من المؤثرات، أهمها   :   زيادة نوقعات واحتياجات المستخدمين،سرعة تطور المعدات والأجهزة التكنولوجية وزيادة تعقيدها باختلاف أنواعها، بالإضافة إلى العديد من العوامل التب تجعل من الصعب على قسم الدهم الفني اقديم خدمة فنية ذات جودة عالية تحافظ على مستوى جيد يرضي المستخدمين.

لا يختلف وضع قسم الدعم الفني في البيئة الأكاديمية كثيرا،   إذ أنه يعاني من الصعوبات ذاتها وتبرز التحديات المالية في البيئة الأكاديمية بسبب محدودية مصادر الدعم المادي إذ أن الخدمات الحاسوبية مجانية في البيئة الأكاديمية. ولمحاولة مواجهة هذه المشاكل، لا بد من التأكد من تقديم خدمة فنية ذات جودة عالية وذلك بقياس أداء قسم الدعم الفني بشكل دوري، إن قياس الأداء سيساعد أيضا في اكتشاف نقاط الضعف وبلورة الأخطاء لتجنبها والتحسين من جودة الخدمة المقدمة.

تأتي هذه الأطروحة لتعرض وسيلة لقياس أداء قسم الدعم الفني في البيئة الأكاديمية وذلك بالأخذ بعين الاعتبار معايير القياس الداخلية والخارجية. تأخذ الأطروحة شكل حالة دراسية ايحائية وذلك بدراسة قسم الدعم الفني في جامعة بيرزيت كحالة دراسية لتطبيق وسيلة قياس الأداء.

بمراجعة الأدبيات، تبين أن أكثر المعايير شيوعا لقياس أداء قسم الدعم الفني   هي: جودة الخدمة المقدمة، مدى رضى المستخدمين عن الخدمة المقدمة، مدى الرضى الوظيفي لفريق العمل في القسم، والاحصائيات المتعلقة بتقديم الخدمة مثل : معدل المشاكل التي تحل في الزيارة الأولى ومعدل الوقت المنقضي لحين حل المشكلة في إطار زمني محدد في وثيقة الاتفاق بين القسم والمستخدمين . تحاول الدراسة بذلك الإجابة عن الأسئلة التالية: (كيف يمكن وصف وصف طبيعة العلاقة، إن وجدت، بين رضى المستخدمين وجودة الخدمة المقدمة؟، ما هو تأثير مدى رضى فريق العمل في قسم الدهم الفني على أداء القسم بشكل عام؟ ، كيف يمكن قياس أداء قسم الدعم الفني في البيئة الأكاديمية باستخدام معايير القياس الأربعة: جودة الخدمة المقدمة، مدى رضى المستخدمين عن الخدمة المقدمة، مدى الرضى الوظيفي لفريق العمل في القسم، والاحصائيات المتعلقة بتقديم الخدمة ؟   ،   كيف يمكن

تصميم الاجراءات الروتينية لأعمال القسم بطريقة DFD بصورة نموذجية؟). يتوقع من هذه الدراسة الإجابة عن هذه الأسئلة عبر تحقيق الأهداف التالية:

1. قياس أداء قسم الدعم الفني في جامعة بيرزيت وذلك بوصف العلاقة، إن وجدت، التي تجمع:

- المتغيرات المؤثرة على الأداء عبر طريقة تصميم أداة قياس تستند على SERVQUAL Instrument

- قياس مدى رضى فريق عمل قسم الدعم الفني عبر استبيان يستند على AJDI instrument

- تجميع البيانات الإحصائية المخرجة من الإلكتروني لقسم الدعم الفني

2. تحليل البيانات التي تم تجميعها من الهدف الأول باستخدام الوسائل الإحصائية المختلفة

3. تصميم خطة نموذجية لتنظيم سير الأعمال الروتينية لقسم الدعم الفني وذلك باستخدام DFD

اسفرت نتائج تحليل البيانات الأولية والثانوية المجمعة في هذه الدراسة عن استنتاج ترابط وثيق بين درجة رضى المستخدمين عن خدمات قسم الدعم الفني وجودة الخدمة المقدمة للمستخدمين . إذ أنه من الممكن وصف العلاقة بين هذين المتغيرين بشكل إيجابي إذ بازدياد إحداهما يزداد العامل الاخر . وقد تم أيضا استنتاج أنه يمكن اعتبار درجة الرضى الوظيفية لفريق عمل قسم الدعن الفني كمؤشر لأداء قسم الدعم الفني . بالإضافة لذلك تم التوصل إلى استنتاج وجود ترابط ما بين النتائج التحليل الإحصائي للبيانات المسجلة في النظام الإلكتروني لقسم الدعم الفني ودرجة أداء القسم حيث تعتبر قراءات التحليل الاحصائي لهذه البيانات بمثابة انعكاس للوضع الحقيقي لأداء القسم إلا أنه لا يمكن الإكتفاء بها كمؤشر شامل يصف هذا الأداء.

تعرض الأطروحة أيضا تصميما لخطة نموذجية لتنظيم أعمال قسم الدعم الفني منطقيا باستخدام DFD. النموذج يقترح تصميما يعتمد قتعة بيانات والتي بدورها تبنى على أساس بدء دورة حياة طلب الخدمة في قسم الدعم الفني من درجة الصفر وهي عبارة عن درجة تعلم ومساعدة ذاتية ممكنة باستخدام قاعدة بيانات . إن تصميم الخطة النموذجية لأعمال القسم في هذه الدراسة تعمد إلى محاولة تحسين وتطوير جودة الخدمة التي يقدمها قسم الدعم الفني ليس فقط بتقييم الأداء بشكل دوري وإنما أيضا بالإلتزام بنصائح تقديم أفضل خدمة . الدراسة تنصح قسم الدعم الفني في جامعة بيرزيت بالعمل الحثيث ب صورة وقائية لتحسين مجريات العمل وتلافي الأخطاء وذلك حتى يتمكن القسم تدريجيا من إحداث تغير ثقافي لمجتمع الجامعة الأكاديمي.

THE THESIS

1. Chapter 1: Introduction

The motivation behind this research study is to provide some detailed insights into helpdesks, especially about Information Technology IT helpdesks in the academic environment. There is no precise definition for the term 'helpdesk' or 'help desk', helpdesks are the front line of users' services. Gartner Group's definition of a helpdesk, as quoted by Marcella and Middleton (1996), is:

"To provide a single point of contact and responsibility for rapid closure

of end-user technology problems."

Marcella and Middleton, who have done extensive research into helpdesk over many years for the British Library Research and Development Department, have developed the following definition of a helpdesk (Marcella & Middleton, 1996):

"An Accessible service point which will provide on-demand advice,

information or action to aid the user in carrying out an IT-related task."

The helpdesk evolved out of necessity in the 1980's, when personal computers started to replace terminals on the desktop and the local area network emerged, this resulted in an enormous amount of queries being generated to the helpdesk, relating to the installed software and hardware (Parsec Technologies, 2002). Over the past 20 years, the helpdesk has evolved away from the constant, repetitive cycle of simply answering users' questions and dilemmas with no plan of action or standard problem-solving strategies. In a presentation at the 1996 ITIMF annual conference in the U.K., Middleton (1996) gave an excellent summary of the differences between traditional and today's modern helpdesks as shown in Table 1-1.

When users need help, they call the helpdesk and thereafter the efficiency of the IT services of the organization is judged by the effectiveness, efficiency, courtesy, and responsiveness shown in handling a single call. If properly handled, the call could strengthen the users' relationship and lead to enhanced users' satisfaction

and better productivity. According to Lynn Sechrest, Director of Gartner Measurement, the IT helpdesk is still one of the most important criteria when measuring customer satisfaction with its services overall. It also carries the brunt of customers' satisfaction or dissatisfaction with IT (Gartner Group, 2001). Thus, the helpdesk can be a potentially powerful business tool. It acts as customer services' front line and has the ability to gather data from across an organization to aid in IT management and strategy (Marcella & Middleton, 1996).

Table 1-1: Traditional vs. Modern Helpdesk (Middleton, 1996)

Traditional Helpdesk	Modern Helpdesk
Fixes results of problems, not their causes	Fixes the causes of problems at source
Reactive, demand driven	Proactive, strategy driven
An information dead end	Gathers/ disseminates information
A career dead end	A worthwhile career path
Isolated	Integrated
Passive – awaiting approaches	Aggressive- markets itself
Technically oriented staff	Customer service oriented
Struggling for resources	Justifies resourcing
A "back room" function	The public face of IT/ Customer Services

Helpdesks suffer from difficulties in many domains; BZU helpdesk is no exception, BZU helpdesk suffers from difficulty in defining its role and obtaining resources, since its existence in 1999, it still has no service level agreement SLA communicated with users or with supporting units in its environment. BZU users are constantly complaining of delay in providing technical support service and usually express dissatisfaction with the way service is provided.

Middleton and Marcella (1997) say that money is one of the main aspects that distinguish academic helpdesk from commercial one. In the academic environment, it is difficult to show the helpdesk contribution to the success of the university as a whole. Staffing issues are problematic at the academic helpdesk, which directly affects the helpdesk performance and thus the service quality rendered to users. Equipment and its wide variety of brands is another major problem that hider the

helpdesk from providing its services effectively. The helpdesk, beside providing technical support services to users, needs to overcome behavioral reactions of users, according to Teare (1998), users facing problems experience many emotional behaviors before even contacting a service point.

With all the challenges and difficulties facing the helpdesk, it is important to evaluate its performance in order to overcome difficulties to provide better service quality to achieve users' satisfaction. Measuring performance can assist the helpdesk in focusing its improvement efforts on the areas of greatest need and can also ensure that the quality of service provided by the helpdesk does not deteriorate (Bird, 2000). Bird (2000) discusses this idea within an academic context, in a journal published by Cause – an association for managing and using information technology resources in higher education.

Landgrave, Wilson and Templeman (2001) say that keeping statistics on helpdesk performance is critical. Without performance statistics, there is no way for the helpdesk manager to know if resources are being used to the fullest or whether more resources are required. In addition, statistics can show the helpdesk manager the strengths and weaknesses of the workflow process. Before attempting to make any changes, it is important to know how well or how poorly the current processes are working. This initial measurement of the current status of the helpdesk is considered the baseline. Once a baseline of performance is known, it is easy to determine the effectiveness of the changes that have been made. For this cause, this study suggests a logical model of a knowledgebase-centric helpdesk system presented by the mean of Data Flow Diagrams DFDs. The workflow of current functions of BZU helpdesk are benchmarked against those suggested in the model to identify weakness points and pinpoint bottlenecks in the current workflow.

Middleton and Marcella (1997), specifically within an academic context, pointed out that performance information gathered at the helpdesk can be used as a leveraging tool and aid the helpdesk in targeting its efforts appropriately. It can also

be used to justify funding. Landgrave, Wilson, and Templeman (2001) point out that as a result of ongoing helpdesk performance monitoring and utilizing the most effective processes, helpdesks can gain a tremendous advantage, they can reduce technical resource needs, save on costs administering helpdesk services, and increase customer satisfaction by providing an excellent service and establishing superior Service Level Agreements.

Gartner Group analyst Mike Rhone stated (McGee, 1998): "Many companies realize they need to improve help-desk operations, but they don't regulatory benchmark their performance." However, the idea is never to measure just for the sake of measuring, the intent should be to gather information that will allow the helpdesk to implement positive change (nanoDesk, 2002). Bird (2000) says that the results of the helpdesk performance analysis should be made publicly available, along with plans for improvement. Bird (2000) states: "Show your staff and your peers elsewhere in the university that you stand behind results and are willing to publicly acknowledge that there may be areas needing improvements."

According to West, there does not seem to be a universally accepted way of measuring helpdesk performance (West, 2000). Designing a matrix for helpdesk performance is extremely easy, but designing an effective one is significantly more difficult. Most resources agree that helpdesk call statistics such as queuing times, time spent per call, total number of calls closed in a given time period, abandon rates and first contact resolution percentage are useful measures of helpdesk performance.

Many support operations now have systems in place to measure compliance with Service Level Agreements SLA. But that may not be enough as SLAs only go part way to truly measuring the performance of the helpdesk. The customer should always be at the center of any support operation. Helpdesk staff may believe that because they are fulfilling SLAs, they are meeting customers' expectations. But even if customers are aware that the helpdesk is delivering on its commitments, they may still be unhappy with the way their calls are handled (Touchpaper, 2002).

The performance measurement matrix used in this study outlines the following four metrics: average resolution time ART, first contact resolution FCR, user satisfaction, and helpdesk staff job satisfaction. User satisfaction is the only external measure of the matrix. Customer satisfaction is generally measured in emotional and attitudinal dimensions and in action-oriented dimensions. McColl-Kennedy and Schneider (2000) further say that for research purposes, customer satisfaction is not measured alone, but in conjunction with service quality and success. However, the customer satisfaction, service quality and success constructs can only be expressed and measured by several indicators on which there is no general consensus but competing ideas and theories. McColl-Kennedy and Schneider (2000) propose that the best way of measuring customer satisfaction is by using measures that are standardized for special groups such industry. If such standardized measures exist, they can easily be modified to fit with the characteristics of the environment of concern.

In this study Gartner Inc. Helpdesk Performance Matrix, is the baseline of a further derived matrix appropriate for measuring helpdesk performance in the academic environment. Gartner Inc. argues that while cost management is extremely important in the helpdesk –especially commercial helpdesks-, it must be given secondary importance to the primary goal of providing an acceptable level of service to the customers. For that reason, cost is given a (40%) weight in the Gartner Inc. Performance Matrix, while various service matrices (average resolution time, first contact resolution, user satisfaction, and helpdesk staff satisfaction) account for 60% of the matrix.

In this study, the Gartner Inc. matrix is modified to better fit with the nature of helpdesk in the academic environment. The cost metric is eliminated and its (40%) weight is disseminated relatively across service indexes of the matrix, in addition, average queue time metric is replaced with average resolution time to fit

with the nature of BZU helpdesk system and the purpose of the study. Table 1-2 shows the original opposed to modified Gartner Inc. matrix.

Table 1-2: Original vs. modified Gartner Inc. Performance Matrix

Performance Metric	Original Weights	Modified Weights
Average resolution time (in place of average queue time)	9%	15%
First-contact resolution	21%	35%
Employee satisfaction	12%	20%
Customer Satisfaction	18%	30%
Total Weightings	60%	100%
Cost per handled call	40%	

The modified matrix is used to propose a methodology for measuring helpdesk performance in the academic environment taking Birzeit University as a case study. This study suggests that periodic performance measurement alone is not enough to approach performance enhancement, a knowledgebase-centric model aided by the adaptation of an electronic helpdesk system is also important to reach performance excellence, moreover, it is necessary to deploy best 'customer service practices' and quality of service QoS indicators into daily functions of the helpdesk. The logical knowledgebase-centric model, developed in this study, ensures continuous governance of a satisfactory service quality.

Therefore, and upon addressing a wide range of literature, in the next chapter, a number of hypotheses are derived from the literature review to examine relationships between variables, main relationships examined about user satisfaction and service quality, helpdesk staff satisfaction and its impact on performance, in addition to other hypothesis related to calls statistics. The hypotheses are tested on the data collected from various sources by the mean of SPSS software and Microsoft Excel within Birzeit University's helpdesk environment. Results of the analysis are stated and implications are addressed.

1.1. Problem Statement, Research Questions, and Purpose of the Study

The main purpose of this study is to develop a methodology for measuring overall helpdesk performance for the helpdesk in the academic environment and apply it to measure the performance of BZU Helpdesk. This study therefore takes the form of a holistic single-case revelatory study (Yin, 1984). BZU helpdesk will serve as a revelatory case for the helpdesk in the academic environment in Palestine. The purpose of the study is both descriptive and explanatory, using data from multiple sources of evidence.

No matter how much helpdesks strive to provide better service, they still face many complaints from different users about the service, in some cases, the reason of users' dissatisfaction is not necessary the technical support service; there are many reasons behind users' dissatisfaction, many of which doesn't necessary point out to insufficient service or knowledge of staff. The main problem of this study is to help technical support helpdesks in the academic environment achieve users' satisfaction by enhancing its performance; to reach this goal, the helpdesk needs to continuously evaluate its performance in order to tap on weakness points and work toward enhancing its position. Measuring academic helpdesk performance can be done by developing an efficient matrix for periodic performance measuring, however, high level of performance can also be granted by using a knowledge centric electronic system and by mapping the routine processes of technical support agents in an attempt to integrate QoS indicators into processes and functions of the helpdesk.

The proposed matrix of this study is generated by modifying Gartner Inc. Performance Matrix. The study also attempts to supplement the performance measurement with a proposed road map solution for the academic helpdesk system. The suggested solution aims to transform the helpdesk traditional role from being reactive, passive, and problem-centric service provider into a proactive, aggressive, knowledgebase-centric service center that would gradually achieve cultural transition

in the academic environment to becoming a self-learning and self-helping community. A number of research questions resulted from the problem statement seek answers from the environment of Birzeit University. On the basis of the literature review and the needs of BZU helpdesk, the main research questions addressed in this study are:

Q.(1) How does BZU users' satisfaction relate to their perception of quality of technical support services performed by the helpdesk?

Q.(2) What is the impact of BZU helpdesk staff job satisfaction on helpdesk performance?

Q.(3) How can the performance of the academic helpdesk be measured by the four proposed indexes: user satisfaction of perceived service quality, the helpdesk staff job satisfaction, and calls statistics of proposed performance matrix?

Q.(4) How can the workflow of the helpdesk functions be best designed logically through the mean of Data Flow Diagrams DFDs?

In order to determine the relationship between BZU users' satisfaction and perceived service quality, if any exists, a survey based on the SERVPREF instrument, a version of the SERVQUAL instrument is constructed to measure the satisfaction level of users toward their perceived service quality performed by the helpdesk. The analysis of data uncovers trends that describe the relationships between variables according to grouping factors. Previous literature showed a significant relationship between service quality and users' satisfaction, thereof, the relationship will be examined within the environment of Birzeit University.

The second question is answered in part by conducting a shortened version questionnaire for the helpdesk staff to determine their job satisfaction level; interviews are also conducted with some agents to help draw an overall picture of their job satisfaction level in the work environment. Some studies state that satisfied employee are ready to exert more effort to serve the organization they work for by

accomplishing their tasks in their best efficiency and build good relations with customers. Other studies, however, stated that employees' performance may reach up to a satisfactory level regardless of the job satisfaction level of employees. This research study examines the relationship between helpdesk staff job satisfaction and its relationship to users' perceived performance level.

Therefore, the purpose of the study, is to develop a methodology to measure and maintain the helpdesk overall performance as an IT service provider. Helpdesk performance is measured by the use of a modified Gartner Inc. performance matrix which is originally created for all domains of the IT service industry, in this study, the matrix is modified to fit the characteristics of the academic helpdesk. The proposed matrix is then put into practice to measure the overall performance of BZU academic helpdesk.

The second main purpose of the study is to maintain the helpdesk performance up to a satisfactory level in daily routine functions of the helpdesk, a road map solution of the workflow of functions of the helpdesk is created and deployed service quality indicators into the DFDs' model. The research questions are all answered within the environment of Birzeit University.

Periodic measuring of helpdesk performance is important to evaluate performance efficiency to work out weaknesses and suggest improvements. To complement performance measurement, a road map solution is proposed in an attempt to organize the workflow of routine functions of the helpdesk that involve interaction with users. The logical model is represented by the mean of Data Flow Diagrams DFDs, the model is knowledgebase-centric, it is based on the assumption that technical support lifecycle starts with the users motivation to self-solve their IT-related problems by the aim of a knowledgebase to form level-zero support tier. In this support tier, users browse the knowledgebase for technical support solutions seeking answers of their queries.

The ultimate goal of the helpdesk, as viewed in this research study, is to transform the helpdesk from its traditional reactive role into a more proactive modernized helpdesk. Modern helpdesks use electronic systems like call management systems and a knowledgebase to boost their performance efficiency. The electronic helpdesk system proposed in the study expects to achieve cultural transition; it transforms the culture of the academic community into a self-learning and self-helping one. The main purposes of the study are emphasized by addressing the topics organized in the following manner:

1.2.   Objectives of the study

Objective (1): Evaluate helpdesk overall performance, by using a modified Garner Inc. service performance matrix of the helpdesk which measures the following:

BZU users' satisfaction and its relationship to users' perceived service quality of technical support helpdesk; a questionnaire is conducted at Birzeit University based on SERVPREF version of the SERVQUAL instrument.

Helpdesk staff job satisfaction by conducting structured interviews with the helpdesk staff and a questionnaire based on the (AJDI) instrument.

Analyze call statistics to find out: (A) Service Resolution time and (B) first contact resolution FCR.

Objective (2): analyze data obtained from Objective (1) as follows:

Construct a questionnaire based on the SERVPREF, a version of the SERVQUAL instrument in order to measure users' perceived service quality performed by the helpdesk and its relationship to users' satisfaction. The questionnaire answers other questions like: the rank of the most used methods to contact the helpdesk, the efficiency of the telephone system to contact the helpdesk, and the most common problems facing users at BZU, the questionnaire also measures the helpdesk performance level through users perceived service quality and overall users' satisfaction.

Determine helpdesk staff job satisfaction of the environment they work within and demonstrate the affect of their satisfaction level on the quality of service they deliver to users.

Analyze the data proceeded from the call management system of BZU helpdesk (V-tiger software) by using service matrices; which are: average resolution time ART and first contact resolution FCR. Point out bottlenecks of the workflow currently followed to perform tasks at the helpdesk in order to highlight the most critical areas in need of improvement at BZU helpdesk and suggest possible solutions.

Objective (3): Design a road map solution that interconnects all modules of this research study. A logical model of the functions of the helpdesk is designed by the mean of DFDs; it also deploys quality of service indicators into the electronic helpdesk system in addition to the DFDs model. A general service quality management model is created to consider implementing SLA indicators within the data flow diagrams model. The main aspects of the objectives of the study are graphically viewed in Figure 1-1.

Figure 1-1: Graphical representation of the objectives of the study
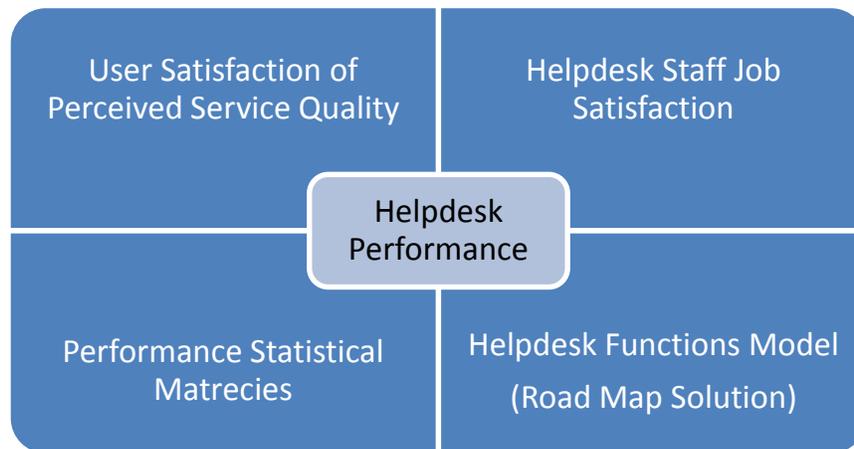
User satisfaction of perceived service quality and helpdesk staff job satisfaction are measured through surveys. While service statistics are interpreted upon analyzing the captured data from the call management system. It is interesting

to notice that, user satisfaction is the only external measure of performance, it is also worth saying that both primary and secondary data is used to measure helpdesk performance. SLA and benchmark figures are both important to evaluate the helpdesk performance against anticipated levels; unfortunately, BZU helpdesk doesn't have SLA nor benchmark figures to which we can benchmark its performance efficiency level, to overcome this obstacle, the researcher suggested figures based on the literature review to be used as a reference for the acceptable levels of performance for BZU.

1.3. Thesis Organization

The topics of the Thesis are organized in eight chapters, the first is this chapter and other chapters are ordered as follows:

Chapter Two: Literature Review

This chapter starts with introduction of helpdesk definition and its distinguished characteristics in the academic environment; it puts on the table some of the theories about the concept of service quality and debates in relation to users' satisfaction and employee job satisfaction. Gartner Inc. performance Matrix is chosen to be the baseline of the proposed methodology for measuring helpdesk performance in the academic environment; therefore, a description of the indexes of the matrix is illustrated in addition to identifying the theoretical framework of the instruments used in measuring BZU users' satisfaction and BZU helpdesk staff job satisfaction.

Chapter Three: Technical Support Helpdesk at Birzeit University

This Thesis is a holistic single-case revelatory study; this chapter presents the history of the helpdesk and the computer center at Birzeit University, highlights its challenges, services, and describes its current situation. It embodies the environment where the proposed methodology for measuring helpdesk performance will be implemented in later stages.

Chapter Four: Research Methodology

This chapter also serves one of the main purposes of the study. It states six hypotheses to be tested in later stages within Birzeit University's environment. It explains how Gartner Inc. Performance Matrix is modified to become appropriate for implementation in the academic environment. It also illustrates research methodologies for measuring the indexes of the modified matrix (also called the proposed matrix), it encompasses the following sections: Research methodology overview and timeframe of the study, Modified Gartner Inc. performance Matrix, Measuring BZU Users' Satisfaction and Service Quality, Measuring Helpdesk Staff Job Satisfaction, and Statistics of the Helpdesk Call Management System.

Chapter Five: Data Analysis

Primary data captured from the surveys and staff interviews as well as secondary data proceeded form the call management system are analyzed in this chapter and results are interpreted. The chapter also intends to validate the SERVPREF instrument which is used to measure the external index of the matrix - users' satisfaction and service quality- by the mean of factor analysis. In addition to analyzing the data captured from helpdesk staff job satisfaction and interpreting calls statistics. The chapter also includes the reliability and validity tests, in addition to sampling and hypotheses testing.

This chapter also illustrates the benchmarking process of BZU helpdesk workflow against the workflow of the proposed road map solution of the helpdesk. Workflow benchmarking helps point out the bottlenecks in the BZU helpdesk processes and justify deploying the proposed model to enhance performance and enrich service quality.

Chapter Six: A Road Map Solution of the Helpdesk System

Chapter six serves one of main purposes of the study; in this chapter, IT services of the helpdesk are organized by the means of modeling. The functions of the helpdesk are modeled logically by the mean of Data Flow diagrams DFDs, which

were first used in the engineering discipline. A general service quality management model is designed to identify the steps of deploying service quality into the helpdesk system. Helpdesk performance can be best organized through the adaptation of an electronic helpdesk system connected to a knowledgebase, which can basically be viewed as solutions respiratory. The chapter is finalized with a walk in the suggested road map solution which interconnects all corresponding modules of the research study.

Chapter Seven: Benchmarking BZU Model against the Road Map Solution Model

This chapter depicts the existing call management system used by BZU helpdesk and portrays the current workflow of the functions of BZU helpdesk by the man of DFDs. in addition a benchmarking is done the existing workflow of BZU helpdesk with the proposed model of the road map solution of the helpdesk.

Chapter Eight: Recommendations and Implications

The research study is finalized by this chapter which indicates recommendations and implications in three sections: Implications of Data Analysis, Helpdesk Strategic Role, and Helpdesk Environment.

2. Chapter 2: Literature Review

Introduction

Chapter Two covers an extent range of literature about four main topics: Helpdesk in the Academic Environment, Satisfaction and Service Quality, Service Level Agreement 'SLA' and Data Flow Diagrams, and Measuring Helpdesk Performance, in addition, the chapter is finalized by listing the hypotheses that are derived from the literature review which will be tested in later stages of the study within Birzeit University's environment. The first section defines the helpdesk in the academic environment and outlines its characteristics. The second section, conceptualizes the perception of service quality and how it affects users' satisfaction and is affected by employees' job satisfaction; this part of literature is the base core of some of the presumed hypothesis mentioned in the methodology chapter. It also touches on the importance of deploying quality of service QoS measures, set in the service level agreement SLA, into the logical design of the helpdesk functions. A basic introduction of the building blocks of the Data Flow Diagram DFD is explained and the guidelines of building a system by the mean of DFDs are illustrated in the third section of this chapter.

The aforementioned subjects form the first step of an introduction to describing the methodology of performance measurement in the service industry. The fourth section of this chapter, describes the Gartner Inc. Performance Matrix, and the main indexes of the matrix are identified in detail. Instruments, such as SERVQUAL and its performance only version SERVPREF is explained and examples of literature are used as testimonials of its validity and communality.

2.1. Helpdesk in the Academic Environment

The helpdesk also referred to as 'help desk', has no precise definition and is loosely used; it can be defined as a centralized source of information or action on

demand, to aid the caller in carrying out a given task (Marcella & Middleton, 1996a). According to Marcella & Middleton, experts in the field of helpdesk, the helpdesk is an accessible service point which will provide on-demand assistant, information or action to aid the user in resolving IT-related tasks, and beyond this basic definition, the role of the helpdesk extends to that of a technology catalyst, achieved by the gathering and analyzing of data at the help desk to manage end-user technology proactively.

Marcella and Middleton conducted many research projects on the Helpdesk strategic planning, service quality and users' satisfaction. In one of their papers written for a project funded by the British Library Research and Development Department (BLR&DD), they identified three essential characteristics of the helpdesk to be (Marcella & Middleton, 1996b):

(1) centralized or multiple helpdesk

(2) staff working exclusively, on rotation, (i.e. staff work at the helpdesk who are not just answering the telephone while doing another job), and

(3) Manning by experts or staff within basic knowledge who can pass on problems.

The helpdesk was evolved out of necessity in early 1980s (Parsec Technologies, 2008). It is relatively a new phenomenon and does not fit into one single discipline; it can fit under the computing subject, information science and or service management (Marcella & Middleton, 1996b). In academic environments, the helpdesk is generally an in-house function, usually part of the global IT function. The incoming call volume and the complexity of the IT environment vary according to the size of the user base. (Lusher & McCormick, 1995).

A Technology support center, on the other hand, often referred to as technical support or 'tech support' center is defined as a postsales service provided to customers of technology products to help them incorporate a given product into their

work environment. It may take the form of field service for office equipment (Orr 1990), auto repair (Harper 1987), or phone-in help desks for software products (Pentland 1992). According to the aforementioned definitions, Helpdesks provide wider services than the technical support center. Though, the two terms are exchangeable.

The helpdesk used to being a reactive service center; a reactive center is where a customer has a problem and contacts the helpdesk- to solve it, Winer (2001) addressed. Nowadays the helpdesk strives to have the shape of a proactive center, a proactive center does not wait for customers to report a problem, rather be aggressive in establishing a dialogue with customers prior to complaining or other behavior sparking a reactive solution (Winer, 2001).

Cuff (2002) says that today's mature helpdesk are well organized, centralized and proactive. A mature helpdesk uses call data as a management tool. By analyzing incidents, problems, and resolutions on an ongoing bases, the helpdesk gains insight into what is really going on in an organization and addresses problems before they become serious. Service Level Agreements (SLAs) are documented and published regularly for users. Helpdesk staff morale is high and turnover is low, primarily because new staff members have an opportunity to advance and develop new skills, and because more experienced staff members have manageable workload and can concentrate on what they do best (Cuff, 2002).

In traditional helpdesk, the agent is responsible for handling a call and solving the problem by resorting to various information and knowledge sources (Marcella & Middleton, 1996b), we call this an agent-centric helpdesk. There are at least two problems with the agent-centric approach. The first problem is of recognizing repetitive problems. Helpdesk personnel report about 60-70% of their time is spent on solving repetitive problems (Sandborn, 2001; Simoudis, 2001). However, when the helpdesk receives a problem call, it may be assigned to an agent

who has not previously resolved that type of problem. The agent-centric helpdesk does not capture an agent's knowledge about resolving a particular situation in a way that it can be searched, reviewed, disseminated, and updated like knowledge-centric helpdesk. Consequently, the benefits of learning are not fully realized in agent-centric model because the structure of the agent-centric helpdesk does not facilitate sharing knowledge.

The second problem is that in today's business environment employee turnover is high, especially for technical employees (Dawson, 1999). In the helpdesk this is a problem because the helpdesk performance is heavily dependent on the knowledge, skills, and ability of the helpdesk agents to quickly resolve problems. Technical support agents are stores of significant knowledge concerning the systems, business processes, and technologies and if they leave their knowledge often goes with them (Meso & Smith, 2000; Piggott, 1997).

A definition of a technical support helpdesk in the academic environment derived from the literature and phrased in the researcher's own words can be:

The academic helpdesk: is a proactive centric point of contact for technology users requesting support for IT-related problems. Its main role is to act proactively by diagnosing problems before they happen and solve them from the source. It shall encourage users to solve their problems through continuous learning from the electronic helpdesk solution knowledge base. The traditional role of the helpdesk shall only be present in unusual hopeless and critical cases. The helpdesk shall also keep on exploring new opportunities and provide training for new technologies and play a strategic role by analyzing reports generated from the electronic system to extract trends in an attempt to act in proactive manners.

2.2. Characteristics and problems of the academic helpdesk

The academic environment has its own distinct characteristics, which from this point of view, gives the helpdesk operating within it a unique identity, objectives, and strategies. According to Middleton and Marcella, experts in the field of the helpdesk, it has become clear that helpdesks' requirements differ according to the environment they are operating in, Middleton and Marcella (1997) indicate that:

"The helpdesk and user support industry has, over the last ten years, risen to prominence as one of the most important areas of the IT and customer services industry. However, it has also become clear that not all helpdesks have the same requirements, and helpdesk operating in academic environments find themselves with distinct circumstances and problems."

The reviewed literature shows that the helpdesk in academic environment strongly plays an important role in the overall users' relationships, and presents a need for connecting the helpdesk system to other systems in order to achieve better performance through integrity. The literature also points out to the stressed issues the helpdesk is facing in academic environment such as resources problems, growing demands and higher users' expectations and users' behavior issues, in addition, to the increasing complexity and wide variety of today's IT systems and equipment.

Macaulay & Cook (1994) state that, in their experience, successful service providers are characterized as:

(1) Provide strong leadership which focuses on the customer.

(2) Keep communicating with customers and employees

(3) Build powerful team as the basis for customer success

(4) Deploy their resources wisely and keep their priorities dictated by the needs of the customer

(5) Encourage a flexible and positive approach that employees can take responsibility for their actions

(6) Nurture and develop their people to keep staff up to date in a changing world where customers' expectations are increasing

(7) Respond quickly to customers' changing needs

Helpdesk in academic environment suffers from difficulty in defining its role and obtaining resources, Middleton and Marcella (1997) indicated. Many operational and financial demands hinder the helpdesk from enhancing its services and empowering its resources, especially in academic environment. Geer, McCalla and Vassileva (1998) think in their book "Intelligent Tutoring Systems" that Universities experiencing growth and reductions in operating budgets are faced with the problem of providing adequate help resources.

Middleton and Marcella (1997) say that money is one of the main aspects that distinguish academic helpdesk from commercial one. In commercial environment, a return on investment study is made to help decide on whether enhancing the helpdesk center returns better leverage to the business or outsourcing service is more cost-effective and provides better efficiency. The matter differs in academic environment; it is very difficult to show the helpdesk contribution to the success of the university as a whole. Especially if the helpdesk goals are unclear, and concentration focal points for the helpdesk in the overall IT strategy are missing, thus measuring whether the helpdesk is doing its job effectively is not well-recognized in the academic environment.

Staffing issues are problematic at academic helpdesk. Helpdesk staff are frustrated because despite their efforts, they can no longer meet customer demands. Usually customers regard them as incompetent, thus, staff morale and motivation suffers (McClure, Smith, & Sitko, 1997). In addition, many helpdesks use help of students as inexpensive and easy option, but this has many pitfalls: reduced reliability and consistency, increased need for supervision, decreased level of service quality and security threats are some of many problems associated with using

students in providing technical support under the helpdesk umbrella (Middleton & Marcella, 1997).

Equipment is another major problem that hinder the helpdesk from providing its services effectively. First, academic environments, according to their ingoing growth nature, purchase equipment on an ongoing bases, an extensive variety of brands, models and version of hardware, software and network configurations subsist, thus academic environments lack standardization, Standardization and support becomes nearly impossible in such an environment (McClure, Smith, & Stiko, 1997; Middleton & Macella, 1997).

One more problem is in handling equipment related issues. Not all equipment in academic environment is acquired through the procurement unit. Some equipment is purchased by the unit through internal arrangements; others are obtained through donations and grants. This contributes in evolving the problem of the lack of standardization, all equipment needs to come first to the helpdesk for an initial check up, in order to make sure it's working effectively and that the equipment specifications matches the requested. This process is essential to the good-well of the university but at the same time it adds to the overhead pressure on the helpdesk staff.

Recognizing customer relationship management CRM into the helpdesk system presents yet a further challenge, equipment Inventory System should be connected to the helpdesk system in order to configure new hardware on the network, some equipment is not connected to the network, which requires networking the helpdesk system to a Facility System; a system that track a facility location, its installed equipment, and occupants is on continuous basis.

In fairly medium sized academic institutes, the helpdesk is usually the only source for providing solutions; therefore, evaluating the success of the helpdesk in providing service to all users isn't an easy task. It might come to mind that the lack of competence in a solely operating helpdesk helps ignore the need for enhancing its

services, but the fact is that technical support helpdesks in academic environments are currently operating at time of great challenge. Even though users of universities have very limited and sometimes no choice in service providers, the helpdesk needs to function to its maximum capacity in order to reach the on growing demands of users in order to satisfy them.

Besides providing technical support to users, helpdesk staff need to overcome behavioral reactions when communicating with users, according to Teare (1998), users facing problems experience many emotional behaviors before even contacting a service point. According to him user emotions will be affected by any number of the following risks, such as (Teare, 1998):

(1) A problem or query prompted by demands of work/ deadlines/ and the specific issues related to knowledge accumulation

(2) Availability of expert help

(3) Experiences of previous service from the helpdesk

(4) Ability to function without the service

(5) Knowledge of alternatives

(6) Actual benefits

(7) Personality; and

(8) Help staff efficiency (first and second line)

Carlsson and Walden (2000) indicate that, often intelligent IT projects are doomed because of "people problems". These people problems include:

(1) People have cognitive constraints in adopting intelligent systems.

(2) People do not really understand the support they get and disregard it in favor of past experience and visions

(3) People cannot really handle large amounts of information and knowledge.

(4) People are frustrated by theories they do not really understand

(5) People believe they get more support by talking to other people (even if their knowledge is limited)

The fifth point above tickles the issue of users' problems which we may also refer to as culture of the community, users usually consider the person answering their calls not capable of providing help. They usually prefer face to face communication; this is one of the most challenging problems of the helpdesk, while the helpdesk level-1 support is trying to provide help over the phone, users even if capable of following up the step-by-step instructions, prefer to ask for a level 2 technical support agent to solve the problem on the spot.

Unfortunately, helpdesks usually gain less attention and are often underestimated despite the vital role they play in organizations. The helpdesk mirrors a big part of the culture in the workplace and contributes to shaping the image of the organization, therefore, its problems should be considered strategically critical and be resolved in the best interest of all parties involved. Marcella and Middleton (1996b) pointed out to the most common problems facing the helpdesk to be as follows:

(1) the explosion in use of IT and the greater variety of software and hardware

(2) organizational restructuring, with resultant fragmentation of IT

(3) eliciting support from operationally discrete technical and support groups

(4) lack of information from development groups about new product roll outs

(5) resourcing

(6) service definition and monitoring

(7) advice on developing the service

2.3. Satisfaction and Service Quality

Technical support helpdesk is considered a high-contact service industry. Recent literature done on examining hypothesized relationships among: employee satisfaction, service quality and overall performance, and customer satisfaction,

found out that user satisfaction is significantly related to Performance and to service quality as well.

Operations management emphasizes on the optimization of operational processes as a mean to deliver value to customers and to meet or even exceed customer expectations to gain profits (Boudreau, 2004). On the other hand, disciplines of organization behavior emphasize on human resource related dimensions. (Becker & Gerhart, 1996). This study brings together the aspect of quality presented in operations management with the corresponding aspect of quality examined in the discipline of organizational behavior; therefore, quality is the meeting point of the two disciplines. In this study, quality of service is examined to measure, in part, the performance of the helpdesk, this part strongly relates to the operations management discipline. While in relation to the organizational behavior, service quality is examined as how it is perceived by users through the service delivery process, which involves high interaction with the helpdesk staff.

When it comes to the nature of the relationship between service quality and customer satisfaction, the specific nature of how they interact and/or influence one another has not been established with certainty. There are different theories and conflicting evidence presented in literature from psychology, management, retailing, marketing to information systems and others. User satisfaction is still the most widely used surrogate measure of IS effectiveness (Melone, 1990). Rockart (1982), however, has proposed that the quality of the IS department's service, as perceived by its clients, is a key indicator of information system effectiveness. Moreover, Cornrath and Mignen (1990) have found that the principle reason that IT departments measure user satisfaction is to improve quality of service they provide.

Rushinek and Rushninek (1986) assert that user satisfaction studies have ignored the impact of service quality on user satisfaction. Thus the construct of service quality has certainly not been ignored by academics and researchers. It is

therefore contended that it is more appropriate to measure service quality than user satisfaction because this is what information systems really wants to measure and could be an antecedent of user satisfaction.

An instrument, SERVQUAL (Parasuraman, Zeithaml and Berry, 1988), has also been constructed to assess the quality of service from the user's perspective. The services of the IT department are heterogeneous. Because most services are labor intensive, they are closer to heterogeneity. Many, if not all of the services of the IT department are performed by people, and people do not always perform consistently. They may be variation from one service to another within the same department, variation in the service a single individual provides from day to day, and from user to user. Thus standardization and quality of service are extremely difficult to control. However, this also leads to large opportunities for customization of services in order to meet users' specific needs and satisfaction.

Another study about service quality and customer satisfaction was done in a retail environment by Taylor and Baker (1994). The purpose of this study was to provide support for the claim that service quality and customer satisfaction are two discrete constructs that share a close relationship and to propose a theory regarding the nature of the relationship; according to Taylor and Baker (1994), many researchers support Parasuraman et al.'s (1988) view of service quality as a comparison to excellence in service encounters by the customers, whereas customer satisfaction is generally viewed as a comparison of expected and perceived service.

What is of interest, however, is the nature of the relationship between service quality and customer satisfaction, particularly in the academic helpdesk context. In the traditional disciplines of retail and marketing, service quality and customer satisfaction are often analyzed in relation to a third construct that is behavioral or purchase intentions. (Taylor and Baker, 1994). The behavioral or purchase intentions construct does not exist in the academic helpdesk environment. This is because the

helpdesk has a monopoly in providing support at most academic institutions and it provides the support free of charge. Users are forced to use it, regardless of whether they perceive the service quality to be inferior or whether they feel dissatisfied with the helpdesk.

Therefore in academic context, service quality and customer satisfaction do not need to be analyzed in conjunction with behavioral or purchase intentions. This in effect simplifies the nature of the relationship between service quality and customer satisfaction, allowing for easier investigation thereof. However, the results of this investigation would only be applicable in the academic helpdesk setting and should not be generalized to other types of information systems environments, where individual or purchase intentions are highly relevant.

It is generally agreed that service employees are the first contact that represent the service and therefore are the starting point to shaping customers' perception of service quality (Parasuraman et al., 1985; Hartline and Ferrell, 1996). Bateson (1985) considered service employees' job as a 'three- cornered fight', in which the customer and the organization are at the two ends, while service employees are 'caught-in-the-middle' among them. Activities of service employees connect organizations to customers, and service employees' are the front end of the organization and their interactions are employed to impress customers (Chase, 1981; Heskett et al., 1994; Oliva and Sterman, 2001). It is clear that the connection node between employees and customers is service. T

Through the process of delivering service to customer, service employee adds behavioral attributes and personal skills as part of the service and therefore influences the perception of the customer toward the service. And the literature suggests that the antecedents of job satisfaction can be categorized into personal characteristics, role perceptions, and organizational variables (Brown and Peterson, 1993). In conclusion, it is important for helpdesk staff as considered service

employees to add positive attributes and behaviors in the process of delivering the technical support service in order to influence users' perceptions positively.

The argument that employee satisfaction enhances service quality is grounded on the theory of equity in social exchanges. Social exchange theory is defined: a social psychological and sociological perspective that explains social change and stability as a process of negotiated exchanges between parties. Social exchange theory posits that all human relationships are formed by the use of a subjective cost-benefit analysis and the comparison of alternatives. For example, when a person perceived the costs of a relationship as outweighing the perceived benefits, then the theory predicts that the person will choose to leave the relationship. The theory has roots in economics. Social exchange theory is tied to rational choice theory and on the other hand to structuralism, and features many of their assumptions. (Gouldner, 1960; Homans, 1961; Blau, 1964; Organ, 1977).

Theorists agree that social exchange involves a series of interactions to generate obligations. An exchange requires a directional transaction – something is given and something is returned. The transaction also has the potential of generating high-quality relationships among the parties involved. (Cropanzano and Mitchell, 2005).

In the context of social exchange theory, when the University offers good working conditions that make its helpdesk staff -service employees- satisfied, service employees will in return be committed to making an extra effort to empress customers –users-(Wayne, Shore, Linden, 1997; Flynn, 2005), and build good relations with them leading to a higher level of service quality. Likewise, in the same context, when users receive high quality service they become satisfied and return loyalty to the organization. The sketch below describes the social exchange theory in a described context in Figure 2-1:

Figure 2-1: Illustration of the Social Exchange Theory in Service Environment

Customer	Service Delivery	Service Employee	Organization
	SERVICE Perceived Performance Quality		
Satisfaction level is shaped after repetitive incidents of experiencing service quality through service employee performance	Quality of Service aspects are delivered to Customers through the exchange of communications: Reliability Responsiveness Assurance Empathy Tangibles	Effect of Employee Attributes on service delivery : - Job Satisfaction - Loyalty - Commitment . . .	Offers Working Conditions that affect employee attributes

According to Dole and Schroeder (2001) higher levels of satisfaction improve morale and reduce voluntary turnover of employees. A meta-analysis conducted by Petty et al. (1984) concluded that job satisfaction and performance are indeed positively correlated. Most models of employee turnover propose a negative relationship between satisfaction and turnover (Hom and Griffeth, 1991; Hulin et al., 1985; March and Simon 1958, Mobley et al., 1979; Rusbult and Farrell, 1983). If employees are satisfied, they are likely to be more productive, competent and motivated and remain loyal to the organization. On the other hand, dissatisfied employees will lead to increased absenteeism and turnover (Rogers, Clow, &Kash, 1994).

Bagozzi (1992) proposed that individuals typically engage in activities because of a desire to achieve certain outcomes. Exposing customers to happy employees result in customers' attitudinal bias towards a product (Howard and Gengler, 2001) or service. On the other hand, hostility of employees influence

customers negatively (Doucet, 2004), leading to customer dissatisfaction regardless of the employees performance.

2.4.   Service Level Agreement 'SLA' and Data Flow Diagrams

Workflow and process definition

To manage the QoS, it is necessary to first model the information system, so that it becomes possible to integrate SLA easily. Indicators defined in the SLA have to be taken into consideration through the processes design and be measured through process execution across the system. Data proceeded from the electronic helpdesk system can be analyzed through the use of matrices and defined SLA benchmarks. SLA must be set to correlate information between SLA and QoS indicators. Besides, the sufficient integration of quality of service measures into system operations and enables to perform proactive management, which is the ultimate goal of the academic helpdesk; to anticipate the needs and problems and fix them before they even occur.

Figure 2-2: Example of a Basic Workflow

A system can be modeled through the use of logical data flow diagrams. The dataflow diagram is one of the most commonly used systems modeling tools, particularly for operational systems in which the functions of the system are of paramount importance and more complex than the data that the system manipulates. DFDs were first used in the software engineering field as a notation for studying systems design issues (Yourdon and Constantine, 1975). A data flow diagram is a picture of the movement of data between external entities and processes and data stores within a system. DeMarco (1978) described the data flow diagrams DFDs as a network representation of a system. The DFD describes the system in

terms of its component pieces, with all interfaces among the components indicated (DeMarco, 1978). Hence, DFDs focus on the movement of data between external entities and processes, and between processes and data stores. It focuses on the logical view of the system, not the physical.

I found DFDs to be the best tool serving the main purpose of this study which is examining the performance of the helpdesk. Measuring performance according to the Gartner Group suggested matrix allows for periodical check for the level of user satisfaction in a specific point in time, while examining the workflow of helpdesk processes represented by DFDs helps keep the performance level of the helpdesk up to a satisfactory level which allows for sustainable delivery of quality service.

The building blocks of the workflow process

Sources/ Sinks (External Entity): is any class of people, an organization, or another system which exists outside the system. It forms the boundaries of the system. The external entities and the system exchange data in the form of data flows. It must be named and titles are preferred to be names of individuals. There are three important things that we must take care of when thinking about a source: (1) they are outside the system we are modeling; the flows connecting the terminators to various processes or stores in our system represent the interface between our system and the outside world, (2) as a consequence, there is no way that the contents of a terminator or the way the terminator works is changed, (3) any relationships that exists between terminators will not be shown in the DFD model.

Data Flow: is a data in motion, it marks movement of data through the system – a pipeline to carry data that connects the processes, external entities and data stores, it always have direction either originated or end at a process or both, it's named as specifically as possible in order to reflect the composition of the data.

Processes: also called transformers or functions, transform incoming data flow into outgoing data flows, the process shows a part of the system that transforms

inputs into outputs, it is represented with a bubble or rounded square or sometimes by a rectangle with rounded edges, and named with a strong verb/object or a combination.

Data Stores: also called data at rest because it represents holding areas for collection of data. Processes add or proceeded data from these stores. It is named using a noun. Only processes are connected to data stores, it shows net flow of data between data store and a process.

2.5.   Measuring helpdesk performance

Measuring performance can assist the helpdesk in focusing its improvement efforts on the areas of greatest need and can also ensure that the quality of service performed by the helpdesk does not deteriorate. Bird (2000) also discusses this within an academic context. Landgrave, Wilson and Templeman (2001) state that keeping statistics on helpdesk performance is critical. Without performance statistics, there is no way for the helpdesk manager to know if resources are being used to the fullest capacity or whether more resources are required. In addition, statistics can show the helpdesk manager the strengths and weaknesses of the workflow process. Before attempting to make any changes, it is important to know how well or how poorly the current processes are working. This initial measurement of the current status of the helpdesk is considered the baseline. Once a baseline of performance is known, it is easy to determine the effectiveness of the changes that have been made (Landgrave, Wilson, & Templeman, 2001). Gartner Inc. analyst Mike Rhone says (McGee, 1998):

"Many companies realize they need to improve help-desk operations, but they don't regularly benchmark their performance."

However, the idea is never to measure just for the sake of measuring. The intent should be to gather information that will allow the helpdesk to implement positive change (nanoDesk, 2002). Bird (2000) says that the results of the helpdesk

performance analysis should be made publicly available, along with plans for improvement. Bird (2000) states:

"Show your staff and your peers elsewhere in the university that you stand behind results and are willing to publicly acknowledge that there may be areas needing improvement."

There is no commonly accepted way of measuring helpdesk performance, (West, 2000). West says that designing a measure for helpdesk performance is extremely easy, but designing an effective one is significantly more difficult. Many sources agree that data statistics of actual performance such as: queuing times, time spent per call, total number of calls closed in a given time period, and first contact resolution 'FCR' are useful measures of helpdesk performance, they can be easily benchmarked with other competitive helpdesks in order to find out the relative performance position.

Agreed rates specified for the aforementioned statistical measures are defined in the Service Level Agreement SLA between the service provider - the helpdesk-and the users, this contract helps determine the service provider's performance level relative to pre-set quality indicators. The service quality must be evaluated according to objective criteria accepted by both parties.

Management shouldn't rely completely on call statistics to determine the helpdesk performance; because the number of calls closed and the time of operation don't necessarily point to a specific trend in performance level, because as Touchpaper states even if customers testify that the helpdesk is compiled with its commitments, they may still be unhappy with the way their calls are handled (Touchpaper, 2002).

The best measure of helpdesk performance is users' satisfaction. If users feel that their problems are resolved quickly and efficiently, then they will be satisfied

with the helpdesk. West (2000) states that, the most reliable method of gathering user satisfaction information, is directly through customer satisfaction questionnaires.

According to Gartner Inc., (founded in 1979, is an information technology research and advisory firm headquartered in Stanford/ Connecticut which was known as The Gartner Group until 2001, and is specialized in Research, Executive Programs, Consulting and Events.) To truly capture an overall helpdesk performance, helpdesk managers need to look at both cost and service metrics, Gartner argues that while cost management is extremely important, it must be given secondary importance to the primary goal of providing an acceptable level of service to customers. For that reason, cost is given a 40% weight, while various service metrics account for 60% of the index. Table 2-1 is Gartner Inc. Performance Matrix. A description of Gartner's service matrix is explained as follows:

Table 2-1: Gartner Inc. Overall Helpdesk Performance Index (Rhone, 1999)

Performance Metric	Weighting	Type of Metric
Average queue time (sec.)	9%	Service
First-contact resolution	21%	**Service**
Employee satisfaction	12%	**Service**
Customer Satisfaction	18%	**Service**
Cost per handled call	40%	Cost

(1) Average Queue Time: this is given the lowest weight in the overall helpdesk performance index, because users will tolerate longer queue time waiting on the phone if they are sure that eventually somebody will pick up and handle their call. This time measure is more efficient in call centers where support services are provided over the phone for short periods, and because BZU helpdesk system does not have Average Call Distribution software ACD, which counts the number of answered and abandoned incoming calls, thus, the average queue time metric will be of no use if implemented in this study, thereof, the matrix need to be modified by replacing this metric with another like average resolution time.

(2) First Contact Resolution FCR: this is given the greatest weight in the overall helpdesk performance index, as nothing will negatively affect user satisfaction more quickly than being bounced around or making multiple calls to the helpdesk.

Although satisfaction surveys are the best way to measure end-user satisfaction, operational metrics, such as First Contact Resolution 'FCR' rate; adds another perspective into the end-user's satisfaction. Gartner Inc. has determined that an increase in IT helpdesk FCR is directly related to an increase in end-user satisfaction on the survey.

Normally, end user hopes that the Level 1 support who is the helpdesk operator- or supervisor is able to resolve his or her issue right there and then, so he/ she can hang up the phone and get back to work. With the average talk time of a support call being approximately eight minutes; it is realistic to think that an end user could return to being productive 10 minutes or so after discovering the issue. (Gartner Group, 2000). Unfortunately, this is not the case at Birzeit University, users face the helpdesk level-1 agent with unwillingness to communicate their problem because of lack in trust toward the person operating on the phone, or because of their limited experience and poor ability to describe the event in need for help. So, if users do not help the helpdesk to resolve their problems at level 1 support, this will increase the probability of them being dissatisfied.

However, if the submitted incident cannot be resolved at first contact, the issue has to be escalated to another helpdesk support agent, typically a Level 2 or 3 agents, in this case, the resolution times grow significantly. It doesn't take the end user long to realize that, if the Level-1 agent can't resolve the issue, then an issue that could have potentially been resolved in less than 10 minutes is now going to take up to 50 times longer, which leads to increased end-user frustration and decreased productivity (Gartner Group, 2000).

FCR is also a good indication of the effectiveness of the level-1. A level-1 agent who has a low FCR rate and needs to escalate a large number of support requests to level-2 and level-3 demonstrate lack of training and troubleshooting skills. However, a level 1 support with a high FCR rate demonstrates the necessary skills to solve issues, and that leads to higher user satisfaction.

A low FCR rate for a Level-1 agent also can lead to high staff turnover. Level-1 support with a low FCR rate typically answer a small percentage of the easy service and support requests and escalate the issues that are more challenging and require a great skill to level-2 and level-3. A level-1 support agent who manages only simple, routine requests and is not challenged to learn new skills and increase his or her troubleshooting knowledge is a good candidate for turnover (Gartner Group, 2000).

(3) Helpdesk Staff Job Satisfaction: employee Job satisfaction is examined through interviews with helpdesk staff and through a questionnaire that is developed based on the Abridged Job Descriptive Index (AJDI) instrument.

Job satisfaction has been one of the most widely researched topics in literature in the field of organizational behavior and human resource (Spinelli & Canavos, 2000; Snipes, Oswald, La Tour, &Armenakis, 2005). Study in this topic began in the 1930s in the industrial workplace (Brief & Weiss, 2002), and continues years later, in every operational domain, because of its relation to aspects like productivity, absenteeism, employment turnover ratios (Tsigilis & Koustelios, 2004), the influence of job satisfaction on work performance has been described by Wilson & Fringpon (2004) as complex, because it is affected by a series of moderating factors such as: employee personality traits, values and self-esteem, group norms and other demographic and organizational factors. Job satisfaction does not only have relation to behavioral aspects and workplace aspects, it also has possible relation to customer perceptions, which has been proved right in many researches and studies.

According to Jones and Suh (2000), defining satisfaction provides a better explanation for behavioral intentions. Job satisfaction in different approaches, Locke (1969) defines it as "a positive or pleasurable emotional state resulting from one's own appraisal of the job or one's work experiences". Smith, Kendall, and Hulin (1969) point out that job satisfaction is "a feeling or affective response to the facets of a work situation". In 1990s, a more cognitive treatment had begun to appear, Motowidlo (1996) defined job satisfaction as "judgments on the favorability of the work environment" and Brief (1998) as "an internal state which is expressed through affective and/or cognitive evaluations of a job experience with some degree of approval or disapproval".

Oshagbemi (2000) states that, one of the most popular and widely used measures of employee satisfaction, is the "Job Descriptive Index" (JDI). The JDI is an instrument developed and copyrighted by the Bowling Green State University in the U.S., and has been extensively researched and tested for validity and reliability (Bowling Green State University, 2008).

In summary, the aspects found in the majority of employee satisfaction instruments are:

  (1) Overall job satisfaction
  (2) Pay and benefits satisfaction
  (3) Satisfaction with training received
  (4) Job development and career opportunities satisfaction
  (5) Satisfaction with job supervision
  (6) Job environment satisfaction – facilities
  (7) Peer-relationships satisfaction

A short interview with some helpdesk staff members is important; employees might feel more comfortable revealing concerns about some organizational issues via verbally.

(4) User Satisfaction: overall user' satisfaction is determined directly from the results of a users' survey. Technology users at Birzeit University are considered customers for the helpdesk.

Customer satisfaction is one of the most debated topics. The concept of customer satisfaction is closely related to quality and they are often measured together. According to Kondo (2001) customer satisfaction is first measured by the number of complaints, however, the absence of complaints doesn't necessarily indicate an ultimate customer satisfaction. On the contrary, it may mean that users have reached to the point where they are hopeless and are no longer expecting any reaction to take place and it is only a waste of time, eventually they give up on complaining.

According to Rust and Oliver (1994), the key elements that distinguish service quality from customer satisfactions are:

- Quality judgments are quite specific as opposed to customer satisfaction which can result from other aspects not related to quality

- Expectations for quality are based on ideals or perceptions of excellence, whereas a large number of non-quality issues can help form satisfaction judgments

- Quality perceptions do not require experience with the service or the provider whereas satisfaction judgments do

- Quality is believed to have fewer conceptual predecessors than satisfaction does

In the domains of retail and marketing, service quality and customer satisfaction are often considered in relation to a third construct, that of behavioral or purchase intentions. However, there are conflicting theories regarding the relationship between them. (Babakus & Boller, 1992). The behavioral or purchase

intentions construct does not imply the academic helpdesk environment because the helpdesk provides services free of charge and its working environment is free of competency because it has monopoly in providing the support service.

University users have no choice but to use the helpdesk support service, regardless of whether they perceive the service quality to be inferior or they feel dissatisfied with the helpdesk. Therefore, in the academic context, service quality and customer satisfaction do not need to be analyzed in conjunction with behavioral or purchase intentions. This in effect simplifies the nature of the relationship between service quality and user satisfaction. Thereof, the results of this study would only be applicable to academic helpdesk setting and cannot be generalized to other types of information systems' environments, where behavioral or purchase intentions are highly relevant.

When it comes to the most efficient instrument used by researchers to measure customer satisfaction and service quality concurrently for the purpose of determining the nature of the relationship between them, the most accurate would be using SERVQUAL questionnaire, specifically the IS-SERVQUAL questionnaire in an information system setting.

2.6. SERVQUAL Instrument

SERVQUAL is a model of service quality measurement and management (Buttle, 1996). It explores the intangible aspects of providing services and evaluates service quality. In 1988, Parasuraman, Zeithaml, and Berry developed a generic instrument called SERVQUAL to measure service quality based on input from focus groups. Although SERVQUAL was first developed to serve the marketing sector, it has also been used in a variety of settings, including libraries and information centers (Kettinger & Lee, 1994). Since 1988 Parasuraman, zeithaml, and Berry have made numerous changes to SERVQUAL, for instance, in 1994 they reported on three

different SERVQUAL formats; they recommended that researchers use a format that separated customer expectation scores into tolerance zones.

Although widely accepted, the SERVQUAL instrument is object of some criticism, mainly: the creditability of perceived service quality as a gap score (Cronin and Taylor, 1992); and the ambiguity of the expectation instrument (Teas, 1993); and the use of a single generic measurement to measure service quality in different types of industry (Babakus and Boller, 1992); Information systems service quality modified- version (IS-SERVQUAL) of the original SERVQUAL questionnaire is developed in order to measure information system service quality. Van Dyke, Kappelman, and Prybutok (1997) state that all problems associated with SERVQUAL questionnaire also apply to the IS-SERVQUAL questionnaire developed by Pitt, Watson, and Kavan (1995). Still IS-SERVQUAL is widely used by managers of information system service departments to measure overall service quality.

Researchers continued to use SERVQUAL instruments. In 1997, Van Dyke, Kappelman, and Prybutok employed SERVQUAL in an Information System IS context. Parasuraman, Zeithaml, and Berry (1988) stated that since service quality depends on the relationship of customer expectations with customer perceptions, it is appropriate to calculate service quality by subtracting expected from perceived service. Then achieves an overall measure of service quality by averaging the scores of all items. Some researchers disagree about whether the service quality should be the difference between expected and perceived service since this procedure gives rise to two issues: the first is disagreement over what really is being measured in SERVQUAL with expectations and the second is the problematic nature of the resulting difference scores.

The difference in score approach is used in a pilot questionnaire before determining an instrument for the study. The gape approach of the pilot study wasn't

chosen as an instrument for the study because of many reasons, more importantly are: It took users long time to determine the level of actual performance opposed to that perceived and desired, it was difficult to differentiate between them which lead in some cases to zero difference and thus neutral results. Cronin and Taylor (1992), and Teas(1993), solved this issue, they recommended that expectation ratings be eliminated altogether.

A performance only approach to service quality utilizes the five performance dimensions of the seven SERVQUAL dimensions. Cronin and Taylor (1992), called this performance only instrument SERVPERF. The results of their research support that: performance scores alone account for more variation in service quality than performance minus expectations. Performance alone provides better predictive validity than SERVQUAL (Cronin & Taylor 1992), other studies show that performance scores alone exhibit better reliability and validity than difference scores (Babakus & Boller 1992; Brady & Roberson, 2002).Van Dyke et al. (1997) reports that the performance perception assessment instrument is more adequate than the expectation assessment instrument, Based upon these findings, the researcher used performance only instrument SERVPERF to construct user satisfaction questionnaire to perform the study. SERVQUAL, and its derived instruments, shape a model that evaluates service quality using a questionnaire containing 22 items divided into five dimensions, Table 2-2, shows the five dimensions; namely tangibles, reliability, responsiveness, assurance and empathy.

Table 2-2: SERVQUAL Instrument Dimensions (Buttle, 1996)

Dimension	Definition	N.O
Tangibles	Physical facilities, equipment, and appearance of personnel	4
Reliability	Ability to perform the promised service dependably and accurately	4
Responsiveness	Willingness to help users and provide prompt service	4

Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence	5
Empathy	Caring, individualized attention the service provider gives its customers	5

The two dimensions (Assurance and Empathy) contain items representing seven original dimensions– communications, credibility, security, competence, courtesy, understanding/knowing customers, and access.

2.7. Conclusion

In conclusion, a number of sources say that measuring the quality of rendered service is an essential measure of performance. Quality of service performed by the helpdesk in an academic environment can be measured through Gartner Inc. performance matrix by taking into consideration the matrices that imply with the nature of the academic environment characteristics, the measurement matrices that fit with academic environment are:

(a) User satisfaction, the users' perception of the quality of rendered service, it can be measured by using the SERVREF version derived from the refined SERVQUAL instrument

(b) Staff satisfaction, since satisfied employees deliver better service to customers, employees' satisfaction level effects customers' satisfaction through the QoS they render

(c) Operational matrices, such as first contact resolution and average resolution time which rates are determined by the quality of service QoS indicators defined in the SLA.

Designing workflow processes to provide technical support services maintains the helpdesk performance level up to a satisfactory rank, especially when QoS indicators are taken into consideration in the design of the workflow. In view of the fact that the main purpose of the helpdesk is to provide technical support services

to users in a satisfactory manner, a relationship, if any exists, between quality of service (as an indicator of performance) and users' satisfaction is examined to further emphasis on the purpose of measuring users' perceived service quality to evaluate helpdesk performance.

3. Chapter 3: Technical Support Helpdesk at Birzeit University

Introduction

This Thesis is a holistic single-case revelatory study; chapter 3 represents the history of the technical support helpdesk and the computer center at Birzeit University, it highlights its challenges and services, and describes its current situation. The chapter describes the V-tiger call management system used to organize the work at BZU helpdesk; it also models the existing workflow of BZU helpdesk by the mean of Data Flow Diagrams DFDs. This chapter is important because it embodies the context at which the proposed methodology for measuring helpdesk performance is implemented.

3.1. A brief Background

The computer center at Birzeit University was founded in 1981. At that time, establishing the computer center was considered an uprising step toward integrating modern trends of technology into the academic environment in Palestine. Birzeit University was the first of four Universities in Palestine to start adopting the Global trends of implementing technology to automate manual transactions. For example, Birzeit University was the first to develop an on-line administrative and academic portal named "Ritaj" that is launched in 2002, it was also the first to provide a wireless network accessed by students and employees on campus and dorms. Moreover, in 2009, Birzeit University was the first in Palestine to enrich the academic experience with the use of smart classroom technology. Birzeit University is also considered the first of its kind - on a regional rank- to equip a Virtual Reality lab on campus intended for the use in academic demonstrations and research projects.

The computer center, as a centralized IT service provider at Birzeit University, is the first in Palestine to measure the performance of its technical support helpdesk by participating in this study. The outlook of Birzeit University to

take a leading position in adopting to the latest technology trends, despite its tied budget and external regulations in equipment procurement, makes it the best preference as a case study to measure the performance of its technical support helpdesk.

The computer center started operating with less than seven employees and grew to take an average of 15 employees into service. Engineer Mr. Yahia Yaish, started working as a director of the computer center since 1995. Mr. Yaish shaped the idea of developing an on-line portal initially intended to automate registration procedures via on-line system. The portal continued to develop to become the official gate to process both academic and administrative tasks and generate high quality reports. Students, academic and administrative staff have to use the portal to process transactions to accomplish their daily tasks.

As the time passed, more manual tasks are automated through the on-line portal, acquiring at least the basic skills and knowledge in dealing with computers and communicating through electronic systems became compulsory at Birzeit University. As a response to this need, the technical support section was established in order to provide the necessary technical support services at the same year Ritaj was launched.

In 1999, the computer center director named the technical support section the 'helpdesk', and so, the Helpdesk Supervisor position came to birth. When the technical support section started at Birzeit University, it counted on both technical support agents along with students to provide technical support services, it wasn't before 2008, that the helpdesk was no longer employing students to work for it because of security threats and lack of confidence.

It is normal for the computer center, as a technology enforcer, to face resistance against adopting new technology trends. The Computer Center received massive complaints when Ritaj was first launched; users needed intensive training

sessions to access Ritaj and use PCs at work, it took them quite a long time to get familiar with the change in their traditional environment.

By the time users become more comfortable using PCs in accessing Ritaj, browsing the Internet, and using other software applications, their need to acquire knowledge through the World Wide Web was evolved and integrating technology into daily academic experience become unquestionable. Instructors started to use Microsoft Office tools to prepare slideshows and play videos to students. With the support of laptops and LCDs, instructors added an extra dimension to the teaching experience at Birzeit University.

The helpdesk had to play an essential role in the academic experience; it has to function more efficiently in order to provide adequate support to upcoming needs of BZU community. The more the users become skilled in using IT tools, the more the helpdesk needs to enhance its role in providing up-to-date services to support various kinds of equipment and technology tools. In the past, complaints were bouncing against Ritaj and the technical support services, but by the time users become familiar with using Ritaj; most complaints are lately filed against the technical support services.

In 2003, the helpdesk was operating with only one technical support agent who previously worked at the helpdesk under the student employment program, and one helpdesk supervisor who was a new graduate, in addition to a number of students worked at the helpdesk under the student employment program. The helpdesk supervisor had to perform all administrative tasks including those of which a secretary should be responsible for because of the nonexistence of a secretary at that time, she also had to answer all incoming calls to the center not only those related to the technical support helpdesk.

At the end of the academic year 2005/2006, the helpdesk supervisor decided to leave the helpdesk, she felt overwhelmed with the tasks assigned to her and was exhausted because of the intensive overhead of the incoming calls to the computer

center, she felt emotionally tensed especially when users were mistaken her for a secretary and not as part of the helpdesk staff.

During the academic year 2006/2007, the helpdesk was operating with only one technical support agent and couple of students with instable working schedules. During this year, the technical support agent was fully responsible for handling incoming calls, providing on-site technical support service, in addition to training and monitoring students who work at the helpdesk under the student employment program. At the beginning of the academic year 2007/2008, a new helpdesk supervisor was appointed to work at the helpdesk, at that year the technical support agent was exhausted and feeling very dissatisfied and left the helpdesk shortly after she was employed.

At the beginning of the academic year 2007/2008, the director paid better attention to the technical support helpdesk, he employed two new technical support agents, and in the following year two additional agents joined the helpdesk. He also hired a secretary to take over administrative tasks and released the helpdesk supervisor from the overhead load. Mr. Kamal Hamdan, a senior employee who had been working at the computer center for more than twenty years, is now the helpdesk supervisor. He was responsible for library information systems before his new position at the helpdesk. The director thinks that Mr. Hamdan has high potential to stay in the helpdesk supervisor position for long time. Currently, four technical support agents along with the helpdesk supervisor are working at the technical support helpdesk at Birzeit University.

In 2007, the helpdesk started using the "V-tiger" open-source software, to log calls into a database and generate periodical reports. The system allowed the helpdesk to finally automate the manual processing of recording and tracking calls. Using the V-tiger software at the helpdesk came as a response to continuous complaints of unsatisfied users even after enhancing the situation of human resources at the helpdesk. Unfortunately, the helpdesk is not yet using all capabilities and

features of the V-tiger package, limited free time to explore and customize features is the main reason, said the director.

The topic of the helpdesk in academic environment has its own identity and had not been studied intensively. Helpdesk in academic environment is considered a new area of research; it wasn't before early 1990's that researchers started paying attention to the subject and began conducting research to examine its performance, quality of service, and user satisfaction. Customer Relationship Management CRM is also a possible field of research relevant to electronic helpdesk systems. Lately, empowering the electronic helpdesk system with a knowledge base is becoming a common practice of modern helpdesks; the researcher think it should be considered in academic environment because of its influence on transforming the academic community into a self-learning one.

3.2. Staff

A total of sixteen employees are currently working in the computer center and are grouped into teams according to their responsibilities and specializations. One of the 16 employees is a secretary. The existence of a secretary in the computer center, helps balance the human resources' structure, the helpdesk supervisor will no longer have to answer all incoming calls to the center nor to perform daily administrative tasks, the helpdesk supervisor can put more effort in quality assurance and report analysis.

The helpdesk supervisor is the first contact to the technical support helpdesk; he/she is considered level-1 support. The helpdesk supervisor at Birzeit University, mainly picks up calls, logs them into the V-tiger call management system and escalates calls within the helpdesk itself or to other computer center personnel. The helpdesk supervisor assigns calls to technical support agents when it is not possible to resolve them at the first contact incident.

Four technical support agents are currently working at the helpdesk; they are considered level-2 support, in some incidents, technical support agents pick up calls,

log them into the system and provide a first contact resolution over the phone. Technical support agents usually provide technical support services into the spot; they are more experienced than level-1 support, but are not ranked nor assigned to certain specialty. Only one technical support agent is specialized in printing and network services. A position at the technical support helpdesk requires a bachelor degree in IT, computer science or engineering; certified candidates in technical support repair and troubleshooting are preferable.

Three senior employees at the computer center provide services as level-3 support agents, calls are escalated to them only when level-1 and level-2 fail to resolve the problem. Level-3 support is considered the final tier at which the problem must be resolved. Level-3 support agents work in networking and infrastructure domains.

Four employees at the computer center work as a development team who are dedicated to developing applications. Another three employees provide support to in-house and externally adopted applications. A total of sixteen employees work in the computer center, they provide services to be (860 – Oct, 2009) employees at Birzeit campus and elsewhere.

3.3. Hierarchy

The computer center is located in the administration building at Birzeit University; the technical support helpdesk used to be physically connected to the location of the computer center. Today, the technical support helpdesk has its own space in another building that has a centralized location in campus. The computer center follows no specific internal hierarchy. Employees work in an open physical space reflecting invisible layers and unseen formality, likewise, the Helpdesk enjoys flexibility and at the same time, is always involved in core activities within the computer center.

As for the posture of the computer center in the overall hierarchy of Birzeit University, it falls under the supervision of the Vice President for Administrative and

Financial Affairs, who goes immediately under the command line of the President of Birzeit University. Birzeit University follows a centralized hierarchy model, while the internal hierarchy of the computer center is best described as a flat hierarchy model. The administrative hierarchy of Birzeit University is posted on the following link: (http://www.birzeit.edu/files/hmap/hmap.html).

The service delivery process of BZU helpdesk requires support from other units at Birzeit University, some technical support incidents require the help of BZU security to let the helpdesk into buildings in times of closure, other services may need the aid of the engineering office; the staff of the engineering office are responsible for routine maintenance of BZU facilities, for example, the engineering office is responsible for connecting network cables between buildings and within. Most of the units that aid the work of the helpdesk fall under the command line of the V.P. for financial and administrative affairs, therefore, in technical support incidents that needs the aid of additional units, each unit contributes work into the process of service delivery separately and their input affects the overall output delivered by the helpdesk to users.

3.4.   Current Issues and burdens

The technical support helpdesk has two positions, the helpdesk supervisor who is considered level-1 support agent and the support technician or the technical support agent who is the level-2 support agent. Candidates for both positions have to hold a bachelor degree in IT-related field, computer science or engineering; certified candidates in PC repair and troubleshooting, operating systems and other work related qualifications are favorable. The helpdesk supervisor receives calls and logs them into the call management system (V-tiger software), he/she is supposed to follow up with users on call repair status, document users' feedback and provide answers to their queries. On the other hand, the technical support agents mainly provide technical support services on site in addition to repair PCs and other equipment at the helpdesk. In 1999, the computer center director named the

technical support section the helpdesk as a response to modern trends and to accommodate with actual tasks. The helpdesk is no longer performing technical support tasks only, it is also involved in equipment procurement, printing services administration, and basic tasks related to network account/profile management and network drives organization.

At first, students were assigned in the helpdesk supervisor position, later on; the director assigned a designated employee with a bachelor degree in IT-related field to fill the "helpdesk supervisor" position. At the beginning, the supervisor functioned as an operator, who only logs calls manually and cycle them to level 2 support agents, unfortunately, no mechanism to follow-up on calls' status with either agents nor users is set.

Users calling the helpdesk didn't show interest in communicating their technology related problems with the helpdesk supervisor. For more than five years, the employee in the helpdesk supervisor position carried out the responsibilities of two jobs, his/her own in addition to the job of a secretary, the computer center director didn't appoint a secretary for long time and counted on the helpdesk supervisor to cover both positions.

Unfortunately, even though this tactic had lowered the budget of the computer center for a while, it caused the helpdesk to lose users' confidence in the qualifications of helpdesk supervisor. By the time, BZU users shaped false expectations of the helpdesk supervisor as a secretary who is not qualified to provide support over the phone nor give instructions to users; therefore, the rate of first contact resolution had dropped tremendously. The helpdesk supervisor felt disappointed, no matter what salary she/he is paid, because the expectations before starting the job didn't match the actual tasks assigned.

The formal helpdesk supervisors expected to build a career for life in which they communicate their knowledge and share their skills with users, unfortunately that wasn't the case, the helpdesk supervisors suffered from users' perception of

them as secretaries who are mainly capable of recording and cycling calls, this false perception limited communications between the helpdesk supervisor and users, which diminished the chances of solving problems at the first contact and thus caused an extra load on the level-2 support agents that could have been avoided otherwise.

The helpdesk at Birzeit University suffers from other issues beside human resource disruption; other issues can be addressed as follows:

(1) The helpdesk doesn't have a documented *Service Level Agreement* with the users at the University, therefore, service quality indicators of helpdesk performance are undefined

(2) High turn-over rate, hiring a new helpdesk staff member doesn't necessary mean expecting best performance; the new support member needs training on the best customer service practices, training will help build a future career for the helpdesk supervisor and the technical support agent who is in contact with users over the phone as well as in direct contact when providing support on site.

(3) Unfortunately, technical support is usually viewed as a secondary service for the computer center; the helpdesk has been ignored for a long while, this might be because of its intangible outcomes on overall business processes in the academic environment.

(4) Rapid upgrades for the variety of computing equipment and applications used. The helpdesk is in charge of providing technical support for all computing equipment such as: personal computers PCs, printers, scanners, laptops, LCD projectors and every other IT-related equipment, which makes it hard for the helpdesk agent to acquire the knowledge for all incidents of troubleshooting.

(5) The helpdesk agents don't share the experience and knowledge of each other; they don't document solutions in a knowledge base, and so, they are wasting a very useful and essential source of learning.

(6) The helpdesk doesn't only communicate with users requesting technical support services; some of its tasks are administrative in nature and require communications with other business units. For example, a purchase process of computing equipment starts when a user sends a request to the helpdesk, then, the helpdesk assigns specifications prepared in coordination with the director, the request is then sent to the procurement unit which in its turn proceeds with the procurement process.

The user who requested the equipment turns to the starting point of the process which is the helpdesk to follow up on the procurement request. In such instances, the helpdesk plays the role of a third party between the procurement unit and users, such tasks contribute in adding more load on the helpdesk supervisor.

(7) The helpdesk doesn't currently pay enough attention to quality assurance; the helpdesk supervisor doesn't follow up on calls completion and user satisfaction and doesn't keep records of users' feedback. Solving a problem doesn't necessary mean that the user is satisfied with the way the service is provided. Getting feedback from users on continuous bases helps monitor changes in users' satisfaction level and therefore triggers suggestions to improve the way service is provided.

(8) The job title: "helpdesk supervisor" doesn't match the real tasks and job description, it is really doing the task of a helpdesk operator who answers queries and logs calls into the Call Management System. The helpdesk supervisor should follow practices to monitor quality assurance, document solutions into a knowledge base, measure customer satisfaction and follow-up on calls in general to extract trends.

(9) There are multiple channels of contact in the lifecycle of BZU helpdesk; BZU users can make the first contact to report a problem through either the helpdesk supervisor or the technical support agent.

(10) The call management system currently used at BZU helpdesk isn't based on knowledgebase, thus, BZU helpdesk doesn't have a database for a step-by-step solutions for technical support problems available to users at any time and place.

(11) Internal transportation is yet another burden, BZU campus is expanding noticeably and far-distanced buildings are established on campus, the helpdesk needs a sufficient mean of transportation to reach buildings as soon as possible to provide sufficient services.

3.5. Conclusion

Helpdesk operating in the academic environment suffers harder conditions than commercial helpdesks. The helpdesk at Birzeit University is no different than other helpdesks. The purpose of the study serves the goal of BZU computer center's management to enhance technical support service quality, gradually eliminate complaints and eventually achieve users' satisfaction.

4. Chapter 4: Research Methodology

Introduction

Chapter five explicates the methodology used in measuring the indexes of the performance matrix, formulated by making few modifications to the original Gartner Inc. Performance Matrix, which was explained previously in the literature review. This holistic single-case revelatory study represents methodologies to measure indexes of the matrix in order to test the hypotheses in the data analysis stage of the study.

The first section of this chapter is an overview of the indexes to be measured and the timeframe of the study, the second section is titled Modified Gartner Inc. Performance matrix, this is the core segment of this chapter, it explains how the Gartner Inc. performance matrix can be modified to be appropriate for implementation in the academic environment. The chapter proceeds to explain how every index is being measured. The research methodology of each index is explained in separate sections as follows: measuring BZU users' satisfaction and service quality of the helpdesk, measuring BZU helpdesk staff job satisfaction, and statistics of the helpdesk call management system.

4.1. Research Methodology overview and Time frame of the study

This study is descriptive and explanatory in nature. In the descriptive part of the study, BZU Helpdesk performance is measured and analyzed by using a proposed modified Gartner Inc. performance matrix, which is described shortly in the next section of this chapter, the modified matrix is used to measure:

- Helpdesk user satisfaction and service quality (external measure)

- Helpdesk staff job satisfaction (internal measure)

- Examining service-related metrics, which are: average resolution time and FCR rate, the date proceeded from the call management system and analyzed using excel worksheets. (Internal measure).

However, the explanatory part becomes clear in:

▪ Testing the proposed hypotheses, more importantly the relationship that exists, if any, between user satisfaction and users' perceived service quality performed by the helpdesk, and the relationship that exists, if any, between helpdesk staff job satisfaction and helpdesk performance, in addition to the other proposed hypothesis.

▪ This study also intends to benchmark the current processes against those demonstrated in the helpdesk road map solution by the mean of Data Flow Diagram DFD. Benchmarking allow to pin point the bottlenecks in the current workflows. The road map solution intends to deploy quality of service QoS indicators in the process design of the helpdesk system. SLA usually defines quality of service QoS measures that are set by users and the service provider. Unfortunately, BZU helpdesk doesn't have SLA and thus it doesn't have a standard base to perform its tasks.

The model of the electronic helpdesk system described in the road map solution is developed in this study taking into consideration integrating quality of service QoS indicators into the processes' design through the use of the tool of Data Flow Diagrams DFDs. A supportive model, quality of service evaluation management, which is described in previous chapter in Figure 4-1, suggests a process of ensuring QoS measures into the Helpdesk road map solution model. The explanatory part, regarding this component, comes clear when the current processes are benchmarked against those of the road map solution to suggest improvements in some cases and re-engineering in others.

A quantitative research methodology was adopted to achieve the following:

▪ Collection of primary data: two structured questionnaires were prepared and administered during the study. The first questionnaire is the BZU Helpdesk User Satisfaction and Service Quality Questionnaire, this questionnaire was prepared using SERVPREF instrument, a version of SERVQUAL, and administered to technology users at Birzeit University. It aims at measuring service quality and users' satisfaction level, in addition to other measures that will be explained in detail later in this chapter.

A second structured questionnaire: Helpdesk Staff Job Satisfaction Questionnaire was administered to BZU helpdesk staff to measure their job satisfaction. This questionnaire was developed based on the Abridged Job Descriptive Index (AJDI) instrument, this instrument is a shortened version of the "Job Descriptive Index" (JDI) instrument, both of which have been developed and copyrighted by the Bowling Green State University in the United States. The questionnaire was administered to level 1 and level 2 support agents.

▪ Conducting Interviews: eight interviews were conducted with random Academic and administrative staff members like: department chairpersons, Instructors, and administrative staff members. The interviews took place in a pre-design stage of the users' satisfaction and service quality questionnaire, the feedback of the users helped in developing some questions of the questionnaire in clear format and easy language.

Three interviews were carried out with the computer center director and the information officer who works in the Office of Planning and Development which falls under the command line of the office of the president at Birzeit University. The first interview took place at early stages of the study to identify the most important points for the computer center management to investigate. The director identified those measures to be: investigating the most common methods to contact the helpdesk, the most common IT problems facing users, and the familiarity of users

with IT policies. He also suggested some questions to score the level of users' experience of IT related issues in general.

The second interview took place at later stages of the study to document historical events and growth stages of the Helpdesk; the material is addressed in Chapter One of this study. The computer center director provided all necessary information about the history of the helpdesk, staff, hierarchy, clients and services of the helpdesk; he also talked about the burdens and difficulties facing BZU helpdesk.

The third interview is a meeting that is conducted with the computer center director, the helpdesk supervisor and the information officer after completing the data analysis stage of the study. The meeting involved a presentation of the results of the questionnaires and the performance statistical matrices; this presentation allows share explanations and thoughts about the causes of certain unsatisfactory trends and helps add more dimensions for better suggestions for improvement.

▪ Collection of secondary data: the statistical data proceeded from the V-tiger call management system that is currently used by the helpdesk is one of the most important secondary data considered in this study. Statistical data is proceeded from the system and uploaded into an excel file. Two performance matrixes are computed: the average resolution time of calls and the first contact resolution FCR rate. The excel file contains data that is dated back to Aug/2007 until the day being proceeded in Jun/2009.

Modeling the current workflow of helpdesk processes is also considered a secondary data. The current workflows are exhibited by using logical data flow diagrams DFDs.

4.2. Hypotheses

In view of the fact that the main purpose of the helpdesk is to provide technical support services to users in a satisfactory manner, a relationship, if any exists, between quality of service (as an indicator of performance) and users'

satisfaction is examined to further emphasis on the purpose of measuring users' perceived service quality to evaluate helpdesk performance. The hypothesis of such a relationship is examined within Birzeit University's environment, the research questions and proposed hypothesis are generated within the environment of Birzeit University. The answers of the questions of the study are sought by testing a number of hypotheses that is proposed based upon the reviewed literature:

Hypothesis 1:	There is no relationship between user overall satisfaction level and the perceived service quality performed by the helpdesk.	$H1_0: p = 0$
	There is a relationship between user overall satisfaction level and the perceived service quality performed by the helpdesk.	$H1_A: p \neq 0$
Hypothesis 2:	There is no significant difference in the mean variance in satisfaction level and perceived service quality performed by the helpdesk between administrative and academic faculty members at BZU.	$H2_0: \mu1 = \mu2$
	There is a difference in the mean variance in satisfaction level and perceived service quality performed by the helpdesk between administrative and academic faculty members.	$H2_A: \mu1 \neq \mu2$
Hypothesis 3:	There is no significant difference in the mean variance in overall satisfaction level between more IT experienced users and those with low IT experience level.	$H3_0: \mu1 = \mu2$
	There is a significant difference in the mean overall satisfaction level between more IT experienced users and those with low IT experience level.	$H3_A: \mu1 \neq \mu2$
Hypothesis 4:	There is no significant difference in the mean variance in perceived service quality performed by the helpdesk between more IT experienced users and those with less IT experience level.	$H4_0: \mu1 = \mu2$
	There is a significant difference in the mean variance in perceived service quality performed by the helpdesk between more IT experienced users and those with less IT experience level.	$H4_A: \mu1 \neq \mu2$
Hypothesis 5:	Helpdesk staff job satisfaction is not an indication of helpdesk performance.	$H5_0: p = 0$

Hypothesis 5:	Helpdesk staff job satisfaction is an indication of helpdesk performance.	$H5_A: p \neq 0$
Hypothesis 6:	The rate of First Contact Resolution FCR has an influence on users' satisfaction.	$H6_0: P = 0$
	The rate of First Contact Resolution FCR has no influence on users' satisfaction.	$H6_A: P \neq 0$

4.3.　Time Frame of the Study:

The academic year at Birzeit University starts in mid August and ends twelve months later in August of next year. This study is cross-sectional; each component of the modified Gartner Inc. performance matrix was measured at a specific point of time in 2009. The helpdesk users' satisfaction and service quality questionnaire was administered in May 2009. It was conducted toward the end of the academic year so that respondents will consider as many technical support incidents as possible in gauging their perceptions. A period of one month is given to all users to respond to the questionnaire and return them via internal mail system. A week before the deadline, the researcher called all secretaries to encourage them to distribute all questionnaires and collect completed ones to return them via internal mail system. the researcher waited for two more weeks after the deadline but no more questionnaires were submitted. A total of 340 questionnaires were distributed but only 99 questionnaires were captured.

The helpdesk staff job satisfaction questionnaire and the interviews were both administered in July 2009. A period of one week is given to the three helpdesk agents and the supervisor to complete the questionnaires and return them via internal mail system, one of the agents didn't participate in the study. Data collection of this part of the study took place during the summer session, because as anticipated, the load on the helpdesk staff is not as heavy as other times of the year, and so responding to the questionnaire won't interrupt their work. The helpdesk supervisor responded to the questionnaire and participated in an individual interview, while

three out of the four technical support agents completed the questionnaire and participated in the interview.

Statistical data is uploaded from the V-tiger call management system in June 2009. The data is accumulation of the last three years 2007, 2008, and 2009.

4.4. Modified Gartner Inc. Performance Matrix

Gartner Inc. Performance Matrix is a wide used matrix for measuring service center performance. The structure of the matrix is supposed to work for all revenue-driven service industry firms. As indicated in research studies posted on the Gartner Inc. website, Gartner Inc. matrix is used by many firms and business to measure service performance of helpdesks and technical support centers.

The matrix should also work for helpdesks operating in the academic environment, but since, one of differentiating characteristics of the helpdesk in the academic environment is that it is providing a free-of charge service to internal business units at the University, the cost construct of the original matrix will no longer have a deployed value. Therefore, the first suggestion to modify the matrix is to get rid of the cost structure.

Table 5-1: Original and Modified Gartner Inc. performance matrix

Performance Metric	Original Loads	Modified loads
Average resolution time	9%	15%
First-contact resolution	21%	**35%**
Employee satisfaction	12%	**20%**
Customer Satisfaction	18%	**30%**
Total Weightings	60%	100%
Cost per handled call	40%	

Modification of the Gartner Inc. performance matrix is based on distributing the weights of the cost construct relatively across other constructs in the matrix. The 40% weight of the cost construct is omitted and the remaining weights are adjusted

to construct a new matrix of four constructs whose weights are equal to 100% instead of 60%. Please refer to Table 5-1 for modified weights.

In addition, the first metric of the original matrix which is average queue time is replaced with average resolution time, because BZU helpdesk doesn't have Average Call Distribution ACD software that counts answered and abandoned incoming calls, therefore, we can't compute the average queue time of users' calls, in addition, average resolution time serve the purpose of this study better than average queue time, because the study aims on measuring the quality of service provided by the helpdesk, and resolution time is a better indication of BZU helpdesk service than average queue time.

A description of the modified matrix weights:

Average Resolution Time ART: this is given the lowest weight in the overall helpdesk performance index in the academic environment, because users will tolerate longer resolution times if they have confidence that the agent who answers the call will be able to resolve their issues or deliver the call to the appropriate agent and he/she is in the way to resolve the problem. In BZU academic environment, where ART is meaningfully long, it is better to interpret it as a percentage of the number of calls accomplished within the Service Level Agreement against average overall calls accomplished by the technical support helpdesk excluding FCR calls, since they have their own measure.

First Contact Resolution: this is given the greatest weight in the overall helpdesk performance index, as nothing will negatively affect user satisfaction more quickly than being bounced around or making multiple calls to the helpdesk. FCR is interpreted as a percentage of the calls achieved on first contact against the average of overall calls performed by the helpdesk. It can be calculated per month or per year, but the shorter, the better, since the measures of the study are evaluated within shorter periods of time.

Helpdesk Staff job Satisfaction: a questionnaire is administered to measure staff job satisfaction, the questionnaire evaluates the job satisfaction according to standard measures of the used instrument, in this study AJDI instrument is used to evaluate BZU helpdesk staff job satisfaction, the mean of items' scores of the instrument is captured and then the percentage of the mean out of the 5-point Likert scale is calculated to be used in the modified performance matrix.

Users' satisfaction: a questionnaire is administered to measure BZU community's satisfaction of perceived service quality of the performance of the helpdesk, the mean of the items of the SERVPREF instrument is captured and then a percentage of the mean out of the 7-point Likert scale is calculated to be used in the modified performance matrix.

Measuring BZU Users' Satisfaction and Service Quality of the Helpdesk
Targeted population and sample design

The helpdesk at Birzeit University provides technical support services to all members of Birzeit University. Students' services are limited to supporting computer labs, wireless network and smart classrooms. Even though students are the main beneficiaries of such facilities, they are excluded from the population of the study because of limited direct communications between them and the helpdesk staff. Usually, the helpdesk communicate with the lab supervisor to deliver technical support service, student email accounts are done by students through Ritaj system through Google supportive service. Supporting the on-line portal 'Ritaj' is beyond the scope of the technical support helpdesk.

The sample frame of this study constituted of technology users who are mainly academic and administrative staff members who work for Birzeit University. The sample was drawn from all business units from academic departments, offices and labs to administrative units, institutes and centers operating in campus and off.

Employees' population at BZU is classified into the following groups, as shown in Table 5-2 below:

Table 5-2: BZU Working Population

Population Groups	No.
Administrative Staff	491
Academic Faculty Members	306
Teaching Assistants	55
Researchers	8
	860

The pilot questionnaire was previously administered in Jan 2009. The pilot questionnaire used the SERVQUAL instrument based on the difference of scores between users perception of actual service quality against their expectations, it has then been modified to using performance only instrument - SERVPREF. The modifications came as a response to users' difficulties in determining a level of performance for two distinct aspects of helpdesk service quality, some users explained the problem as being their unfamiliarity with such kind of questions' format, the double scales used for each question confused users because they are used to one column scale for each question, many of them chose the same level of quality to each question of the instrument, ignoring the different identity of each, therefore users' expectations of desired service matched the actual service performance in most cases yielding to many unjustifiable neutral scores.

The revised questionnaire was piloted on a small number of colleagues and faculty members as a pre-design stage. After a pre-test, sets of 5 to 10 questionnaires were sent via internal mail to all BZU departments, offices, units, institutions and centers. The questionnaire was accompanied with a cover letter from the Assistant of V.P. for Academic Affairs of Development to urge users to participate in the study. The cover letter ensures respondent anonymity. The questionnaires were distributed by each department's secretary.

The SERVPREF items in the questionnaire were not grouped by dimension. They were ordered randomly. A total of 340 questionnaires were disseminated and every one of each is given an ID number to uniquely identify it. The dissemination process resulted in 250 unreturned questionnaires and only 99 responses are captured. The number of responses of the investigation study is very close to the response rate of that of the pilot study, which was 70 questionnaires.

4.5. Questionnaire Development and Design:

The SERVPREF instrument, a version of the SERVQUAL instrument, which is used in this study is based on a model of IS-SERVQUAL that includes the following five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The SERVPERF instrument was tested and validated over a ten year period with a series of studies since its refinement in 1994 (Landrum & Prybutok, 2004; Landrum, Prybutok, Kappelman, & Zhang, 2008; Landrum, Prybutok, Strutoon, & Zhang, 2008).

The questionnaire investigates user overall satisfaction and perceived service quality performed by the helpdesk at Birzeit University in Palestine. The questionnaire includes 43 closed-ended questions in total in addition to two open-ended questions one of the open-ended questions are addressed in section 3 of the questionnaire; it asks users to address their training needs, if any. The second open-ended question is addressed in section 4, which is the last section of the questionnaire and only contains this question; it asks users to address any additional suggestions and notes.

Five-point and seven-point ordinal scales are used throughout the questionnaire. 22 questions in 5 dimensions built on SERVPREF- performance only instrument- in order to measure helpdesk performance as a quality of service indicator. The instrument is written in Arabic language because it is the local language of respondents. The department of Arabic language at Birzeit University

reviewed language use and formality. Please refer to Appendix A for a copy of the helpdesk user satisfaction and service quality questionnaire and attached cover letter.

The questionnaire is composed of four parts, in addition to a brief introduction, and accompanied by an encouragement cover letter to urge users to widely participate in the study. The first section is composed of 8 questions, 6 of which are investigating users' perception of the performance of the helpdesk in communicating with users through the telephone system; these questions are addressed in a 7-point Likert scale which level increases gradually by one point from 1 to 7. Questions 2 through 7, investigates the efficiency of the helpdesk's communications through the telephone system as the most used method in contacting the helpdesk. The measures investigated are listed in Table 5-3.

The first question of the questionnaire asks the user to rate the commonality of usage of listed contact methods to reach the helpdesk; it is designed in a 5-point ordinal scale which level increases gradually by one point from 1 to 5. A sixth option is added to allow for "never been used" response, the other five options are: a- telephone, b- email, c- step in, d- through 'Request Technical Support' on Ritaj system, e- Other.

Question number eight, which is the last in section one, investigates the most common technical problems facing users in the work environment. The 'never been happened' option is added to the set of options, which are: a-internet and email, b- Ritaj system, c-Software programs and applications, d- hardware problems, e- printer problems, and f-other.

Table 5-3: Scoring users IT experience at Birzeit University

Question N.O	Investigated Aspect	Measure
Q.2.	The helpdesk's inquiries about the nature of the issue are obvious and easily understood.	Responsiveness
Q.3.	User's confidence in the qualifications of the helpdesk member who answers the call.	Assurance

Q.4.	The waiting time before the helpdesk agent picks up the phone and receives the call.	Average Resolution Time
Q.5.	The percentage of first contact resolution over the phone.	First Contact Resolution rate
Q.6.	The match of first contact diagnostic with the actual problem on-site.	Reliability
Q.7.	Confidence that the helpdesk agent is documenting the call for follow up purposes	Assurance

Section two of the questionnaire is composed of 21 Questions. Question number 29, which is the last one in the section, investigates the overall user satisfaction of the technical support services of the helpdesk. Questions numbers 9 through 27 are randomly ordered among the 5 measures in addition to Questions numbers 2, 3 and 6 of the first section. The SERVPERF instrument of the study is composed of the following items:

(1) 3 items measure tangibles (Questions N.O. 2, 3, and 6) - tangibles refer to physical facilities, equipment, and personnel; the three tangibles questions investigate the efficiency of the helpdesk's performance through the telephone system. There is no doubt that the items may point to other aspects such as responsiveness, reliability and assurance, but mainly they are related to using the telephone system as part of the physical resources available for the helpdesk to communicate with users.

(2) 5 items measure reliability (Questions N.O. 9, 10, 18, 19, and 20) – reliability refers to the ability of the helpdesk to perform promised service dependably and accurately; the 5 reliability questions asks the user about the following aspects: Q.9. – Efficiency in solving problems as fast as possible, Q.10 – efficiency in processing administrative related requests as fast as possible, Q. 18 – sticking with deadlines and appointments, Q.19- coordination among the helpdesk staff and other employees in the computer center to accomplish tasks, Q.20 – setting the right priority to the problem.

(3) 5 items measure responsiveness (Questions N.O.11, 12, 13, 14, and 15) – responsiveness is the willingness to help customers and provide prompt service; the 5 responsiveness questions investigate the following aspects: Q.11- First Contact Resolution FCR , Q.12- Explaining the reasons behind the problem and consequences of it in order to avoid inconvenience, Q.13- Keeping track of historical incidents and relate to them in an attempt to solve the problem, Q.14- the resolution grants long term prevention, Q15- provide answers to users' queries.

(4) 5 items measure assurance (Questions N.O. 16, 17, 21, 25, and 26) – assurance is the ability of employees to inspire trust and confidence in users; the 5 assurance questions investigate the following aspects: Q.16- updating users of the problem status through all stages of providing the service, Q.17- getting back to users in order to make sure they are satisfied with the quality of service provided, Q.21- Confidence in the experience and knowledge of the helpdesk staff, Q.25- confidence and trust to put private and confidential information under the helpdesk's control, Q26 – privacy and data security.

(5) 4 items measure empathy (Questions N.O. 22, 23, 24 and 27) - empathy refers to the amount of caring and individualized attention provided to users; the 4 empathy questions investigate the following aspects: Q.22-the language of the helpdesk staff is simple and easily understood, Q.23- willingness and initiative to provide assistance in every possible way, Q.26- keeping users informed with the latest security threats and provide instructions to ensure security and privacy. Q.24- courtesy of the helpdesk staff, Q.27- suggests alternative approaches to achieve tasks more efficiently.

Section three of the BZU helpdesk users' satisfaction and service quality questionnaire is made of demographic information and other information related to users' general experience and IT knowledge. Question number 30, asks about the user's work location at BZU, most questions of this section specifically point to

users' experience related to IT field and BZU environment in general. These questions are used to classify users into different IT experience groups according to the resulting scores. The questions that are used to classify users are:

Table 5-4: Facets of Scoring Users' Overall IT Experience

Question	Measure	Min. Score	Range	Max. Score
Q. 31	The need for IT training	0	0-1	1
Q. 33	Number of monthly requests for technical support service	1	1-2-3	3
Q. 34	Average number of daily hours of using computers	0	0-2-4	4
Q. 35	The average time tolerated in waiting for resolution	0	0-1-2	2
Q. 38	User opinion toward using a knowledgebase to seek resolution for technological problems	0	0-1	1
Q.39	Users' self-evaluation of their overall IT experience	1	1-2-3-4	4
Q. 44	Number of years of work experience at Birzeit University	1	1-2-3-4	4
	Range of respondents' scores	3		19

- The need for IT training (Questions N.o. 31), Question 31, provides two options to the user "Yes" which score is zero, and "No" which score is 1. It is understood that users who are not in need for training are more comfortable with using technology and dealing with IT tools in general, therefore, the 'No' option is given a score of 1 opposed to zero for the 'YES' option.

- Number of monthly requests for technical support (Question 33). Users who have been involved in more technical support related incidents are more likely to form precise judgments to the performance and quality measures. Question 33 has three options in a range format, the first choice is given a score of 1, the

second is 2 and the third is given 3 points. The score rises with the number of incidents.

- Average number of daily hours of using computers (Question 34). The longer the user is using technological devices in his/her daily life, the more likely he/she will be exposed to incidents in need for technical support. This question provides three options in which the number of hours is demonstrated in a range format, the ranges increase from option 1 to option 3 and the correspondent score follows the following scheme 0, 2, 4 respectively, the third option of this question is given one more point in comparison to normal scoring scheme because it indicates that the user will become more comfortable in communicating with technological devices by the time and he/she won't be in need for technical support unless the situation is totally hopeless. It also mean that, this is the kind of users who are more likely to be productive throughout the day, therefore, technical support service quality and performance efficiency are of more importance for such a group of users.

- Average time tolerated in waiting for resolution – average resolution time (Question 35). This question investigates the demanding level of a user, it is very critical and the hardest to score, because tolerated time depends highly on the type of the problem and its influence on the productivity of the user, and since it is hard to ask for tolerated time to each possible problem, I provided 6 time ranges for this question in addition to one more open-ended option. Some users indicated in the open-ended option that their tolerance time depends on the nature of the problem, if the answer of the user complies with this idea; the user is given the highest score which is 2. The options of this question start with the shorter time tolerated which reflects a high demanding user; and ends with longer tolerated time. The first three shorter ranges are given the highest score which is 2, while the following other 3 ranges are given 1.

More demanding users doesn't necessary mean superiority or inferiority; we

can't point to a specific positive or negative attribute here because in some certain incidents demanding is considered a positive activator while in others it is considered a frustrating attribute. Regardless of the demanding dimension of users, it is generally accepted that users who tolerate longer time zones are more likely to tolerate other dimensions regarding service quality.

▪ User opinion toward using a knowledge base to seek resolution for technological problems (Question 38). Regardless of being academic or administrative personnel, users in academic environment are supposed to be immersed in the educational and learning vision of the academic institution. The answers options of this question are ''YES' or ''NO'. The user's attempt to learn by self-doing is an indicator of a positive attribute and thus is scored by 1 while users who reject such vision are given a score of zero.

▪ Users' evaluation of their overall IT experience (Question 39). This question is crucial, because users may feel inferior if they evaluate their IT experience as basic or just fine. Users are more likely to exaggerate their answers in items associated with personal attributes. Even though, this may cause a defect in scoring, its influence on the overall scoring per individual and for all responses won't be of recognized effect. The user is given four choices describing his/her IT experience as either: basic, fine - medium, high or expert, each option is scored increasingly by one point starting from 1 to 4.

▪ Number of years of work experience at Birzeit University (Question 44). This question is straight forward, the answers are put in form of ranges, four ranges are provided in ascending order, the lowest range is given the lowest score, which is 1, and the scores rise by one point respectively. The scoring mechanism complies with the idea that the longer a user works at Birzeit University, the more likely he/she experiences different and repetitive technical

support incidents at different points in time, which will result in more reliable answers.

▪ The average scores of performance measures of the SERVPREF items of the study is calculated, this average of users' perceived quality of helpdesk's performance is computed for each respondent, the mean of users' perception of service quality performed by the helpdesk is then multiplied by the specified percentage of the modified Gartner Inc. helpdesk performance matrix for the academic environment.

This research study investigates the relationships between variables, most importantly, the users overall satisfaction level with relation to the users perceived service quality performed by the helpdesk. It also calculate the average means of users satisfaction and service quality to be used in the performance matrix, the results of the responses are captured upon running the following statistical tests:

• Descriptive data analysis: descriptive statistics for all variables is done in addition to frequency tables; the analysis is aided with a graphical presentation by the mean of histograms, pie charts, and other graphical representation.

• Bi-variant inferential analysis: correlation and linear regression analysis is done on the two numeric variables: Overall user satisfaction and the user perceived service quality. A T-test is done to find out whether each of the two variables mentioned above differ across different groups of users (administrative and academic), while the method of splitting data sheet is done to compare the mean variance of the above mentioned variables across groups of users of different IT experience levels.

• Multi-variant analysis: factor analysis of the 22 independent variables measuring helpdesk service quality is done to group the items according to the underlying construct they represent; this is also done to validate the instrument. The constructs uncovered by the factor analysis should closely resemble the five dimensions in the SERVPREF instrument.

4.6.   Measuring BZU Helpdesk Staff Job Satisfaction

Targeted populations and sample design

The helpdesk staff job satisfaction questionnaire is administered to helpdesk staff in mid July, 2009. Five staff members are currently working at the helpdesk, one of them is the helpdesk supervisor, who is considered level-1 support agent, and the other four are level-2 technical support agents. It is also worth mentioning that, in some buildings and units at Birzeit University, a number of technical support agents are hired to provide technical support services, those employees are not under the supervision of the helpdesk and they usually coordinate with the helpdesk to solve advanced or permission related issues. Thus, the study will stick with the boundaries of the helpdesk environment and bonded to its responsibilities.

Questionnaire Development and Design:

"Abridged Job Descriptive Index" (AJDI) instrument has been chosen to measure the helpdesk staff job satisfaction at BZU Helpdesk. This instrument is a shortened version of the "Job Descriptive Index' (JDI) instrument, both of which have been developed and copyrighted by the Bowling Green State University in the United States (Bowling Green State University, 2001).

Helpdesk staff job satisfaction questionnaire is in English language. It is composed of a brief introduction and two sections; the introduction inspires an internal motivation for the respondent to investigate his/her level of job satisfaction so that respondents won't feel obligated to complete the questionnaire rather feels personally interested in the results.

The first section of the questionnaire is composed of demographic questions in addition to one more open ended question for listing work responsibilities. The second section uses a 5-point Likert scale to determine the satisfaction level as follows: 1 not satisfied at all, 3 somewhat satisfied, and 5 extremely satisfied –

numbers 2 and 4 fall in between the scale points in ascending order and are not titled). This part investigates employee satisfaction of the following aspects:

(1) General working conditions, investigating the following four facets (weekly working hours, flexibility in scheduling, location of work, and paid vacation)

(2) Promotion and pay potential, investigating the following five facets (salary, promotion opportunities, benefits, job security and recognition for work accomplished.

(3) Work relationships, investigating the following facets (relationships with co-workers, with supervisors, and with subordinates (if applicable)

(4) Use of skills and abilities, investigating the following facets (opportunity to utilize skills and talents, to learn new skills, and support for additional training and education).

(5) Work activities, investigating the following facets (variety of job responsibilities, degree of independence associated with work roles, adequate opportunity for periodic changes in duties)

The second section ends with an open ended question to list additional aspects related to job satisfaction. The questionnaire is very simple and short in detail since the main purpose of the structured questionnaire is to solely measure job satisfaction, no instrument has yet been developed to measure job satisfaction aspects with performance or service quality constructs.

The researcher also interviewed staff members separately. The interview involved asking the following questions:

(1) Do you understand what is expected from you in your job?

(2) Do you have the resources to successfully complete your job?

(3) Do you think that BZU users are satisfied with the overall helpdesk performance? Why?

(4) Do you think BZU users contribute to the success or failure of the helpdesk? Explain your answer.

(5) Are you facing any problems in the work environment? If yes, please explain.

The interview took each participant between 10 to 15 minutes at most. The mean of helpdesk agent's satisfaction scores is calculated for each, and then the average of the means is computed to be multiplied by the weight of employee job satisfaction index in the modified Gartner Inc. helpdesk performance matrix.

4.7.   Statistics of the Helpdesk Call Management System

FCR is defined as a users' inquiry or problem that is resolved in one contact and is measured as a percent of time when the issue is completed fully on the first contact. It can also be measured as a percent of overall resolved calls. So FCR doesn't mean the first person of contact it rather means the first time the user got help and felt satisfied. Extent literature agrees that FCR contributes to user satisfaction; some authors even describe FCR as a key determinant of user satisfaction. Measuring FCR is important because of the following considerations, mentioned on Ascent Group Inc. official website:

- "…the absence of first call resolution has been found to account for up to 30% of a call center's operational cost…" – Niels Ashgrove – Call Center Managers Forum
- "….the inability to reach the right person with the right information drives 60% of customer service dissatisfaction …"- Center for Customer Driven Quality, Purdue University, USA
- "…customers who experience problems that are dealt with quickly and easily have a repurchase intention rate of 89%."- Center for Customer Driven Quality, Purdue University, U.S.A

Ascent Group Inc, headquartered in Athens, is a management consulting firm that specializes in customer service operations and improvement, performance

benchmarking, competitive benchmarking, work management and market research. Ascent Group Inc. had mentioned in a new research conducted in 2009 titled: An extract from Achieving First Call Resolution that "an 80% of FCR rate sounds pretty good. However, an 80 percent FCR means your customers call you, on average, 1.2 times to resolve a question or issue" (Ascent Group Inc. website: http://www.ascentgroup.com)

The information officer who works in the Office of Planning and Development at Birzeit University, uploaded the call statistical data stored in the V-tiger software into an excel file. The excel file contains the following columns:

(1) *Created Time*: the time the call is logged into the system, some calls are not logged immediately when received, an estimated time is entered instead. Nothing can be done to overcome this defect and the data will be analyzed as is.

(2) *Ticket ID*: a unique ID given to every ticket issued from the system.

(3) *Assigned to*: the user name to which the call is assigned, unfortunately, some support agents used anonymous user names such as Support Group or Admin which will not point to the name of the support agent who accomplished the task, and thus, analysis of each agent's FCR rate can't be performed.

(4) *Title*: the title of the problem, every support agent gives a problem a title; no defined look up list is available to standardize titles of the problems.

(5) *Related to*, *Entity Type* fields had never been filed.

(6) *Modified Time*: the name of the column doesn't point to its real intension; modified time captures the closing time of the ticket.

(7) *Category:* this field is misused, it contains some imprecise entries such as: small problem, big problem, while it is supposed to be: printer, network, hardware, and software. Again there isn't a pre-defined look up list to select entry.

(8) *Description*: contains the description of the problem in addition to the location of the caller.

The First Contact Resolution happens when the problem is resolved at the first contact, according to Gartner Inc. research studies about FCR, an average time of 8 minutes to resolve the problem can be considered a first contact resolution. First, the outcome of subtracting the closed time out of the created time is computed which yields to the average resolution time. Then, the Average Resolution time is checked as follows: if the ART is 11 minutes or less, the incident is resolved at first contact, and then all incidents imply with this rule are counted and a percentage of FCR is computed.

The FCR rate is found for each year separately, the three FCR rates are then demonstrated by a graph for better demonstration. The mean of the FCR during the year 2009 is then multiplied by the specified loading of the modified Gartner Inc. performance matrix for the academic environment. The mean average of FCR rates of the years 2008 and 2007 are excluded in order to stick with the time frame of the study.

ART is a measure of the average length of time that the user waits until the helpdesk agent resolves his/her issue. Some call centers calculate the ART in seconds since almost all resolution incidents happen over the phone, but for the academic technical support helpdesk, the situation is different, it may take the helpdesk hours and days to completely resolve the problem, thus, the ART in this study is calculated in terms of hours and minutes.

The ART is the outcome of subtracting the closed time out of the created time of the ticket, the ART is calculated for each year separately and the three means are plotted on a graph for better demonstration. The mean of the average resolution time calculated for the year 2009 is then multiplied by the specified loading of the modified Gartner Inc. performance matrix for the academic environment. It is

interesting to notice that ART has the lowest percentage in the Gartner Inc. helpdesk performance matrix.

4.8.   Limitations of the study

The study faced limitations throughout some phases of data collection; I found users unwilling to participate in the questionnaire since they were very frustrated with the performance of the academic helpdesk to the extent that they didn't expect any progress of its performance upon the results of the study. Another limitation is difficult accesses to computer centers in other universities in Palestine who were not encouraged to share the results of their performance with other universities. In addition, data collected from BZU helpdesk electronic system wasn't suitable to measure more performance indicators, a lot of missing fields, unclear tags and unknown titles in the files. Although I faced these limitations, I was lucky enough to get hold on adequate data that is considered representative for the outcomes of the study.

4.9.   Conclusion

In conclusion, the proposed Performance Matrix of this study, is originally derived from Gartner Inc. Performance Matrix. The Gartner Inc. It is modified to become appropriate for implementation in the academic environment. The major modification of the matrix involves elimination of the Cost index and reallocation of its weight relatively across the other four service indexes of the matrix. The chapter proceeds to explain in details the research methodology of each index of the proposed matrix; Users' satisfaction and service quality, is measured through surveying. Surveying is also used in evaluating helpdesk staff job satisfaction aided by personal interviews. The methodology of interpreting statistical information of the raw data captured from the call management system – V-tiger software- is also explained in this chapter.

5. Chapter 5: Data Analysis and Findings

Introduction

The proposed methodology that is explained in the previous chapter is practically implemented on Birzeit University's helpdesk. SPSS statistical software and Microsoft Excel are used to make computations and statistical analysis of the primary data captured from surveys and secondary data captured from the call management system. The chapter is organized into sections, each of which demonstrates the analysis' results of the helpdesk performance constructs.

5.1. Helpdesk users' satisfaction and service quality questionnaire

The SPSS statistics software package is used to analyze data collected from the helpdesk users' satisfaction and service quality questionnaire based on the SERVPERF instrument, a copy of the questionnaire is available in Appendix A. The respondents were asked to gauge their attitudes toward some measures thought to be important to classify users according to their IT expertise and personal attitudes relevant to the helpdesk service. The SERVPERF instrument, in this research study, asks the respondents to rank the performance level of BZU helpdesk for certain aspects that measure the five constructs of the instrument which are: tangibles, reliability, responsiveness, assurance, and empathy. The questionnaire also seeks to answer other important questions that of concern for helpdesk management.

Out of 340 questionnaires disseminated to all academic and administrative departments and offices in addition to institutes and centers in BZU campus and off, only 99 responses had been received. The 29% response rate, despite the encouragement cover letter from the Office of V.P. for Academic Affairs, shall point to a low-concern of BZU community, the overlooking of participation in research projects, is more disappointing when related to academic and research institute. 2 out of the 99 questionnaires were excluded from the study because of excessive missing data.

A number of 35 respondents completed the last section of the questionnaire, which is an open-ended question that asks for suggestions and comments; most comments touched on the following issues:

- Number of helpdesk staff is not adequate, many users suggested that the helpdesk need more technical support agents (11 supportive comments)

- Communication and coordination problem among the helpdesk staff, especially when it comes to tracking the problem, in addition to some concerns about the helpdesk's staff courtesy, some users complained that the helpdesk staff is using a high voice tone when communicating with them. (7 supportive comments)

- Training needs, users demanded instructive and learning materials about the most needed and common services at Birzeit University. (4 supportive comments)

The remaining comments handled some common issues like the repetitive of inconvenient incidents regarding network disconnection, Ritaj system low speed and printing services disturbance.

Normality Check

Table 5-1: One-Sample Kolmogorov-Smirnov Test

		Overall Satisfaction Level	Users' Perceived Service Quality
N		97	97
Normal Parameters(a,b)	Mean	3.78	3.8090
	Std. Deviation	1.502	1.14722
Most Extreme Differences	Absolute	.152	.054
	Positive	.120	.054
	Negative	-.152	-.054
Kolmogorov-Smirnov Z		1.496	.534
Asymp. Sig. (2-tailed)		.023	.938

a Test distribution is Normal.

First, a check for normality is performed on the variables: (User perceived service quality of helpdesk performance, and User satisfaction). A One-Sample Kolmogorov-Smirnov procedure is used to test the null hypothesis which proposes that: a sample comes from a particular distribution. Table 6-1 below shows the result from running a Kolmogorov test on SPSS, the

Figure 5-1: Methods of Contacting the Helpdesk

Z test statistic is the product of the square root of the sample size and the largest absolute difference between the empirical and theoretical cumulative values. Unlike much statistical tests, a significant result in this test is a bad news. The test returned a probability of the Z statistic equal to (.524) and the significance is (.938) which is greater than (.05), therefore, the null hypothesis is rejected and **the distribution of data is normal.**

Section One Analysis

The analysis of the first question of the questionnaire shows that the telephone is the most used method to reach the helpdesk. 46% of technical support requests are reported to the helpdesk via telephone, the email system comes next, 25% of user's queries are sent through the email system, and then comes personal visits and Ritaj system. Figure 5-1 demonstrates the share of every method in reporting queries and technical support incidents to BZU helpdesk.

As expected, **the telephone is the most common method to reach the helpdesk**, questions 2 through 7 are structured to measure the reliability, responsiveness, assurance, FCR and average resolution time in answering users' calls by the telephone. The results of the analysis shows that, in a 7-point Likert

scale, where point 4 falls in the midpoint of the scale, four out of the six measures fall below the midpoint of the scale, which indicates low satisfaction level regarding these measures, Figure 5-2 is a plot of the mean of users' responses regarding to: (user's feeling that the helpdesk is logging calls into the system, response time, first contact resolution over the phone, correct initial diagnostics of the problems, asking appropriate questions over the phone to identify the problem, users' confidence in the helpdesk staff's experience), those measures fall on the line in ascending order respectively, the last two measures fall above the midpoint of the scale yet didn't make it to 5th point which means scoring a neutral satisfaction level. The assurance, responsiveness and reliability measures have the highest mean scores respectively. The average of all means of questions related to helpdesk performance over the telephone system is 3.89 (equivalent to 55%), this mean doesn't point to a high level of satisfaction, and thus, we can say that **BZU users are not satisfied with the helpdesk performance over the telephone system**. Questions number 2, 3, and 6 measuring responsiveness, assurance and reliability are also involved in the overall analysis of the SERVPERF constructs.

Figure 5-2: Performance of the Helpdesk through the Telephone System
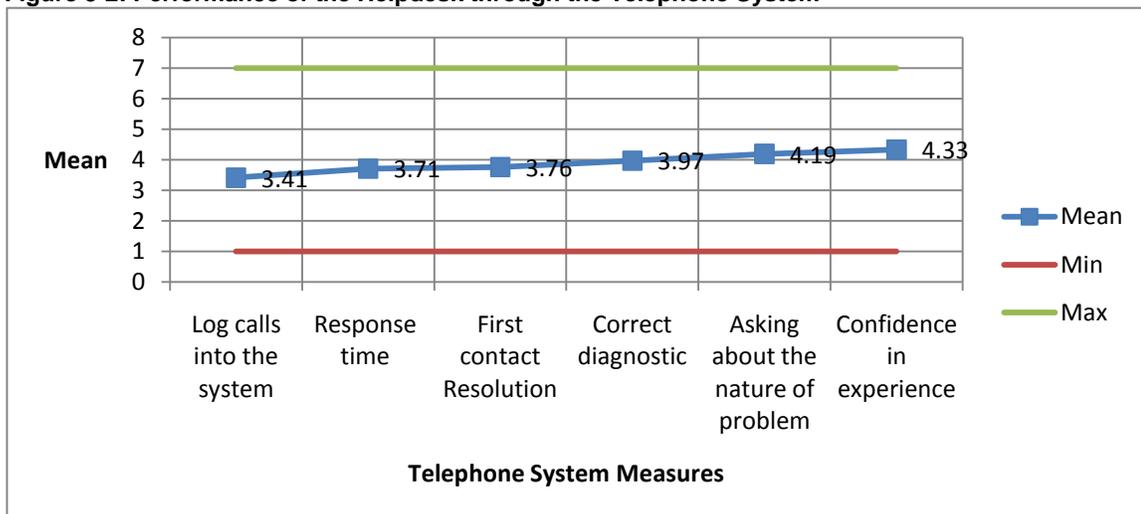
The analysis of question 8 shows that, problems with: the email system & networking, and problems with Ritaj system are the most common problems facing

users at Birzeit University. An average of 24% of problems are either network or email related, the same percentage count for Ritaj system problems – taking into considerations that Ritaj problems are out of the responsibilities of the helpdesk. Printing problems comes next in the rank, an average of 20% of the problems, facing users at Birzeit University, are printing related problems, hardware and software problems count for an average of 32% all together in an equal share amount for each. Figure 5-3 is a graphical presentation of this discussion.

Figure 5-3: Problems Facing BZU Users
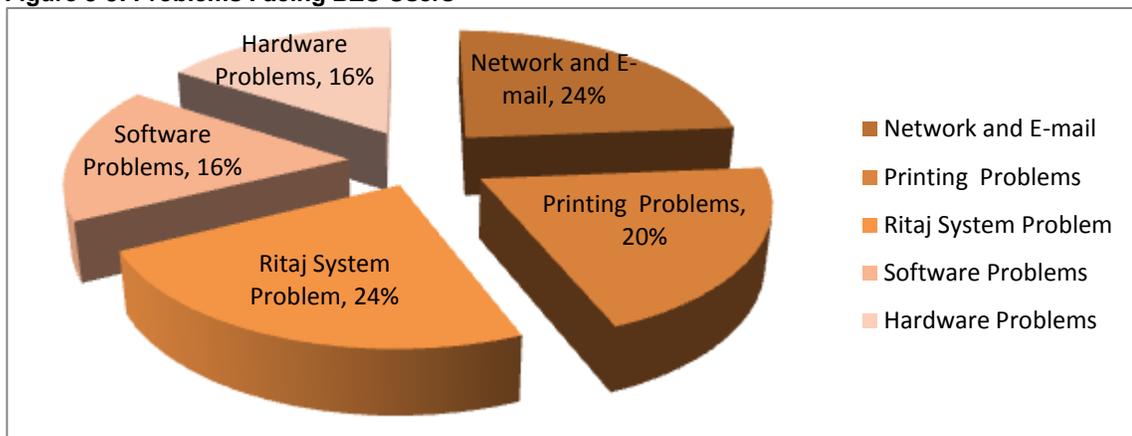
Correlation Analysis

The matrix displayed in Table 5-2, is a correlation analysis and linear regression of overall users' satisfaction and their perceived service quality performed by the helpdesk, the results of the matrix indicate that the relationship of the two variables is highly significant which a correlation coefficient of (.833).

Table 5-2: Correlations between Users' Satisfaction and Perceived Service Quality

		General Satisfaction evel	Mean of perceived service quality
Overall Satisfaction Level	Pearson Correlation	1	.833
	Sig. (2-tailed)	.	.000
	N	97	97
Mean of perceived service quality	Pearson Correlation	.833	1
	Sig. (2-tailed)	.000	.
	N	97	97

To determine the nature of the relationship, the sign of the regression coefficient is examined by generating Table 5-3 from SPSS. The table shows that the sign of the regression coefficient is positive; therefore, the relationship between users overall satisfaction and their perceived service quality performed by the helpdesk is a positive, meaning that **the higher users perceive the quality of service performed by the helpdesk the higher their overall satisfaction** level is. Though, this result might not be consistent if we take into consideration grouping users into different categorical groups.

Table 5-3: R and R-square Statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.833(a)	.693	.690	.836	.693	214.582	1	95	.000

a Predictors: (Constant), Mean_Performance_User
b Dependent Variable: General Satisfaction Level

The previous results yield us to **reject the first null hypothesis** and accept its alternative hypothesis that proposes: there is a relationship between users overall satisfaction level and their perceived service quality performed by the helpdesk, furthermore, the relationship can be described as positive, which indicates that the higher users perceive service quality performed by the helpdesk the more likely they experience high level of satisfaction.

To test whether the overall satisfaction level differs across administrative and academic staff members, an independent samples t-test is done on SPSS, Table 6-4 shows the results of the test, the difference in the mean of overall satisfaction level between administrative and academic staff equals .6 (4.11- 3.51 = .6) in favor for administrative staff, and the difference in the mean of users' perceived service quality performed by the helpdesk equals .49 (4.06 − 3.75 = 0.49) in favor for academic staff, which leads us to the result that: **academic staff members perceive better level of service quality performed by the helpdesk while administrative**

staff members express better level of satisfaction. It is also interesting to notice that for each group, the mean of the two constructs has a very close value.

Table 5-4: Users Satisfaction across Administrative and Academic Staff

	Admin Or Academic	N	Mean	Std. Deviation	Std. Error Mean
Overall Satisfaction Level	Administrative	54	4.11	1.423	.194
	Academic	39	3.51	1.502	.241
Mean of Perceived Service Quality	Administrative	54	4.0686	1.11466	.15169
	Academic	39	3.5752	1.10164	.17640

The above results lead us to **reject the Second null hypothesis** and accept its alternative hypothesis which proposes: there is a difference in the mean variance of users overall satisfaction level and perceived service quality performed by the helpdesk between academic and administrative staff members.

Section Three Analysis

In order to examine if users IT experience and general attitude toward the helpdesk influence the level of overall satisfaction and perceived service quality, section three of the questionnaire is mainly dedicated for gathering data about users' general IT experience, in addition to demographic data and other information. For the purpose of categorizing users' IT experience and attitudes into: Low, Medium, and High; users' scores of the seven questions explained previously in Chapter 5 in Table 5-3 are summed for each user, as demonstrated in Table 5-3, users' scores theoretically range between a minimum of 3 and a maximum of 19, however, the entered data shows that BZU users' scores actually range within 10 points that fall between a minimum of 8 and a maximum of 18.

After the summation process, it is found that, SPSS missed four mean values because of missing answers for one or more questions; the four respondents' means are not excluded from the study rather they are assigned a value of 12, which is a rounded number of the average of all users' scores, this method of assigning the average mean for missing data, is applicable when the number of missing values is

very small. According to the resultant mean of users' scores, the users are grouped into three categories of different levels of IT experience, as shown in Table 5-5:

Table 5-5: Categorical Groups of Users' IT Experience Levels

Category	Score Range
Low　　　　(group code 1)	8-11
Medium　(group code 2)	12-14
High　　　(group code 3)	15-18

The two categories of interest are the low and the high IT experience categories. Both categories range within 4 points at the most ends of the scale. The data file is spitted into the three users' categories of overall IT experience. And a regression analysis is done to find out if the mean of users' satisfaction significantly differs across the different groups of IT experience. Table 5-6 is an SPSS output of the analysis.

Table 5-6: Correlation of Overall Satisfaction and Perceived Service Quality across Users IT Experience Levels

IT Exper.			Overall Satisfaction Level	Perceived Service Quality
1.00	Overall Satisfaction Level	Pearson Correlation	1	.879(**)
		Sig. (2-tailed)	.	.000
		N	25	25
	Mean of Perceived Service Quality	Pearson Correlation	.879(**)	1
		Sig. (2-tailed)	.000	.
		N	25	25
2.00	Overall Satisfaction Level	Pearson Correlation	1	.848(**)
		Sig. (2-tailed)	.	.000
		N	63	63
	Mean of Perceived Service Quality	Pearson Correlation	.848(**)	1
		Sig. (2-tailed)	.000	.
		N	63	63
3.00	Overall Satisfaction Level	Pearson Correlation	1	.678(*)
		Sig. (2-tailed)	.	.045
		N	9	9
	Mean of Perceived Service Quality	Pearson Correlation	.678(*)	1
		Sig. (2-tailed)	.045	.
		N	9	9

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 5-6 is a correlation matrix of the two numeric variables (overall satisfaction and perceived service quality) proposed according to the three categories of users' IT experience levels. This matrix allow us to compare the mean of users' satisfaction and the mean of perceived service quality across different levels of user' IT experience. The first category which is low IT experience level is coded by 1, it has a person correlation of .879 and its significance is below .01, which indicates a strong relationship between users perceived service quality and their overall satisfaction level, the same applies on the medium and high IT experienced users, with .848 and .678 P values respectively.

Table 5-7: Satisfaction and Perceived Service Quality across Different IT Experience Levels

IT experience Level		N	Mean	Minimum	Maximum
1.00	Overall Satisfaction Level	25	3.84	1	6
	Mean of Perceived Service Quality	25	3.6664	1.09	5.36
2.00	Overall Satisfaction Level	63	3.86	1	6
	Mean of Perceived Service Quality	63	3.8675	1.00	6.10
3.00	Overall Satisfaction Level	9	3.11	1	5
	Mean of Perceived Service Quality	9	3.7951	2.47	6.05

When it comes to comparing the means of users' satisfaction of the three groups, Table 5-7 which is an SPSS output, indicates that the group with low IT experience level, has a mean of 3.84 for an overall satisfaction level and a mean of 3.66 for perceived service quality performed by the helpdesk. The mean of users' satisfaction of low IT experience level is higher than their perceived level of service quality, still both falls in the dissatisfaction zone of the 7-point scale. On the other hand, users' with high IT experience level have a mean of 3.11 of overall satisfaction level and a mean of 3.79 for their perceived service quality performed by the helpdesk, which means that the higher the level of users IT experience the lower their satisfaction level is, but at the same time, the higher is their perceived service quality, keeping in mind, that all means fall in the dissatisfaction zone of the 7-point ordinal scale.

It is interesting to notice that, for the users with medium level of IT experience, the mean of users' overall satisfaction is 3.86 which is equal to their mean of perceived service quality, this result validates my proposed methodology of scoring the questions upon which users have been classified into three groups according to a gradual ascending order. And since the significance of the relationship between the two variables (overall user satisfaction and perceived service quality) as shown on Table 6-6 ,is higher for the low IT experience level group, and since, 25.8% of respondents belong to the low IT experienced group while only 9.3% of respondents belong to the IT high experienced group, as shown in Table 5-8, we can conclude the following result: in general users at Birzeit University fall within the category of low IT experience, they are more likely to perceive low level of service quality performed by the helpdesk and are expressing higher level of satisfaction, and vice versa.

Table 5-8: Response Rate across Users with Different IT Experience Levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	25.8	25.8	25.8
	2.00	63	64.9	64.9	90.7
	3.00	9	9.3	9.3	100.0
	Total	97	100.0	100.0	

These results yield us to **reject the second null hypothesis** with an alternative hypothesis that proposes: there is a difference between the mean of users' overall satisfaction level of high IT-experienced users opposed to those who have low IT experience level. The results of Table 6-7, also yield us to **reject the third null hypothesis** with an alternative hypothesis that proposes: the mean of users' perceived service quality performed by the helpdesk is different and not equal across users' groups of different IT experience level.

Employees working in more than 12 buildings responded to the questionnaire, the Faculty of Engineering won the biggest share of responses; 17.5 percent of responses belong to employees from the Faculty of Engineering, the main

library comes next with 15.5 percent response rate; the Faculty of Arts is the third in the rank with 3.4 percent of response rate. Figure 5-4 is a graphical demonstration of the percentage of response rate according to the place of work of the respondents of the study.

Figure 5-4: Response Rate across Main Buildings at Birzeit University
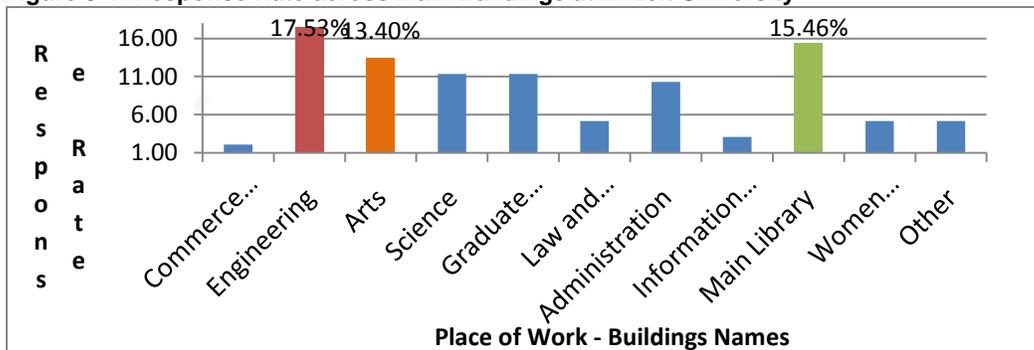
Majority of responses, which is 52 out of 97 cases, assured their need for training in topics related to general technical support skills, hardware troubleshooting and in other IT related topics. Some personnel working in the Faculty of Graduate Studies, Faculty of Law and Public Administration, Administration Building, and the Main Library assured their need for training.

Grouping categories of users' IT experience level

To classify users into three different IT experience levels, section three of the questionnaire addresses questions related to different users' behaviors related to IT experience and attitude; each choice of available answers is given a score according to its logical connection in a relationship with perceived service quality and users' satisfaction, questions are previously explained in the methodology chapter. There are seven scoring aspects according to which, users are categorized into three groups pertaining their IT experience level. The relationship between users' perceived service quality and their satisfaction level is examined for each scoring aspect in order to further explain users' behavior in relation to their overall IT experience level and to validate the scoring mechanism.

Table 5-9: Statistical Results of Users' Need for IT Training

	IT Training	N	Mean	Std. Deviation	Std. Error Mean
Users' Perceived Service Quality	NO	45	3.6152	1.17985	.17588
	YES	52	3.9767	1.10209	.15283
Overall Satisfaction Level	NO	45	3.31	1.443	.215
	YES	52	4.19	1.442	.200

The first scoring aspect is the users' need for training, to investigate the relationship between users' need for training and their mean satisfaction and perceived service quality performed by the helpdesk, the analysis indicated in Table 5-9 that: **the mean satisfaction of users who denied a need for training is lower than those who believed they are in need for training**; the mean satisfaction of users who denied a need for training is found to be 3.62 which is lower than 3.98 for users who commend a need for training.

Table 5-10: Statistical Results of the Number of Support Service Requests

Number of Tech. Requests	Frequency	Percent	Users' Perceived Service Quality	Overall Users' Satisfaction
1-3 requests	73	75.3	3.91	4.07
4-9 requests	18	18.6	3.51	2.89
10 and more requests	6	6.2	3.40	3.0
Total	97	100.0		

The same trend applies for overall satisfaction level in relationship with the need for training, the mean of overall satisfaction of users who denied their need for training is lower than those who though they need IT training.

The second scoring aspect is the number of monthly requests for technical support. 75% of respondents needed technical support services from 1 to 3 times a month, as shown in Table 5-10, the percentage declines swiftly to 18.6% with increase in number of requests. To examine if this aspect cause a variance in users' satisfaction level and perceived service quality, the results of the analysis shows a variance in the mean of users' satisfaction in relation to the number of technical support request, **users who need technical support services the less, experience**

more satisfaction than those who request technical support services more often.
There isn't much variation between the mean of users' perceived service quality but
the same trend applies, a decrease in users' perceived service quality with increase of
experienced technical support requests.

Table 5-11: Statistical Results of Average Number of Hours of Using Computers Daily

	Frequency	Percent	Users' Perceived Service Quality	Overall Users' Satisfaction
Less than 1 Hr.	5	5.2	4.34	4.60
2-5 Hrs.	40	41.2	3.75	4.05
6 and more	52	53.6	3.80	3.50
Total	97	100.0		

The third scoring aspect is the average number of hours of using computers
daily, only five respondents of the sample use the computer for less than one hour a
day, while 53.6% of respondents use computers for 6 hours and more a day, and the
remaining 40% of respondents use computers from 2-5 hours a day. There is slight
differences in the variance of the mean of satisfaction level in relation to the different
number of hours of using computers daily, it is found that **users who use computers
for longer period, experience lower satisfaction level.** Table 5-11 shows the results
of the analysis that is hardly described according to a specific trend.

Table 5-12: Statistical Results of Average Time Tolerated in Waiting for Resolution

	Frequency	Percent	Users' Perceived Service Quality	Overall Users' Satisfaction
Shorter tolerated time	20	20.6	3.82	1.55
Longer tolerated time	77	79.4	3.80	1.49
Total	97	100.0		

The fourth scoring aspect is the average time tolerated in waiting for
resolution; only 20% of respondents don't tolerate long waiting time for resolution
and they demand resolution within two hours. The remaining 79.4% of the sample
tolerate longer time of waiting for resolution. Table 5-12 represents the percentages
of respondents according to the time they tolerate in waiting for resolution. To
investigate users' mean satisfaction and their perceived service quality in

relationship with tolerated waiting time, an SPSS analysis is run and the output is represented in Table 5-12. The analysis shows that **there is almost no difference in the mean of users' perceived service quality across the two categories, the same applies for the mean of satisfaction level of users, still, we can say that users who tolerate shorter waiting times experience more satisfaction than those who tolerate longer waiting time.**

Table 5-13: Users' opinion toward Self-learning by Searching a Technical Support Knowledgebase

Position toward knowledge base		Frequency	Percent	Users' Perceived Service Quality	Overall Users' Satisfaction
Valid	NO	7	7.2	3.02	2.57
	YES	87	89.7	3.85	3.83
	Total	94	96.9		
Missing	System	3	3.1		
Total		97	100.0		

The fifth scoring aspect is the user position toward using a knowledge base to seek resolutions for technology related problems. Three respondents didn't answer this question; the majority of the sample, as shown in Table 5-13, supports this suggestion. Only 7.2% of the sample doesn't agree to solve their problems through self-learning by using a technical support knowledgebase. Since the number of negative responses is very small in comparison to the number of the opposed category, investigating the mean of users' satisfaction and perceived service quality won't be of much importance due to the very small neglected variances between the mean of the two constructs across the two groups.

The sixth scoring aspect is the users evaluation of their overall IT experience, the majority of respondents evaluated their IT experience level to range between medium and high, 49.5% of respondents evaluated their IT experience as medium and 38% evaluated it as high. Table 5-13 shows the percentages of users according to their evaluation of IT experience level.

Table 5-14: Statistical Results of Users' Evaluation of Their IT Experience Level

User evaluation of IT experience		Frequency	Percent	Users' Perceived Service Quality	Mean of Users' Satisfaction
Valid	Basic	2	2.1	2.8	3.0
	Medium	48	49.5	3.90	4.06
	High	37	38.1	3.76	3.65
	Expert	10	10.3	3.71	3.10
	Total	97	100.0		

To examine the relationship between the mean of users' satisfaction and their evaluation of their IT experience level, it is found that the medium and high categories, which represent the majority of the sample, have no significant difference in the mean of users' perceived service quality, opposing to the basic and expert levels at the far ends of the scale. Table 5-14 demonstrates the mean of users' satisfaction and their perceived service quality across the different categories of IT experience. The mean of users' satisfaction of Basic general IT experience level are neglected due to the small number of responses in this category. However, it is interesting to notice that **users who self-evaluated their IT experience level in the experts' zone expressed the least satisfaction** level than other groups.

Table 5-15: Statistical Results of the Years of Work Experience at Birzeit University

Work Experience	Frequency	Percent	Users' Perceived Service Quality	Mean of Users' Satisfaction
1-2 years	21	21.6	3.29	3.05
3-9 years	26	26.8	3.74	3.77
10-15 years	17	17.5	3.95	3.76
16 years and more	33	34.0	4.10	4.27
Total	97	100.0		

The last scoring aspect has to do with the number of years of work experience at Birzeit University. Table 5-15 shows that the level of **users' satisfaction increases with longer work experience at Birzeit University.** The same trend applies for users' perceived service quality.

The results of the SPSS analysis of the seven aspects of scoring users' IT experience show that all means of the two constructs (Users' perceived service quality and users' satisfaction) across the seven aspects of scoring are below the 4th

point of the 7-point Likert scale, which means a low overall users' satisfaction and perceived service quality across the scoring measures.

Section three of the questionnaire also includes other questions not involved in scoring users' IT experience. The survey shows that 75% of employees at Birzeit University seek for other sources of help for technical support related issues. Some faculties at Birzeit University, hires a designated technical support agent to provide support services to employees in offices and students in computer labs, this phenomena is due to the overall users' disappointment of technical support services during the helpdesk recession. Table 5-16 shows that 51 of respondents ask their colleagues for technical support help; while only 16 seek help from the designated technical support agent in their building or department. This result triggers the issue of the tangible benefits of hiring designated technical support agents who don't belong to the helpdesk.

Table 5-16: Users' Alternative Sources for Technical Support Service

Seek Tech. Supp. Service from Other Source	Frequency	Percent
NO	21	21.6
YES	74	76.3
Designated agent	16	21.6
Colleagues	51	68.9
Students	4	5.4
Other	3	4.1
Missing	2	2.1
Total	79	100

The analysis of the remaining three questions of section 3 is shown in table 5-17 below. The remaining questions investigate the following: users' support for establishing a technology training center, users' awareness of IT policy at BZU, and if users expect a change in the technical support service upon knowing the results of the questionnaire.

Table 5-17: Users' Support for Creating a Technology Training Center, Users Awareness of IT Policy, and Users' Anticipation toward a Change

	Training Center		IT Policy		Change in Tech. Service	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
NO	6	6.2	69	71.1	9	9.3
YES	91	93.8	28	28.9	87	89.7

93.8% of respondents support the establishment of a technology training center, and 89.7% of the sample expects a change in the Helpdesk performance upon the results of this research study, while only 28.9 % of the sample is aware of the IT policy at Birzeit University.

SERVPREF Instrument analysis

The heart of the questionnaire is Section Two, where helpdesk performance is examined by perceived user satisfaction of the service quality measures underlined in the items of the SERVPREF instrument. Section Two consists of 29 questions, 2 of which are not a SERVPREF instrument items, one of the two questions asks about the user's overall satisfaction level toward BZU helpdesk performance, while the other asks if overtime technical support shifts are necessary for them. 19 items of the SERVPREF instrument are asked in Section Two of the questionnaire while 3 more items are asked in Section One; they are questions N.O. 2, 3 and 6. The SERVPREF instrument of this study consists of 22 Performance only items distributed through five measurement constructs which are: tangibles, reliability, responsiveness, assurance and empathy.

The statistical method used for the SERVPREF instrument is Factor Analysis by SPSS software. Factor analysis is a method of data reduction which is used to ensure that the questions asked in the questionnaire relate to the intended construct. It seeks the underlying unobservable (latent) variables that are reflected in the observed variables (manifest variables).

There are many different types of rotations that can be done after the initial extraction of factors, including orthogonal and oblique rotations, orthogonal rotation such as Varimax and equimax and oblique rotations, such as promax which allow the factors to be correlated with one another. As a rule of thumb, a bare minimum of 10 observations per variable are necessary to avoid computational difficulties. Therefore, for the SERVPREF instrument of this study, which has 5 constructs, the minimum number of cases should be 50. The assumptions of the nature of the SERVPREF items are: (the variables are a linear combination of some underlying of hypothetical or unobservable factors, some of the factors are assumed to be common to two or more variables and some are assumed to be unique to each variable, the factors or unobserved variables are assumed to be independent of one another, all variables in a factor analysis must consist of at least an ordinal scale).

Table 5-18: Descriptive Analysis of Listwise Items of the SERVPREF Instrument

SERVPREF Items	Mean	Std. Deviation	Analysis N
Tech Service Response Time	3.29	1.477	77
Admin Service Resp. Time	3.66	1.635	77
Resolution on the first visit	3.99	1.721	77
Provide Explanations	3.68	1.428	77
Problem History Recognition	3.68	1.534	77
Long Term Resolution	3.45	1.509	77
Answers to Queries	3.86	1.484	77
Follow-ups	3.08	1.628	77
Assurance of Service Completion	2.57	1.585	77
Time Respect	2.74	1.617	77
Coordination among Staff	3.03	1.564	77
Priority Setting	3.45	1.690	77
Trust in Staff Experience	4.29	1.685	77
Clear Communication Language	4.12	1.573	77
Initiative attitude	3.70	1.663	77
Courtesy and politeness	4.73	1.675	77
Privacy	5.10	1.667	77
Data Security	4.91	1.726	77
Suggestions	4.14	1.753	77
Tel- inquiry	4.23	1.784	77
Tel- Trust in Experience	4.47	1.721	77
Tel- Troubleshooting	4.09	1.687	77

Table 5-18 above is the output of a univariate option of the descriptive analysis of the factor analysis. A univariate option is the only way to see how many cases were actually used in the factor analysis. The number of cases used in the analysis of Table 6-18 is 77 which is less than 97 the number of cases in the data file, this is because there are missing values in some of the items used in the factor analysis, by default, SPSS does a listwise deletion of incomplete or missing cases. The cases of the study, by the rule of thumb explained above, are adequate for conducting a factor analysis because the number of cases of this study exceeds the minimum number of required cases.

Table 5-19: Descriptive Analysis of Pairwise Items of the SERVPREF Instrument

SERVPREF Items	Mean	Std. Deviation	Analysis N	Missing N
Tech Service Response Time	3.29	1.500	97	0
Admin Service Resp. Time	3.68	1.632	91	6
Resolution on the first visit	3.99	1.683	96	1
Provide Explanations	3.68	1.447	96	1
Problem History Recognition	3.58	1.585	91	6
Long Term Resolution	3.40	1.490	96	1
Answers to Queries	3.85	1.467	97	0
Follow-ups	3.02	1.601	97	0
Assurance of Service Completion	2.54	1.548	97	0
Time Respect	2.75	1.561	97	0
Coordination among Staff	3.11	1.538	91	6
Priority Setting	3.51	1.689	91	6
Trust in Staff Experience	4.24	1.694	97	0
Clear Communication Language	4.07	1.563	97	0
Initiative attitude	3.64	1.678	97	0
Courtesy and politeness	4.81	1.637	96	1
Privacy	5.15	1.603	97	0
Data Security	4.94	1.667	93	4
Suggestions	4.05	1.715	91	6
Tel- inquiry	4.19	1.734	95	2
Tel- Trust in Experience	4.33	1.691	95	2
Tel- Troubleshooting	3.97	1.656	94	3

In order to include the results of all cases, even those that suffer from some missing values, the SPSS listwise default is changed to pairwise deletion of missing values. Listwise and pairwise are methods to exclude missing values, in listwise,

cases having missing values for any variable are excluded from all computations. While pairwise deletion uses as much of data as possible for computation of the zero-order correlations on which the partial correlation are based, a case having missing values for both or one of a pair of variables is not used. The analysis of this study counts on the total number of responses which is 97, the descriptive analysis of the 97 cases of the 22 items is shown on table 5-19, the table shows the mean of the 22 items of the SERVPREF instrument, the items that suffer a very low satisfaction level are: assurance of service completion, helpdesk's respect to its service appointments, while the item that scores high on perceived service quality is related to privacy.

Table 5-20 below, allows us to look at some of the basic assumptions, the Kaiser-Mayer-Olkin KMO measure of sampling adequacy and Bartlett's Test of Sphericity. The KMO measure generally indicates whether or not the variables are able to be grouped into a smaller set of underlying factors. The KMO measure usually varies between 0 and 1, and values closer to 1 are better, a value of .6 is a suggested minimum. Table 5-20 below, shows the KMO measure to be .855, which means that factor analysis may be useful with the data; it supports the use of factor analysis and suggests that the data may be grouped into a smaller set of underlying factors.

Bartlett's Test of Sphericity compares the correlation matrix to an identity matrix. Bartlett's measure tests the null hypothesis that the original correlation matrix is an identity matrix. For factor analysis to work we need some relationships between variables and if the R matrix is an identity matrix then all correlation coefficients would be zero.   An identity matrix is a correlation matrix with 1.0 on the principal diagonal and zeros in all other correlations is what we need to prove. We want Bartlett's test to have a significant value less than 0.05. Barttlett's Test measure is significant and read to be .000, which means that the R matrix is not an

identity matrix and an expecting relationship between the five measures of the SERVPREF instrument is going to be appropriate.

Table 5-20: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.855
Bartlett's Test of Sphericity	Approx. Chi-Square	1625.4863
	Df	231
	Sig.	.000

There are several ways to conduct factor analysis. Principal components extraction analysis is used in this study to determine the inter-item correlation coefficient matrix which is used to explore the inter-relationships between the items to determine if the items can be grouped together to represent a smaller set of underlying factors. SPSS provides two choices for analysis, either selecting factors with eigenvalues greater than a user-specified value or retaining a fixed number of factors. The Eigen One Rule or Kaiser-Guttman rule instructs us to keep only those factors whose eigenvalues are greater than 1.0 and discard the rest.

The logic of this rule is that by selecting 1.0 as the criteria for retaining the factor, is that the variance accounted for by the factor must be at least as large as the variance of a single standardized variable, which have a mean of 0 and a standard deviation of 1.0. However, many statisticians criticize the Eigen one rule as still being somewhat arbitrary and based solely on the data, these statistician feel that theory in addition to logic should be considered in this process, so as a result they suggest that the Eigen one rule be used solely as a guideline, therefore, changing the eigenvalue to be greater than a figure close to 1.0 is appropriate.

In this study, the eigenvalue is set to be greater than .8 and a rotation of the results is used. The interpretability of factors can be improved through rotation. Rotation maximizing the loading of each variable on one of the extracted factors while minimizing the loading on all other factors. Rotation works through changing the absolute values of the variables while keeping their differential values constant.

Because we assumed the factors to be independent, the Varimax rotation method, which is one of the orthogonal rotation methods, is chosen to conduct the analysis.

Table 5-21: The Eigenvalues of the Components of the SERVPREF Instrument

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.342	51.556	51.556	11.342	51.556	51.556	5.593	25.424	25.424
2	2.169	9.861	61.416	2.169	9.861	61.416	3.592	16.328	41.752
3	1.497	6.805	68.221	1.497	6.805	68.221	3.402	15.462	57.214
4	.978	4.445	72.666	.978	4.445	72.666	2.602	11.829	69.044
5	.886	4.026	76.692	.886	4.026	76.692	1.683	7.649	76.692
6	.798	3.629	80.322						
7	.594	2.700	83.022						
8	.560	2.544	85.566						
9	.520	2.364	87.930						
10	.432	1.962	89.892						
11	.346	1.575	91.467						
12	.282	1.284	92.751						
13	.280	1.274	94.025						
14	.250	1.134	95.159						
15	.238	1.084	96.243						
16	.190	.862	97.105						
17	.166	.753	97.858						
18	.138	.626	98.484						
19	.117	.532	99.016						
20	.102	.465	99.480						
21	.072	.326	99.806						
22	.043	.194	100.000						

Extraction Method: Principal Component Analysis.

Appendix-C-A shows the R matrix of the items of the questionnaire. The significance values are scanned and no values greater than .05 are found. The correlation coefficients are also scanned and no values greater than .9 are found. Therefore, the data of this study is free of singularity problem and there is no need to consider eliminating any questions at this stage.

Table 5-21 shows the output of the eigenvalues associated with each other, eigenvalues represent the amount of variance in the data that is explained by the factor with which it is associated. In SPSS the factors are extracted in order by the

amount of variance that they explain. Therefore, the first factor will have the highest eigenvalue, the second the next highest, etc., the first few factors generally explain the majority of the variance while the last few factors explain only very small proportion of the variance.

Before extraction, SPSS has identified 22 linear components within the data set. The eigenvalues associated with each factor represent the variance explained by that particular linear component and SPSS also displays the eigenvalue in terms of the percentage of variance explained, so, factor 1 explains 51.55% of the total variance. It should be clear that the first few factors explain relatively large amounts of variance especially factor 1, whereas subsequent factors explain only small amounts of variance. SPSS then extracts all factors with eigenvalues greater than .8, which leaves us with five factors.

The eigenvalues associated with these factors are again displayed and the percentage of variance explained in the columns labeled Extraction Sums of Squared Loadings. The values in this part of the table are the same as the values before extraction, except that the values for the discarded factors are ignored, hence, the table is blank after the fifth factor. In the final part of the table labeled Rotation Sums of Squared Loadings, the eigenvalues of the factors after rotation are displayed. Rotation has the effect of optimizing the factor structure and one consequence for these data is that the relative importance of the five factors is equalized. Before rotation, factor 1 accounted for 51.55% which is considerably more variance than the following four (compared to 9.86%, 6.80%, 4.45%, .88%), however, after extraction, it counts for only 25.42 % of the variance compared to 16.32%, 15.46%, 11.82%, 7.64%, respectively. The summation of the rotated variances is 76.66 (25.42+16.32+15.46+11.82+7.64) and the weight of the variance of each of the 5 constructs that explain the overall performance of the helpdesk in this study is: 33.15%, 21.28%, 20.16%, 15.41%, and 9.96% respectively.

A scree plot can also be used to visually determine the number of useful factors to be extracted, a scree plot is a line graph with eigenvalues plotted on the Y (vertical) axis, and the factors are plotted on the horizontal or X-axis. A scree plot should form the intersection of two lines; one line should be an initial sleep line of useful factors and the second line should be a gradual trailing line of factors that should be eliminated. The plot is called a 'Scree' Plot because it often looks like a scree slope.

To interpret the scree plot demonstrated on Figure 5-5 below, we want to find out the point where the two lines intersect, all factors that fall on the initial steep line are taken into consideration and the factors that are found in the gradual trailing line of the scree are discarded. The problem with this data is that the intersection between the two lines is not clear. The intersection could occur anywhere between factors 5 and 8.

Figure 5-5: Scree Plot of Factor Analysis of the SERVPREF Instrument
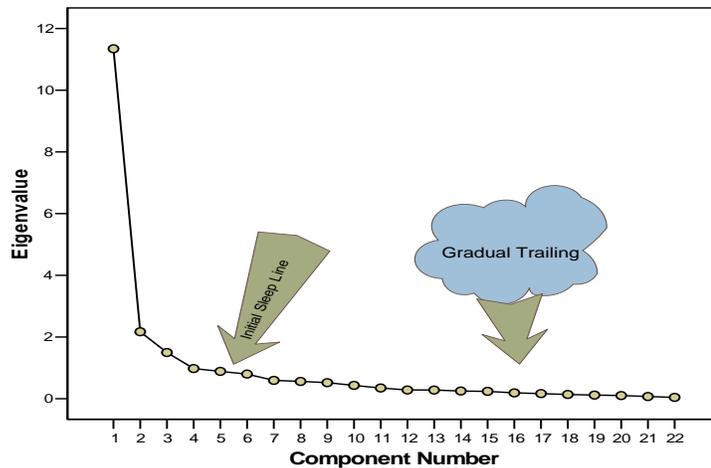
According to my interpretation the scree plot above supports the five factors extracted with eigenvalues greater than 0.8.

Table 5-22, shows the communalities before and after extraction. Principal component analysis is based on the initial assumption that all variance is common; therefore, before extraction the communalities are all 1. The communalities in the

column labeled extraction reflect the common variance in the data structure. So, for example, we can say that 70.4% of the variance associated with question 1 is common, or shared variance. Another way to look at these communalities is in terms of the proportion of variance explained by the underlying factors. After extraction, some of the factors are discarded and so some information is lost. The amount of variance in each variable that can be explained by the retained factors is represented by the communalities after extraction. The average of communalities is .766.

Table 5-22: Communalities

Items	Initial	Extraction
Tech Service Response Time	1.000	.704
Admin Service Resp. Time	1.000	.465
Resolution in the first visit	1.000	.780
Provide Explanations	1.000	.818
Problem History Recognition	1.000	.805
Long Term Resolution	1.000	.769
Answers to Queries	1.000	.673
Follow-ups	1.000	.750
Assurance of Service Completion	1.000	.740
Time Respect	1.000	.747
Coordination among Staff	1.000	.783
Priority Setting	1.000	.755
Trust in Staff Experience	1.000	.718
Clear Communication Language	1.000	.739
Initiative	1.000	.784
Courtesy	1.000	.755
Privacy	1.000	.862
Data Security	1.000	.900
Suggestions	1.000	.867
Tel- inquiry	1.000	.820
Tel- Trust in Experience	1.000	.847
Tel- Troubleshooting	1.000	.792

Extraction Method: Principal Component Analysis.

Table 5-23 shows the component matrix before rotation. This matrix contains the loadings of each variable into each factor. By default SPSS displays all loadings; however; I requested that all loadings less than .4 be suppressed in the output and so there are blank spaces for many of the loadings. This matrix is not particularly important for interpretation.

At this stage SPSS has extracted five factors by setting the eigenvalue to be greater than .8, Table 5-23, shows the rotated component matrix,. This method of extraction is accurate only when: (1) there are less than 30 variables and (2) communalities after extraction are greater than .7, OR (1) when the sample size exceeds 250 and (2) the average communality is greater than .6.

In this case study, the average communality is found to be .766, which is greater than .7, and the number of items of the instrument is 22 which is less than 30. Thus, we can conclude that the extraction methodology is accurate.

Table 5-23: Rotated Component Matrix

Items	Component				
	1	2	3	4	5
Time Respect	.820				
Follow-ups	.786				
Coordination among Staff	.784				
Assurance of Service Completion	.718				.417
Priority Setting	.704		.437		
Initiative	.686	.432			
Tech Service Response Time	.586	.455			
Answers to Queries	.575			.472	
Admin Service Resp. Time	.481				
Tel- Trust in Exper.		.841			
Tel- inquiry		.840			
Tel- Troubleshooting		.807			
Privacy			.832		
Courtesy			.789		
Trust in Staff Experience	.435		.567		
Clear Communication Language	.535		.544		
Provide Explanations				.769	
Resolution in the first visit			.400	.629	
Problem History Recognition		.460		.627	
Long Term Resolution	.563			.599	
Suggestions			.401		.769
Data Security			.648		.654

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 13 iterations.

There are several things to consider about the format of the matrix above. First, factor loadings less than .4 have not been displayed because I asked for these

loadings to be suppressed. Second, the variables are listed in order of their factor loadings because I asked for the output to be sorted by size.

Table 5-24: Factor Analysis Calculations

Proposed construct	Factor Analysis Construct	Items	Fact. 1	Fact. 2	Fact. 3	Fact. 4	Fact. 5	Mean
Q18. Reliability	Reliability	Time Respect	0.82					2.75
Q.16.Assurance	Reliability	Follow-ups	0.786					3.02
Q.19.reliability	Reliability	Coordination among Staff	0.784					3.11
Q.20.reliability	Reliability	Priority Setting	0.704		0.437			3.51
Q.23.Empathy	Reliability	Initiative attitude	0.686	0.432				3.64
Q.9.Reliability	Reliability	Tech Service Response Time	0.586	0.455				3.29
Q.10.Reliability	Reliability	Admin Service Resp. Time	0.481					3.68
Component 1								**3.29**
Q.12. Responsive	Responsive	Provide Explanations				0.769		3.68
Q.11. Responsive	Responsive	Resolution on the first incident			0.4	0.629		3.99
Q.13. Responsive	Responsive	Problem History Recognition		0.46		0.627		3.58
Q.14. Responsive	Responsive	Long Term Resolution	0.563			0.599		3.4
Q.15.Responsive	Responsive	Answers to Queries	0.575			0.472		3.85
Component 4								**3.7**
Q.3. tangibles	Tangibles	Tel- Trust in Experience		0.841				3.4
Q.2. tangibles	Tangibles	Tel- inquiry		0.84				3.7
Q.6.tangibles	Tangibles	Tel- Troubleshooting		0.807				4.33
Component 2								**3.81**
Q.17.Assurance	Assurance	Assurance of Service Completion	0.718				0.417	2.58
Q.27.Empathy	Assurance	Suggestions			0.401		0.769	4.05
Q.26. assurance	Assurance	Data Security			0.648		0.654	4.94
Component 5								**3.86**
Q.24.Empathy	Empathy	Courtesy and politeness			0.789			4.81
Q.22.Empathy	Empathy	Clear Communication Language	0.535		0.544			4.07
Q.21.Assurance	Empathy	Trust in Staff Experience	0.435		0.567			4.24
Q.25.Assurance	Empathy	Privacy			0.832			5.15
Component 3								**4.57**
								3.81

12 loadings of the matrix are double loading, while this complexity is not a problem statistically, it does add to the logical complexity of the factors' structure. Table 5-24 shows the items grouped according to SPSS loadings in comparison to factors previously proposed in early stage of creating the questionnaire. Every group of items measures a construct of the SERVPREF instrument; it also shows the mean of perceived service quality of users for every item of the instrument. According to the Thurstone's rules, in factor matrix analysis, items that relate strongly to the proposed factor is selected (factor loadings of .4 and above), then items that are double loaded are dropped and those that are unique or do not load on any factor are deleted as well, items that load high on a factor that was not the proposed factor are also deleted.

Some researchers, on the other hand, will maintain items with double factor loadings as long as the items would logically belong to both factors. In this case study, two variables suffer from double loading which are: (using clear language communication, and providing answers to users' queries), When groping the items into constructs, items that have higher factor loadings are grouped together and considered as being more representative of the factor than items with lower factor loadings.

Table 5-25: Calculated Mean of Perceived Service Quality after Variance Consideration

Comp.	Construct	Mean	Percentage Of Mean	Variance after Rotation	Overall Percentage Of Variance	Mean by Variance
Comp. 1	Reliability	3.29	47%	25.42%	33.15%	15.58
Comp. 2	Tangibles	3.81	54.4%	16.32%	21.28%	11.57
Comp. 3	Empathy	4.57	65.2%	15.46%	20.16%	13.14
Comp. 4	Responsiveness	3.7	52.8%	11.82%	15.41%	8.13
Comp. 5	Assurance	3.86	55.14%	7.64%	9.96%	5.49
		3.84	**54.9%**	**Sum ~ (76.66%)**	**Sum ~ (100%)**	**53.91%**

Factor scores are like predicted scores for each factor. All items are included in the grouping technique even those with double loading, even those items that have higher loading on another construct because of a strong assumption of a logical connection between the item and the construct. Regression factor scores are calculated as: the case's standardized score (mean value of users' perceived service quality) on each variable represented by a percentage of on the 7-point Likert scale, multiplied by the corresponding factor loading of variance (the eigenvalues after rotation in Table 5-21), and sums these products.

Table 5-25 is summary of the factor analysis hard work; the first and second columns represent the SERVPREF constructs, the third column is the mean of underlying aspects that measure the construct, the fourth column is the same as third column but expressed in terms of percentages, the fifth column represents the overall variances that explains the variance of the helpdesk performance and its impact on users perceived service quality, please be aware that the variances taken from the original eigenvalue are optimized by rotation to explain 100% of the variance of the helpdesk performance. The computations show that BZU users' perception of helpdesk service quality and overall performance is around 54%, this figure must be compared to a benchmark set by the helpdesk management to better evaluate the anticipated performance of BZU helpdesk.

It is interesting to notice that, before using the factor analysis technique, the difference of the mean of users' perceived service quality before and after applying the eigenvalue variance effect can be neglected, meaning that the interpretation of results won't differ much before or after data reduction which also validates the results of the analysis.

It is also interesting to notice that after the factor analysis, the number of items for each construct is as follows: reliability 7, responsiveness 5, assurance 3, empathy 4, and tangibles 3. The number of items for the tangibles construct is fair,

since tangibles has to do with physical facilities and equipment and by looking at the characteristics of the academic environment, we find out that with the very tied budget and almost standard equipment, we can conclude that 3 items are fair enough to measure this construct. Empathy has 4 measuring items, which is also considered fair enough, according to the SERVQUAL original structured instrument, 5 items are dedicated for measuring this construct, however, this structure is flexible

The mean of users' overall satisfaction level of BZU users is 3.78 on a 7-point Likert Scale, which is equivalent to 54%, the percentage of BZU users' overall satisfaction is equivalent to that validated by factor analysis. The analysis of this study emphasizes on the existence of a strong relationship between users' overall satisfaction level and their perceived service quality.

To examine the relationship between uses' perceived service quality and their satisfaction level of the SERVPREF instrument, a correlation matrix is generated using SPSS software, Table 5-26, shows that, there is a strong relationship between users' perceived service quality and users satisfaction level, users perceived service quality explains 83.3% of the variance in users' satisfaction level and the significance of the relationship is very high.

Table 5-26: Correlation Matrix of Users' Perceived Service Quality and Overall Satisfaction Level

Variables	Tests	Perceived Service Quality	Overall Satisfaction Level
Perceived Service Quality	Pearson Correlation	1	.833(**)
	Sig. (2-tailed)	.	.000
Overall Satisfaction Level	Pearson Correlation	.833(**)	1
	Sig. (2-tailed)	.000	.

** Correlation is significant at the 0.01 level (2-tailed).
a Listwise N=97

The analysis of Table 5-27 also shows that a positive relationship between the overall users' satisfaction which is the dependent variable and users' perceived

service quality which is the independent variable; meaning that an increase of the independent variable (users' perceived service quality) is accompanied with an increase in the variance of the dependent variable (users' satisfaction) and thus explains this variance. Therefore, the first null hypothesis is rejected. The first null hypothesis is rejected before the results of factor analysis and after factor analysis.

Table 5-27: Coefficients of Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.367	.296		-1.241	.218
	Users' Perceived Service quality	1.090	.074	.833	14.649	.000

a Dependent Variable: General Satisfaction Level

5.2.   BZU Helpdesk staff job Satisfaction questionnaire

Five employees are currently working at BZU helpdesk, one of them, is the helpdesk supervisor, who has been working in the computer center for more than 20 years in different job positions. He started working as a helpdesk supervisor since April 2009. Three out of the four technical support agents as well as the helpdesk supervisor participated in the helpdesk staff job satisfaction questionnaire that is based on the shortened version of the JDI instrument.

The data was analyzed using Microsoft Excel; the results are shown in Table 5- 28. The questionnaire measures overall job satisfaction of the following five factors: general working conditions with 4 items, pay and promotion potential with 5 items, work relationships with 3 items, development opportunities with 3 items, and work activities with 3 items. In a 5-point Likert scale, the results of the analysis show an average of 2.94 (equivalent to 58.8%) of job satisfaction among BZU helpdesk staff. This overall result points to a weak satisfaction level among the staff, which is by the literature review, influence the service quality in the service delivery process and thus results on a bad influence on the helpdesk performance.

Unfortunately, as shown in Figure 5-6, almost all measures fall below the midpoint of the scale except the work relationship among staff and with the director and supervisor, this measure scored a mean of 4.13 which is the highest across all measures. Pay and promotion potential scored a mean of 2.40 which is the lowest among all.

Figure 5-6: BZU Helpdesk Staff Job Satisfaction Measures
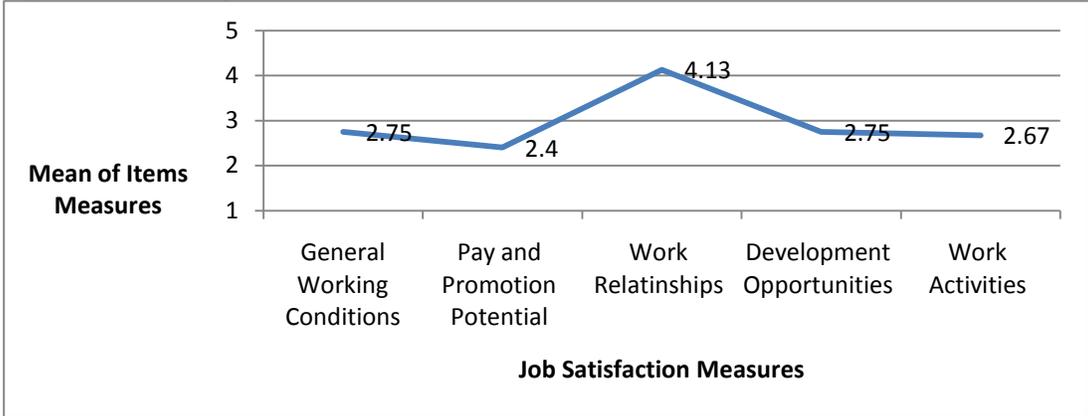
The job satisfaction questionnaire was accompanied with a short interview with couple of staff members who were willing to participate. The helpdesk supervisor expressed his depressed feelings when he and other technical support agents exert every effort to provide the best quality of service to users but some users remain unsatisfied or in some cases express extreme negative attitudes when they face the same problem or different one after a while of providing the last technical support service, he indicated that, poor users' IT experience is one of the most important factors that cause users' dissatisfaction and thus influence their emotion when requesting service from the helpdesk. He adds that, users poor IT experience is the core reason why FCR rate is very low at the helpdesk, the week IT experience contributes in giving inaccurate and unclear initial user's explanation about the nature of the problem, in addition to vague answers to the queries of level 1 support, this also contributes in weak interpretation of calls when escalating them among the helpdesk staff.

The technical support agents didn't add much to the feedback of the helpdesk supervisor, they assured his statement in a different way, they suggest that a training program on general IT related issues be created to enhance users' IT knowledge. They also added; users are not fully aware of the role of technical support agents, many routine tasks that can be performed by the users within minutes are transferred to the helpdesk, this behavior adds to the overall load of the agents and extends users' expectations.

The helpdesk staff were asked five questions in an interview administered before administering the questionnaire, the first question was: do you understand what is expected from you in your job? All answers of this question are positive, the helpdesk staff don't face a difficulty in identifying their duties, but they all agree on that users are not fully aware of their duties and responsibilities; this comment is not surprising due to the absence of SLA of BZU helpdesk.

The second question is: do you have the necessary resources to successfully complete your job? The helpdesk staff agree that, they are facing difficulties in providing quick service in cases where they have to wait for supportive units such as the engineering office or the general services department to accomplish a specific segment of service necessary to start providing technical support services. They indicated that low performance level of supportive units has a negative impact on the quality of technical support service provided to end users. They also mentioned the problem of lack of the means of transportation across campus, BZU campus has lately been undergoing a wide expansion and the helpdesk staff still make on-feet trips between buildings which negatively affects users' waiting time for resolution.

The third question of the interview was: do you think that BZU users are satisfied with the overall helpdesk performance? Why? Some respondents answered 'Yes' while others preferred to phrase their answer by expecting higher level of users' satisfaction in comparison to past years. They feel that users are satisfied with

the current helpdesk performance because they no longer receive as many complaints as they had before.

Helpdesk staff think that users play a vital role in the success level of the helpdesk performance. When they were asked: do you think BZU users contribute to the success or failure of the helpdesk? They explained that users' IT knowledge and experience has a direct impact on their response to the helpdesk, users who have adequate IT knowledge better response to the queries of the helpdesk and they experience less frustrating emotions when they face a technical support problem.

The last question of the interview was: are you facing any problems in the work environment? They persisted on the problem of lack of users' IT experience and knowledge, the lack of appropriate mean of transportation in campus, and the low performance of supportive units that affect the quality of technical support service provided to end users. They also mentioned the lack of development opportunities and their need for training on the best customer service practices and technical support troubleshooting and certifications in the domain of their expertise.

In conclusion, we can say that BZU helpdesk staff members are not experiencing a high level of job satisfaction, one of level-2 support agents insisted on the importance of continuous training for technical support members which is not offered in the mean while. The results of users' satisfaction questionnaire didn't indicate a high level of users' satisfaction, the same applies for the results of the helpdesk staff job satisfaction questionnaire along with the analysis of the staff.

By examining the results of the users' satisfaction and perceived service quality with the results of the helpdesk staff job satisfaction, we can say that helpdesk staff job satisfaction influence the helpdesk performance and thus affect users' satisfaction and their perceived service quality. As found in previous section of this chapter, users' satisfaction level was found to be 54%, and in this section, helpdesk staff job satisfaction is measured to be 58.8% which is very close to the

value of users' satisfaction measured in previous chapter, these results indicate a strong reflection of helpdesk staff job satisfaction on their overall performance. Therefore, the fifth null hypothesis is rejected and its alternative hypothesis, which proposes that helpdesk staff job satisfaction is an indication of helpdesk's performance, is accepted. In this study, low helpdesk staff job satisfaction indicated a low level of helpdesk's performance.

Table 5-28: Data of Helpdesk Staff Job Satisfaction Questionnaire

Position	Supervisor	Agent 1	Agent 2	Agent 3	Mean
GWK-Hours worked each week	5	2	3	3	3.25
GWK- Flexibility in scheduling	3	3	3	1	2.50
GWK-Location of work	3	3	4	3	3.25
GWK-Amount of paid vacation	3	1	2	2	2.00
					2.75
PYP-Salary	3	3	3	2	2.75
PYP-Promotion opportunities	3	1	2	1	1.75
PYP-Benefits	3	1	2	2	2.00
PYP-Job security	3	3	3	2	2.75
PYP-recognition	3	3	3	2	2.75
					2.40
WR-with coworkers	3	5	5	4	4.25
WR-with supervisor	3	4	5	4	4.00
					4.13
Dev-utilize your skills and talents	3	4	4	2	3.25
Dev-learn new skills	3	3	3	3	3.00
Dev-training and education	3	2	2	1	2.00
					2.75
WA-variety of responsibilities	3	3	3	2	2.75
WA - independencies	3	3	3	2	2.75
WA-periodic changes in duties	3	2	3	2	2.50
					2.67
	3.12	**2.71**	**3.12**	**2.24**	**2.94**
work period at the helpdesk	**3**	**12**	**10**		**8.33**

5.3. FCR and ART Analysis

BZU helpdesk is currently using the V-tiger software, which is an open source call management system. The helpdesk supervisor and the technical support agents log calls into the system to track users' requests, track problems and follow up on calls, and in general organize the work at the helpdesk. Measuring the helpdesk performance based on the proposed model of this study wouldn't be possible unless the data captured from the call management system is analyzed. A very important fact to reveal before starting the discussion of the analysis of the statistics is that, helpdesk supervisor and technical support agents don't log all calls into the system especially those resolved at first contact. Therefore, the data of the call management system seem to be fluctuating across different months of the year according to number of calls logged immediately into the system.

Data captured from the call management system is dated back to Aug/2007 until Jun/2009; per month averages of the number of calls handled and FCR calls are computed. Figure 5-7 demonstrate a graphical comparison between the average number of overall calls handled per month and the share of FCR calls in overall calls.

Figure 5-7: Average Number of Calls per month and Share of FCR per month for the years 2007/08/09
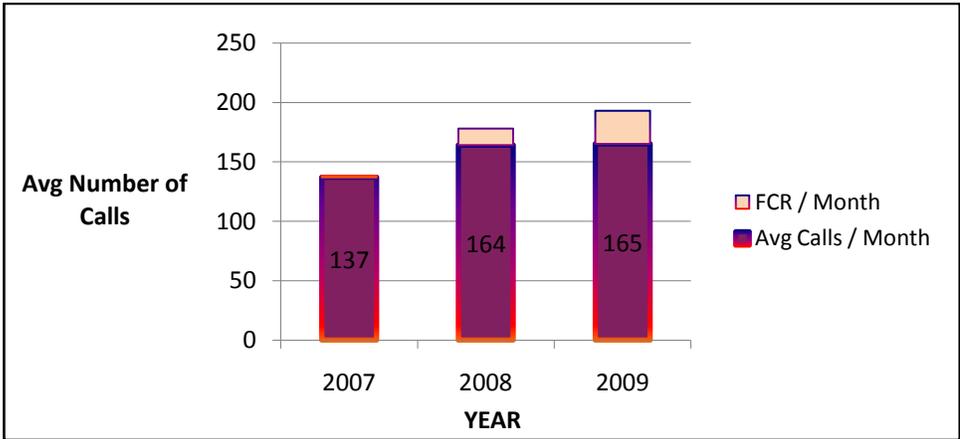
Figure 5-7 shows that FCR is enhancing from year to the next, average FCR in 2007 was only 1% while it is 8% in 2008 and 17% in 2009. I suggest neglecting the results of FCR rate of the year 2007 due to the fact that, the data of this year was collected in 5 months, three of which can be considered as a testing period of the v-tiger software. It is expected that, during the testing period, only some calls were logged into the system for testing purposes which indicates a lack of accuracy. By looking at Figure 6-8, which is a graphical demonstration of average resolution time of calls per month, we notice high fluctuating results of the year 2007 in comparison to 2008 and 2009.

Figure 5-8: ART per month for the years 2007/08/09
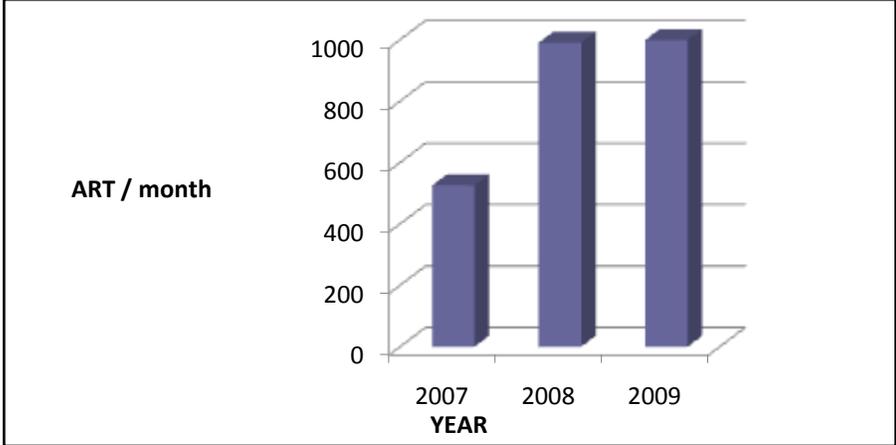
ART is calculated to be 40: 39: 47 Hrs: min: sec., the number of calls resolved within 3 hours are calculated as: the average number of calls per month excluding the average of FCR calls per month is calculated to be 137 ($165 - 28 = 137$) calls per month, the total number of ART calls per month that been resolved within 3 working days are 55 calls which make a percentage of 40% ($55/137 = 40\%$). According to a benchmark study conducted in 2006 between MIT and Stanford University in the United States, it is found that 66% of calls are answered within 3 days of reporting. By considering this benchmark study as a reference to benchmark BZU helpdesk, the acceptable maximum period of time for resolution would be within 3 working days of reporting the problem.

The acceptable ART should be stated in the SLA of the helpdesk with end users. The results of concern in measuring the helpdesk performance is the analysis of data captured in 2009 in order to stick with the timeframe of the study, the results of 2007 and 2008 were demonstrated for comparison purposes. In general the data statistics of the call management system doesn't show improvement in ART but a noticeable advantage in FCR. Even though FCR rate has doubled in 2009 to reach 17% opposed to 8% in 2008, yet it hasn't reached a satisfactory level. As stated in the literature, a technical support helpdesk should have at least 60% rate of FCR calls, other sources stated 80% of FCR rates. If we take 60% FCR rate as a minimum to benchmark the FCR rate of 2009

5.4. Conclusion

The proposed methodology to measure helpdesk performance in the academic environment is implemented on BZU helpdesk. The matrix has the adjusted weights of 15%, 35%, 20%, and 35% for ART, FCR, job satisfaction, and users' satisfaction respectively. As noticed, FCR has the highest weight on the matrix and at the same time has the lowest performance score among all; this factor highly affects the overall performance which is read to be 52%., this low reading is also acquired from other measures; ART is measured to be 40%, helpdesk staff job satisfaction is found to be 58.8% while users' satisfaction as indicated by perceived service quality is 53.91% only. Users' satisfaction as the only external measure of the matrix with the second heaviest weight is examined closely by factor analysis which is a data reduction technique. The items of the SERVPREF instrument were grouped into five underlying factors as follows: Empathy with 65.2% score, Assurance with 55.14% score, Tangibles with 54.4% score, Responsiveness with 52.8% score, and Reliability with 47% score. The highest is empathy with 65.2% which solely measures the helpdesk performance over the telephone system. The scores of the other four measures range around 52%, and none of the scores hit the 70% level.

6. Chapter 6: Benchmarking BZU Model against the Road Map Solution Model

Introduction

Chapter six presents a road map solution for the helpdesk in the academic environment; it serves the purpose of maintaining the helpdesk to function according to the best practices of 'customer care and support'. The road map solution is connected to performance measurement by that: suggestions that result from measuring helpdesk performance are best implemented into a logical model of the DFDs of the helpdesk rather than just listing them in a form of instructions and listed guidelines. The second section identifies the features of the electronic helpdesk system, the basic tiers of the support service, and modeling of routine functions of the helpdesk in interaction with users as an external entity. The model is based on a knowledgebase-centric vision.

The second section of this chapter describes BZU helpdesk model, BZU helpdesk functions is modeled by the mean of DFD. Analysis of this information indicates bottlenecks in the process. Bottlenecks, or performance issues, can be due to any number of reasons such as an ineffective design, a technical architecture issue, perhaps a lack of resources or staff education and most importantly commitment issues.

6.1. The Road Map Solution Model

General Service Quality Management Model for the Helpdesk

A service quality management model is developed in this study. The model of this study is derived from a total service quality management model developed by Chang & Lin (Chang & Lin, 1991) for manufacturing industries; the large model of manufacturing industries is simplified to fit with the purpose of this study and the characteristics of the academic helpdesk. The original total service quality

management model integrates the pre-service delivery stage, service delivery stage, and post-service delivery stage into one single model appropriate for manufacturing quality management system. (Chang & Lin, 1991). The Chang & Lin (1991) model is based on the Quality Function Deployment QFD, which is an approach that demonstrates the effectiveness of quality function deployment in service industries as well as product design. The General Service Quality Management Model proposed in this section is a revelatory model of the Chang & Lin (1991) model demonstrated in their paper titled: Data Flow model of a total Service Quality Management System.

The design of the general service quality management model integrates the pre-service delivery stage, service delivery stage and the post-service delivery stage into one single model. The design specification is described by means of data flow diagrams DFDs. The difference between the revelatory model and the proposed general service quality management model is that: the Chang & Lin (1991) total service quality management involves four major components, namely the design of service quality, deployment of service quality, service delivery and service quality evaluation. The first two components of the Chang & Lin (1991) compromise the quality function deployment QFD activities which is a technique that had been widely accepted in the manufacturing industries which gradually transformed the manufacturing industries from being defect-free driven toward being concerned about customer satisfaction. (Chang & Lin, 1991).

A quality of service management model for the Helpdesk service in the academic environment can be viewed as an integration of three major components, namely the (1) the design of service quality, (2) service delivery, and (3) service quality evaluation. The 'deployment of service quality' component, represented by the revelatory model, is eliminated in this model because it is strongly related to the manufacturing industries and not the IT service industry. The component is rather eliminated and not modified because it is believed that the model is complete without

further details as well as to maintain simplicity of the model as long as it fully serves its purpose without the need for extra component.

The design of service quality activities convey the pre-service stage, while service delivery activities convey the service delivery stage and service quality evaluation form the post-service stage. Design of service quality refers to the activities converting users' needs, wants, requirements, and expectations into service quality performance levels, standards and measures and is usually written in the form of a contract between the IT service provider and the users and is called Service Level Agreement (SLA). Figure 6-1 is a visual table of the components of the model.

Design of service quality is composed of two functions: the first is service level agreement SLA setting which represents the voice of the users in a policy enforcement framework; it should include description of the services as well as competitive benchmark measures. The second component is service planning which identifies performance procedures and critical modes based on the SLA indicators.

Performance measures identified in the SLA are used to determine which support level (level-1, level-2, or level-3) helps establish desired performance; all services, in this stage, are defined in detailed delivery procedures to determine the sequence of steps to be followed when a particular request takes place. Unfortunately, Birzeit University helpdesk doesn't have SLA communicated with users. Developing a SLA and communicating it with users is the baseline of my proposed model of service quality management as well as it is to many other service quality models.

Service delivery stage takes place into two steps: the first is when the service is rendered for the users. It involves two functions: service delivery and assignment which corresponds to the operational task of dispatching users' calls from the Calls queue of the electronic helpdesk system and assigning calls to technical support

agents. The second takes place through following instructions and procedures set in the first stage to deliver services to users according to standard measures and procedures. This function includes monitoring of immediate user feedback. This section is believed to have the biggest influence to lead to better users' satisfaction. The next section of this chapter describes a suggested road map solutions of the functions of the helpdesk. It encompasses graphical representations of the data flow diagrams for each function through the technical support service delivery stage.

Service quality evaluation is the post-service delivery component; this stage leads back to the service design stage and thus completes the life cycle of the quality of service management model. The service evaluation function involves tasks such as: processing of customer feedback, internal service analysis which is done by capturing service statistics from the electronic call management system, and generate the reports on actual service performance. The processing of customer feedback takes place at the end of service delivery stage, it is done through contacting the user after the service is delivered to make sure that users are satisfied with the rendered service in addition to acquire feedback about the service delivery incident.

Figure 6-1: Context Diagram for Service Quality Management Model
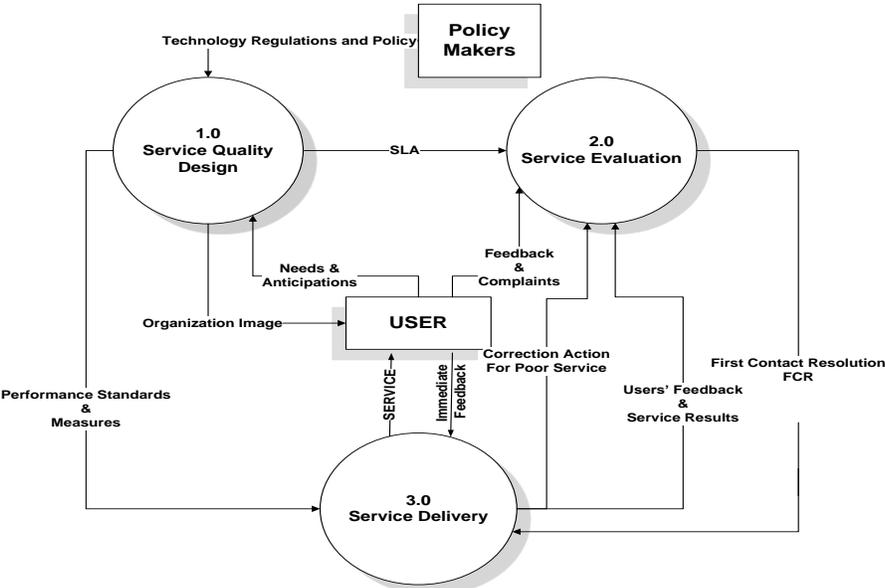
Unfortunately, the helpdesk at Birzeit University doesn't have a SLA communicated to users. Therefore, the current performance of BZU helpdesk staff is not based on known measures and standards, and as mentioned before, it will be hard for users to determine if the performance of the helpdesk staff is satisfactory because every user perceives the rendered service according to his/ her own expectations and measures. The rational of adapting to electronic helpdesk, which is also referred to as knowledge databases, is relatively simple; a knowledgebase- centric helpdesk represents an evolutionary advance from operating within a traditional reactive environment to a   proactive environment characterized by its self-learning attribute and its IT experienced culture.

Electronic Helpdesk System Structure

Features of the helpdesk electronic system

1. User-friendly web interface for easy access from remote sites.
2. Audit tracking and history to trace changes to database information and identify the staff involved in responding to a specific question
3. Distributed read and write access to database for support staff
4. Experience-based learning: storing resolved problems into a knowledgebase to become available to all users for future queries.
5. Provide an intelligent language interface. Options include: natural language queries.
6. Timestamps every process in the system to allow for time calculation factors
7. Reports development and customization capabilities
8. Multimedia capabilities: allow for the use of video files, sounds and pictures to make complex issues clearer.

The suggested design of the electronic helpdesk system is proposed with the following requirements in mind:

1. By default, all incoming calls should first go through level-1 support to increase the chances of FCR.
2. To assist in the routing requests to appropriate support agents, each request would be categorized.
3. Each technical support agent is responsible for requests about his field of specialty
4. If the request could not be resolved by the initial support agent then the request could be escalated to more expert support staff or to another support staff.

The design of the helpdesk electronic system is based on a categorization of the queries into broad subject areas and a specification of Sub- categories of each broad category, the major categories of the system might look like: PC problems, software problems, network problems, printing problems, printing problems, and other computing device problems. Associated sub-categories need to be identified in the system, so that, a technical support agent is effectively assigned to the categories of his/her expertise.

Tiers and support levels

The design of the helpdesk requires a minimum of three levels of support; at the tier level-1, a request will be directed to the helpdesk supervisor over the phone in most cases. If the request cannot be resolved at this level, it is escalated to level-2, here; the responsibility for requests regarding a particular support category is transferred to the technical support agent who is listed to have adequate skills to deal with the topic in question. If the request cannot be resolved at the tier level-2, it is escalated to the level 3, the final level of support. Here, the responsibility to resolve a request resides with a senior employee in the computer center.

The proposed model of this study is a knowledgebase-centric model, level-ZERO support is an essential tier of support because it allows the helpdesk to operate as a knowledgebase-centric service provider. Thus, the proposed model is based on a minimum of four levels of support. The knowledgebase-centric suggestion is based on the foundation of a dedicated knowledgebase management system where users can browse it easily to seek solutions for their technical support related queries.

The knowledgebase is intended to transform the culture of Birzeit University into self-learning community. Upon the adaptation of a knowledgebase-centric helpdesk system, users will unconsciously start the technical support process by self-searching of solutions in the knowledge base, if the solution is not found or not successful, then the user will turn to level-1 support agent who in his turn will also search the knowledgebase for solutions if he/she doesn't have them already.

When level-1 support agent doesn't find a solution in the knowledgebase or can't solve the problem; the call is escalated to level-2 technical support agent who also searches the knowledge base for solution. If the solution is not found then he/she will seek other sources of help such as: other level-2 support agents (in this case the call will be bounced to the level-2 agent who knows the solution), the internet, venders and technical support forums, and at last seek the help of level-3 senior agent.

The repetitive attempts of level-1 and level-2 support agents to search the knowledgebase are necessary to know whether an up-to-date solution exists for the problem, and if not, to post a solution for the incident. It is also important to guide the user to the keywords used in searching for the solution of his/her problem, so that, he/she can do it without returning to the helpdesk. Figure 6-2, shows the lifecycle of technical support request.

Figure 6-2: The Life Cycle of the Technical Support Request

Life Cycle of the Helpdesk
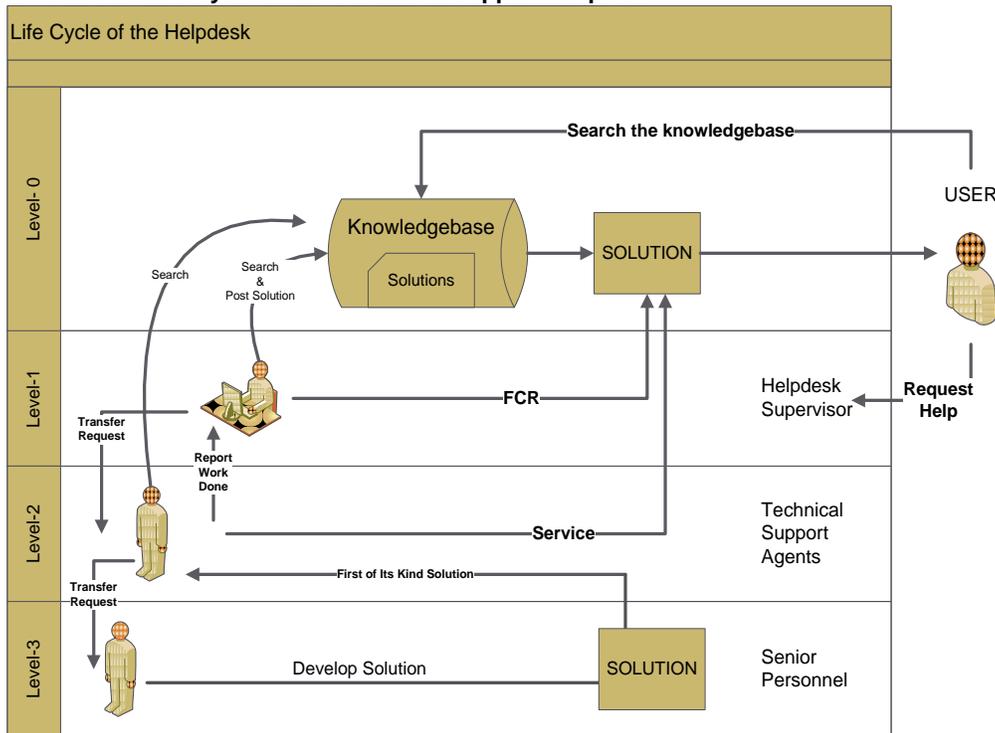
The electronic helpdesk system interface: forms, fields and requests

The performance of services cannot be counted, measured, or inventoried to ensure quality of service delivery; rather the satisfaction and dissatisfaction incidents can be counted through the electronic helpdesk system. Furthermore, the performance of services often differs among helpdesk agents, users, and from day-to-day, therefore, service quality should be examined through a period of time and not per day activities.

This section represents a proposed helpdesk electronic system that contains the minimum required features necessary to reach excellence in performance. A few key concepts are required to generally describe the interface of a helpdesk system, these are forms, fields and requests. Forms collect information. Each application consists of at least one, but typically a number of forms. Each form consists of a number of various types of fields. Fields collect several types of information. Menus can be attached to fields to assist users in choosing values for a field or to restrict the

data that is entered. Initially each new form begins as a template consisting of a number of core fields such as Request ID and Status and extra fields may be added.

The helpdesk primary form may have one or more supporting sub-forms. One of the supporting sub-forms records information about the user by entering his/her employee ID, the sub-form prompts information about the user such as: name, location, email, etc. which is retrieved from a form that is used by the HR to store such information. Another supporting form records a list of the technical support main and sub-categories and who is responsible for responding to these requests at various levels of support. One more sub-form records the work done by the technical support agent, and another to record solution of the problem to be later submitted to the helpdesk supervisor for review before being posted into the knowledgebase. Data from the supporting forms interact with requests in the primary form via the use of workflow. The coming pages explain the functionality of the sub-forms in detail.

In the proposed electronic helpdesk system shown in Figure 6-3, the primary form consists of six sections namely: Header, User Information, Category and Assignment, Request Description, Work Done, and Solution sub-from. The User Information sub-from consists of fields that define the identity of the user, location, and contact information. The Header identifies the login name of the helpdesk staff, Request ID which is a unique integer, request Created Date, Priority and Status field which is a selection field, the Priority and Status fields are set by the agent who, upon analyzing the call, sets the priority of the request and the current status of the request. The Status field is changed throughout the lifecycle of the request; it is also modified by different staff members according to the agent who is handling the request.

The Category and Assignment section has a Category field, Sub-Category field, in addition to assignee field, the assignee field is a drop down list which lists available agents, it is updated upon the chosen category and subcategory of the

request. Assigned Date field is a system-field that timestamps the request. One important field in this section is the Scheduled Service field; this field is usually set by the assignee upon coordination with the user in order to manage an appropriate time to provide the service. Once the call is assigned to an agent, a notification alert appears on the 'Request Queue' of the agent view, the agent opens the request and contacts the user to schedule an appointment to provide the service, the agent enters the scheduled time in the 'Service Scheduled at' field. This pre-service mechanism assures efficiency and reliability of providing technical support service to users.

The agent enters the call information into two steps, first, he/she enters data in the 'one line summary field' and next he/she further explains the nature of the call in the 'Details' field, the Details field is important for writing specific notes or when the One Line Summary field doesn't explain much about the problem in hand. This sub-form is used by the support staff or the supervisor to work on or update the request after it has been created, but it is usually filled one time when the request is received. Modifications in this field usually take place if the technical support agent discovers inconsistency between the initial diagnostic made upon the requester's input and the real troubleshooting of the problem. The system also allows for relating multiple requests of the same problem, for example, if the user's problem requires performing two tasks, the agent need to login to the system two requests, where he/she can relate one to the other by entering the request ID in the 'Related to Request' field.

Submitting a request into the system is achieved by filling in all the required fields and any optional fields and finally hitting the submit button. Once the form has been successfully submitted into the system it becomes a request and creates a 'Request Report' which is stored in the database, the status of the request is set to Pending until the request is viewed after assignment to the technical support agent. It is important to mention that, users has different level of permission in the primary form than that for the helpdesk staff, the sub-forms of the user view are all read only.

The interface also shows 'Work done' which is a diary field, this field is used to list the steps of the work done to resolve the problem. In case of first contact resolution, the helpdesk supervisor assigns the call to his/her own, and submit the request upon filling all mandatory fields, after resolution, the supervisor fills the Work Done field and hits the Save button, and then changes the Status field to FCR. The Work Done field is modified by the assignee of the request upon each technical support visit, if multiple visits are needed, once the agent starts the resolution process, the status of the request is changed to In-progress.

Recording new information in the request report is automatically updated on the user's form view. Every time a service is rendered, the technical support agent enters new information into 'Work Done' field and the last modified date is automatically updated. The agent form view allows for 'Save' and 'New Entry' options in the 'Work Done' sub-form, it also allows for viewing the historical work done by the current assignee and previously assigned agents. Figure 4-3 is an image of the proposed interface for the helpdesk electronic system.

Each request has a unique identifier, the "Request ID" field, an integer-type field which value increments with each new request entered into the system. Escalating a request to another technical support agent will be reflected on the 'Request Report' and thus on the 'Request Queue', the status of the request is reflected on the request queue as well. When the technical support agent determines that the problem is resolved, he/she changes the request status to Resolved.

At the service evaluation stage, the helpdesk supervisor often checks the resolved requests on the Request Queue and proves read the solutions to make any needed changes before he/she posts them into the knowledgebase. In some cases the helpdesk supervisor re-frames the solution in comprehensive steps extracted from the Work Done field which is filled by the technical support agent. After submitting the solution to the knowledgebase, the supervisor contacts the user to make sure he/she

is satisfied with the service provided in order to set the request status to Closed, consequently, it will be removed from the Request Queue.

Figure 6-3: Main Form of the Electronic Helpdesk System

Only new problems require solution writing from scratch, solutions of previously occurred problems are already posted and may only need few modifications. The solution sub-from, also allows for searching the knowledgebase, the agent can search possible solutions by entering problem keywords in the Solution Summary field in order to browse available step-by-step instructions to solve the problem.

To describe the main functions of the helpdesk electronic system which involve interaction with users, a model of the helpdesk system is designed by the tool of data flow diagrams DFDs. Figure 6-4 shows a context diagram of the helpdesk system. The complete DFD model is explained in the next section.

Figure 6-4: Context Diagram of the Helpdesk System Model
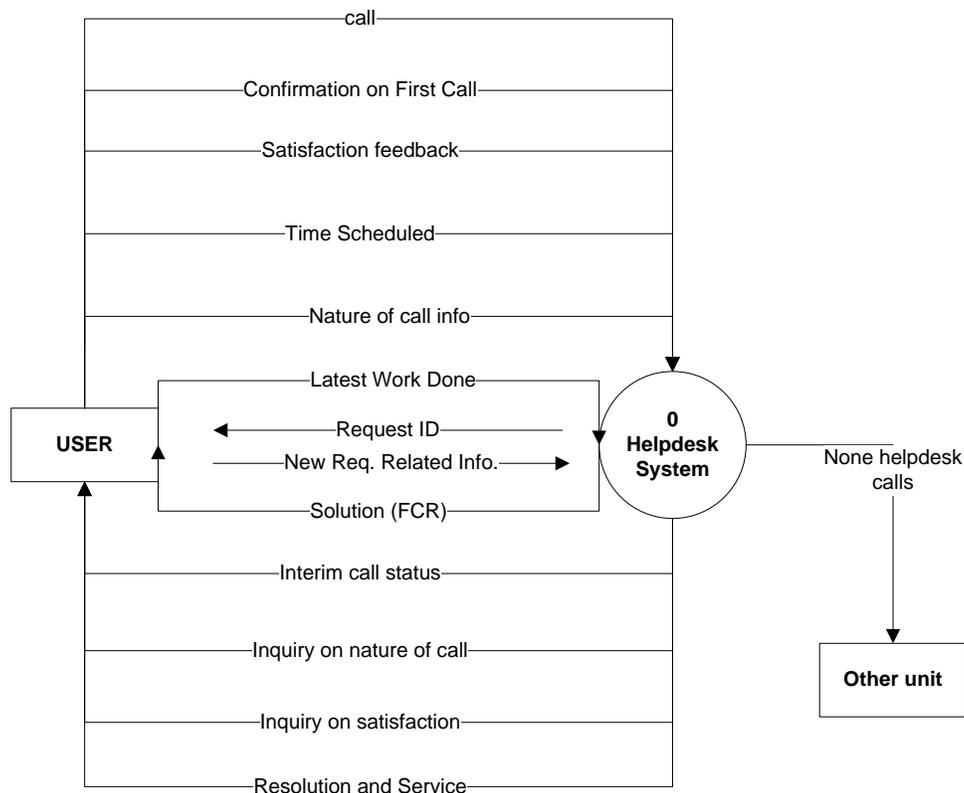
The helpdesk in Detail: Workflow and DFDs

The use of workflow changes the static database requests into a flexible tracking system. Workflow can be thought of as a set of rules which when applied to the data are used to manipulate that data to store some information to achieve some goal. A DFD model of the helpdesk system is designed to be illustrated parallel with the typical features of the electronic helpdesk system.

The helpdesk DFDs gather between the view of knowledgebase-centric design and user-centric one. The model consists of ten functions that deal with one external entity throughout the design, who is the BZU User. At the same time, the proposed level-zero support, made possible by the knowledgebase, is defined through logical inter-connection between the functions, as such, first contact resolution, through searching the knowledgebase, is the first resolution option once a call is received to the helpdesk in order to deliver timely service to users without the need to transfer the request to level-2 support agents or level-3 support.

Few keywords need to be defined before starting to decompose the system into iterative process. A Call is the raw data received by users when contacting the helpdesk, once the helpdesk agent decides that the call is helpdesk related, he/she creates a Request Report, call information is logged into the Request Report before submitting a request. A Request Report is the most vital data store in the model; almost all processes are connected in a way or another to the Request Report to capture information or to submit information into it. The Request Report and main functions of the model can be best described by the primary form illustrated in Figures 6- 5 A and B which is level-0 DFD of the helpdesk system. A note to emphasis before proceeding, and as described in the helpdesk lifecycle, the baseline assumption of this model is that the user first search the knowledgebase for solution to perform technical support self-service, if the self-service attempt is not successful, then contacting the helpdesk is justified.

Status field of the primary form. This filed must go through a number of states to complete the request. Changes in the state or value of this field are important triggers of workflow. Each change of state of the status field is time stamped allowing performance metrics to be calculated. For example, average resolution time is calculated as the time period between request created time and request closed time, while FCR is calculated by counting up the number of requests

resolved within FCR, this status option is efficient especially when the FCR incident takes longer than 10 minutes.

Figure 6-5A: level-0 Diagram of the helpdesk System
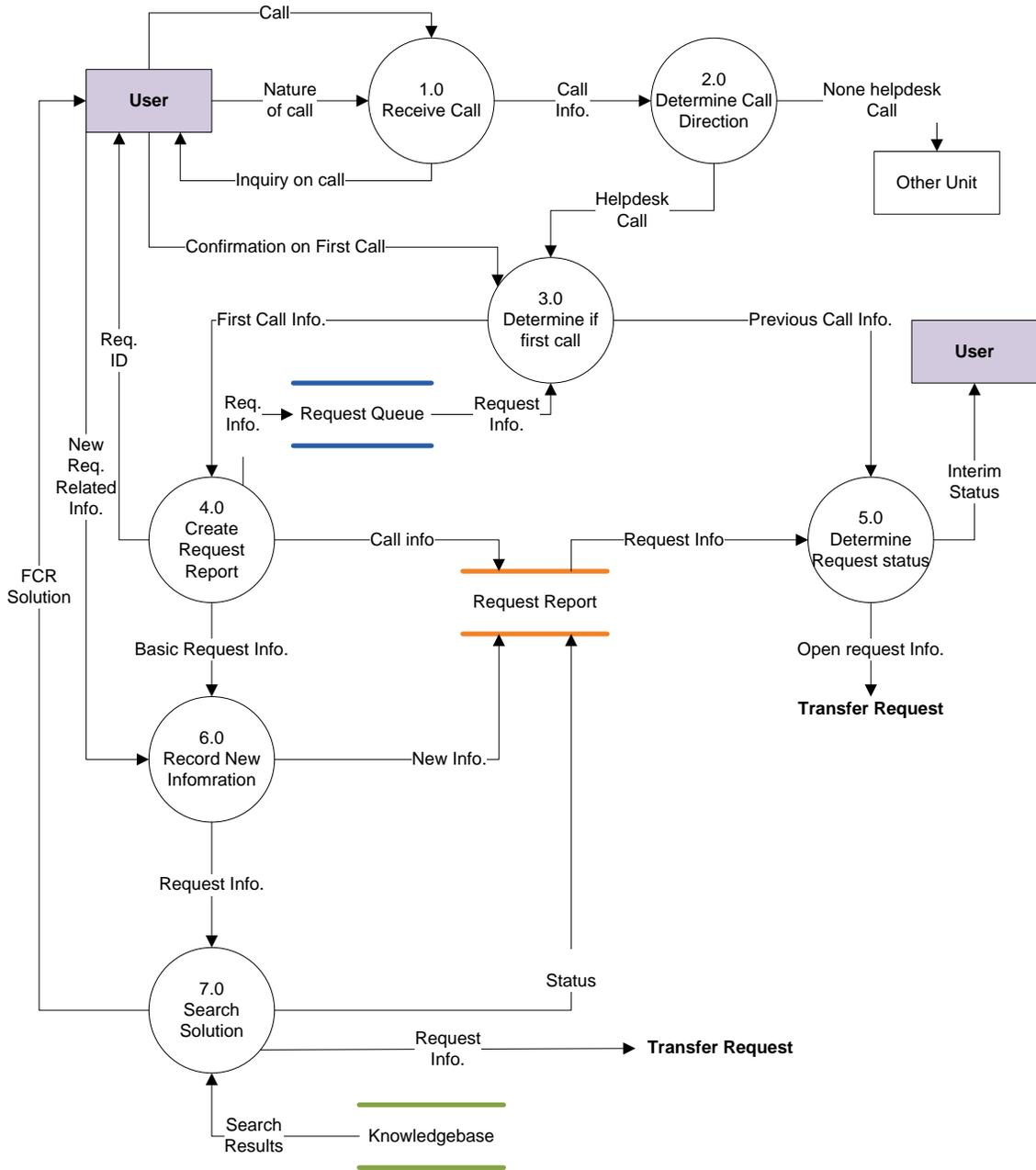
Note: processes in Figure 4-5A are performed by the helpdesk supervisor.

An important feature in the design of the electronic helpdesk system is the

Figure 6-5B: level-0 Diagram of the helpdesk System
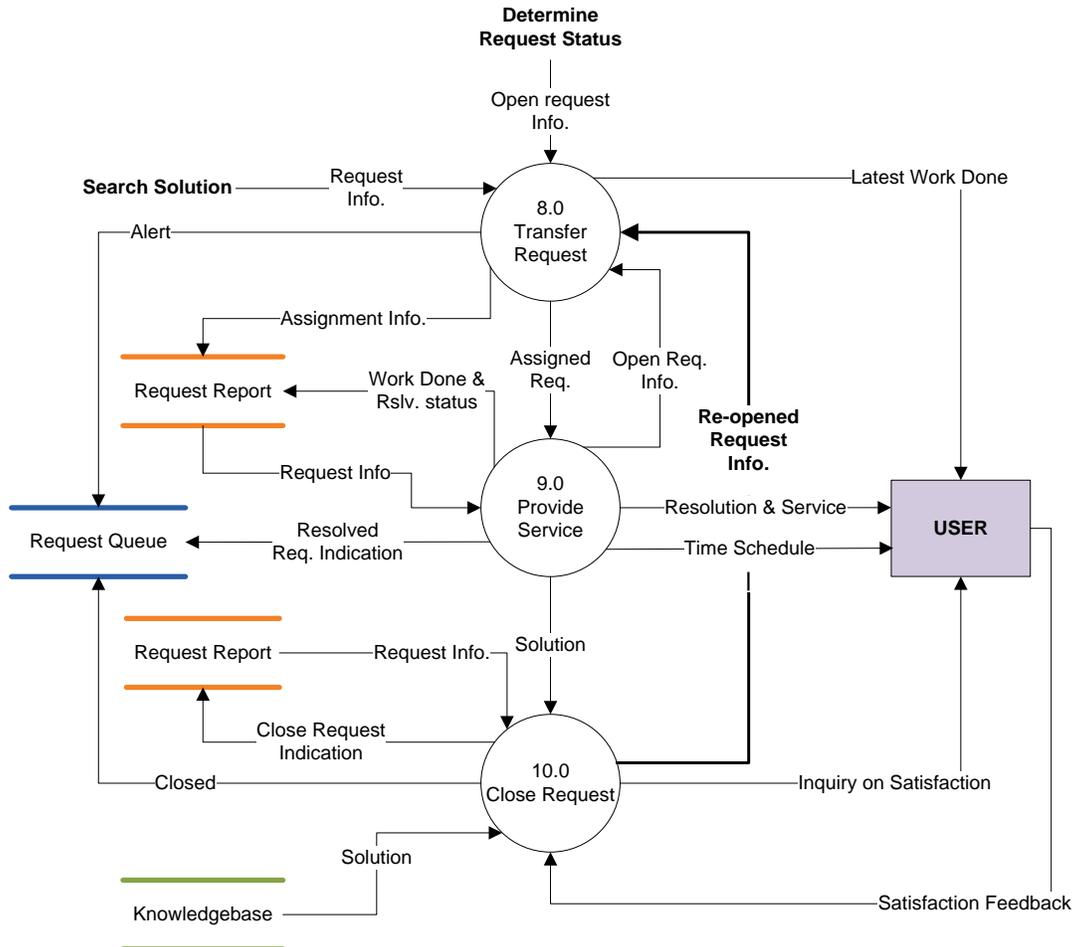
There are six states that a request must pass through. Initially a New request is Pending to the relevant support agent. Once the technical support agent is working on the request, the status changes to Work in Progress, at this stage the request may be reassigned to different individuals to work on until the support staff believes that the request has been successfully Resolved, the helpdesk supervisor, who is the level-1 support agent, may resolve the issue immediately with the user over the phone, in this case the status of the call is set to FCR. If the requestor is not satisfied with the solution he/she may request to Re-open the request or if they are satisfied

with the answer, the helpdesk supervisor may set the request to the Closed state. If no further action is taken by the technical support agent within two days or one week (whatever agreed on) of the request being assigned to him/her, a notification message is sent out to the helpdesk supervisor to take appropriate decision of providing service or reassigning it over to another agent.

Further Explanations of the iterative processes of the functions of the helpdesk model follows:

1.0 Receive Call

Figure 6-6: DFD of Function 1.0- Receive Call
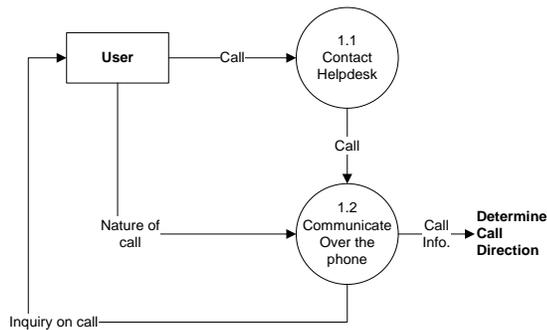
Users usually reach the helpdesk through multiple contact methods. The most common methods are: telephone system, email system, and the electronic helpdesk system. Emailing the problem or filling in a form through the electronic system will also lead to calling the user whether needed information is available or not. As a quality added-value practice, the user would feel the individualized care from the helpdesk when he/she receives a call to confirm the request; this practice is expected to boost the empathy construct of user satisfaction.

2.0 Determine Call Direction

As the helpdesk supervisor receives a call, he/she analyzes the information in mind, if he/she finds out that the category of the call is out of the responsibilities of the helpdesk, such as calling for a Ritaj problem or non IT related category, then the agent transfers the call to the appropriate channel. Then, the next function is

undertaken, which is Determine If First Call. Please refer to Figure 6-7 for a DFD of function 2.0 of the system.

Figure 6-7: DFD Function 2.0 – Determine Call Direction
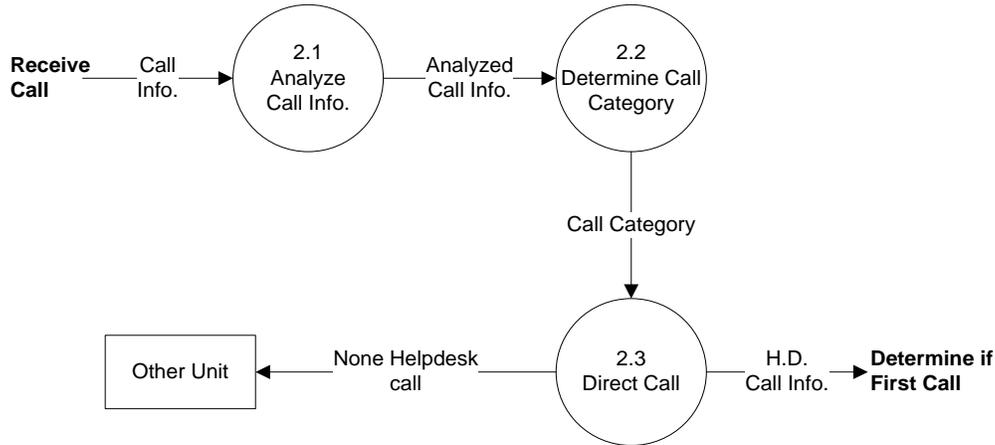

3.0 Determine if First Call

The traditional way of performing this function is that the helpdesk supervisor asks the user if it's the first time to contact the helpdesk for such a problem, however, he/she is better reduce the number of inquiries by searching the Request Queue for a corresponding request, it is thought to be very comforting for many users when the helpdesk supervisor informs them that he/she is currently viewing the request on the system, this can be understood as an indication of personal care for users which emphasize empathy. It also brightens users' perception of the reliability of the helpdesk.

Figure 6-8: DFD of Function 3.0 –Determine If First Call
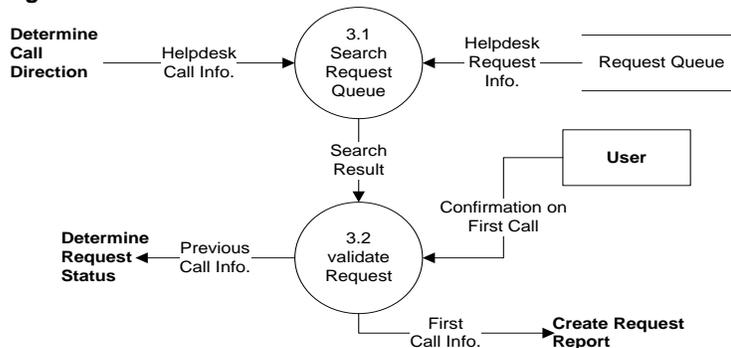
4.0 Create Request Report

**Figure 6-9: DFD of Function 4.0- Create Request Report**
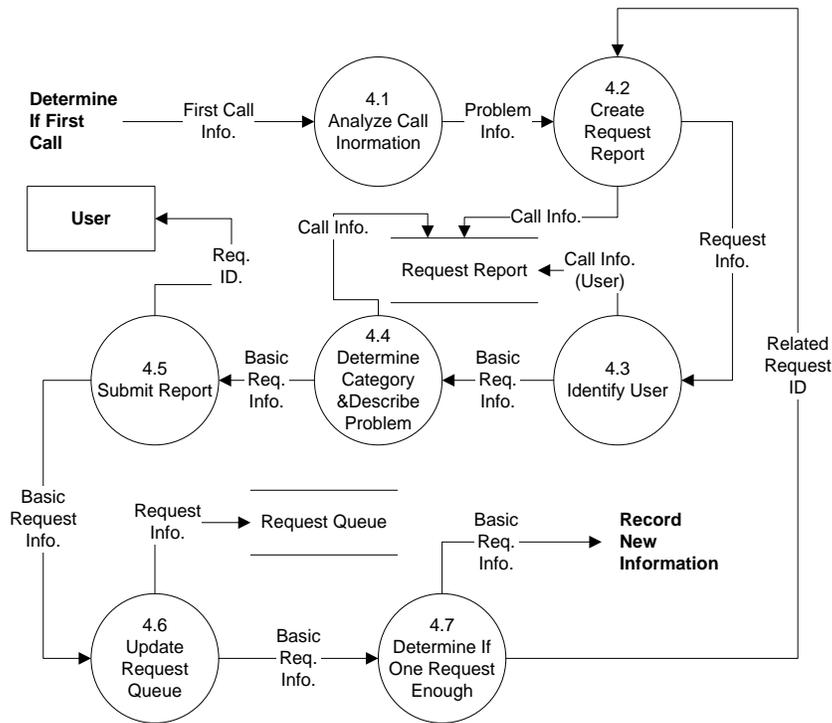
IF the call is a first time call, the call information acquired from the user is used to create a Request Report. First, the helpdesk supervisor analysis the call information to determine if multiple requests are necessary, then, he/she generates a Request Report to fill out information to create the request. The Request Report is modeled as a data store. Figure 6-9 demonstrates this function.

5.0 Determine Request Status

If the user's call is not a first time call, then the helpdesk agent needs to provide the user with more information about the call in order to comfort the user that his/her call is reaching a progressive status. This function can be considered as a read only information function, the agent reads to the user the status of the request, he/she can also read the Work Done on the issue up to the time of the user's call. If the user

recognizes a progress in the call, then he/ she will feel more comfortable and wait for the time scheduled to provide service. Figure 6-10 shows the DFD of this function.

Figure 6-10: DFD of Function 5.0- Determine Request Status
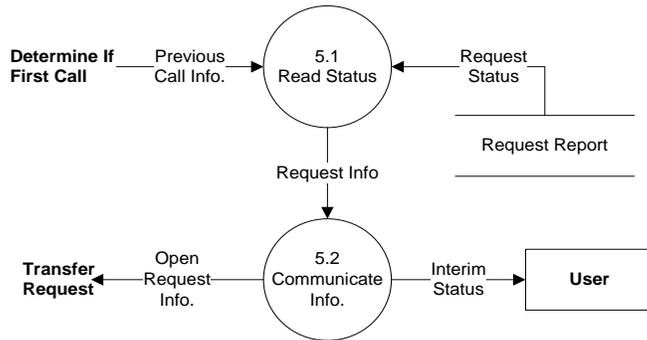
6.0 Record New Information

Upon creating the Request Report, the helpdesk supervisor records new information into the 'Details' field. The details field is the first information viewed by technical support agents, therefore, it is better be well defined and be written in neat language. Only familiar abbreviations among the helpdesk staff should be used to avoid ambiguity.

Figure 6-11: DFD of Function 6.0-Record New Information
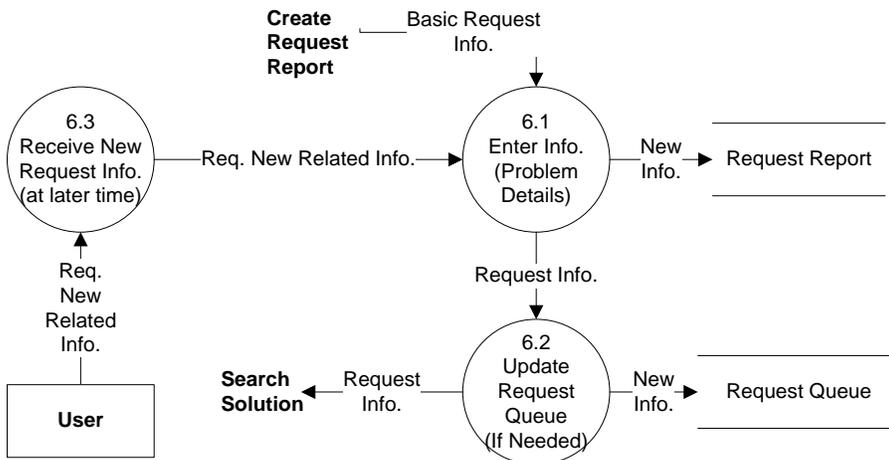

Figure 6-11 shows the DFD model of function 6.0 of the system. The function allows for the user to provide New Request Related Information in later

time, the system allows for a data flow entry from the user to be recorded into the Request Report.

7.0 Search Solution

The helpdesk supervisor should search the knowledgebase in order to seek immediate solution to the user. Even though, on the basis of this model, it is assumed that users had previously searched the knowledgebase before contacting the helpdesk, the helpdesk supervisor needs to search the knowledgebase once again in order to make sure that no solution is available, the helpdesk supervisor's search results may be more accurate because of his/her advanced skills that are sharpened by experience built with different incidents, the narrowed keywords in the search engine is one key determinate of the success of the search process. This practice validates the user's search results, which is one of the most important quality assurance practices.

**Figure 6-12: DFD of Function 7.0- Search Solution**
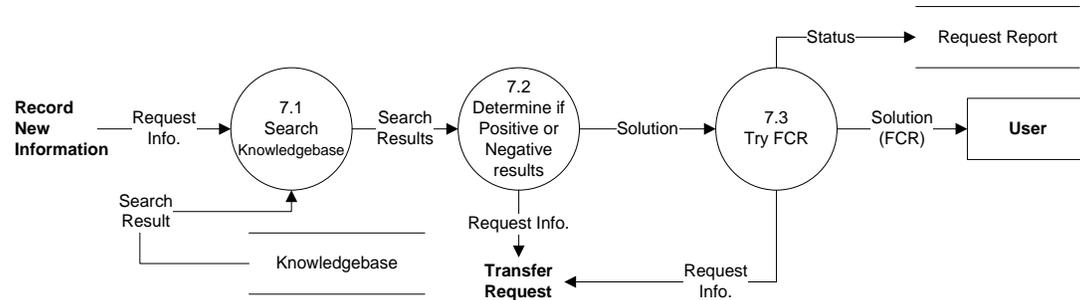
At any case, the helpdesk supervisor or the support agent who receives the call should always return to level-zero support and advise users to do so, if the solution is found in the knowledgebase, the helpdesk supervisor should encourage the user to follow the instructions available on the knowledge base, or he/she may go through the solution with the user over the phone to achieve a FCR, if the user requires professional help on site, then, the supervisor transfers the request to technical support agent to provide service to the user on site. Figure 6-12 shows the DFD model of function 7.0 of the system.

8.0 Transfer Request

This function deals with incoming data according to its nature, incoming Request Information from Search Solution and Close Request starts processing in the Assign Agent process while Open Request Information that comes from Determine Request Status starts processing in the Check Last Modified Date. If last modified date exceeds the maximum timed allowed for the call to reside pending in the agent Calls Queue (as stated in the SLA), then the helpdesk supervisor needs to take appropriate actions to alert assignee to schedule time to provide service or to decide to reassign the call to a different technical support agent. Figure 6-13 is a graphical demonstration of function 8.0.

Figure 6-13: DFD of Function 8.0- Transfer Request
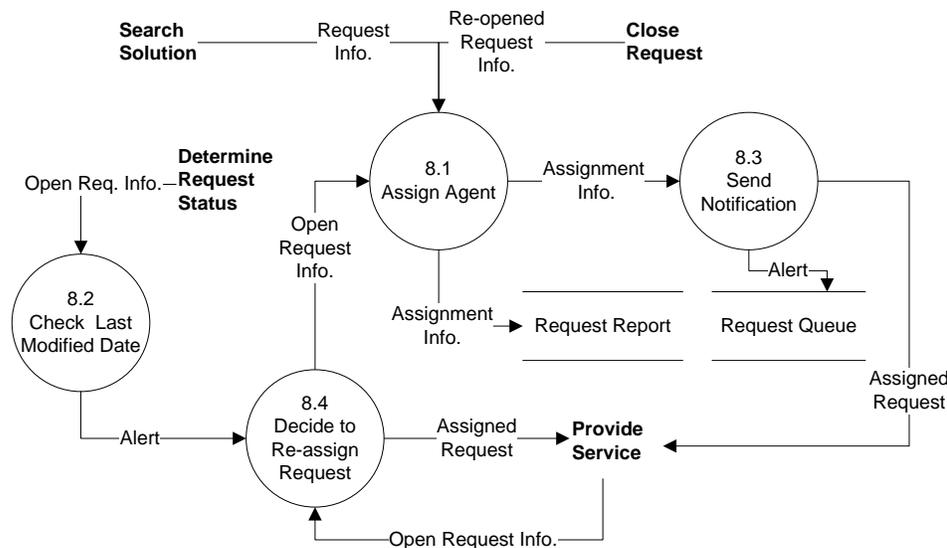

Note: 8.1 is performed by the helpdesk supervisor, 8.2 & 8.3 are performed by the electronic system, 8.4 is performed by both the supervisor and the assignee.

In case of dealing with reassigned request, the helpdesk supervisor contacts the technical support agent assigned for the opened request, upon the available information, the helpdesk supervisor negotiates the willingness of the technical support agent to provide the service. If the helpdesk decides to re-assign the call to

different agent the data flow moves to the Assign Agent function, if the support agent ensures that he/she is willing to provide the service then the data flow continues to the Provide Service function. Figure 6-14 is a DFD model of function 8.4- Decide to Re-assign Request.

Figure 6-14: DFD of Function 8.4- Decide to Re-assign Request
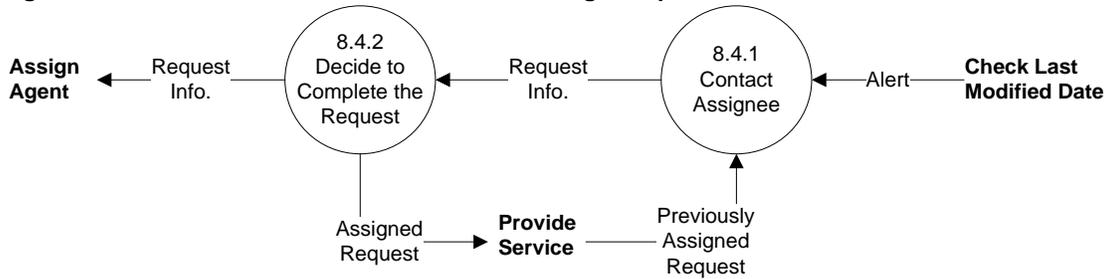
Note: 8.4.1: the supervisor contacts the assigned agent, while, 8.4.2: the assignee decides to whether to complete the request by proceeding to 'Provide Service' function, or if not, the request is re-assigned again through the 'Assign Agent' function.

The first process of Assign Agent function, which is shown in Figure 6- 15, is checking the category of the problem in hand, as discussed before; the agents are listed in groups according to their expertise in the categories and sub-categories of the problems.

**Figure 6-15: DFD of Function 8.1-Assign Agent**
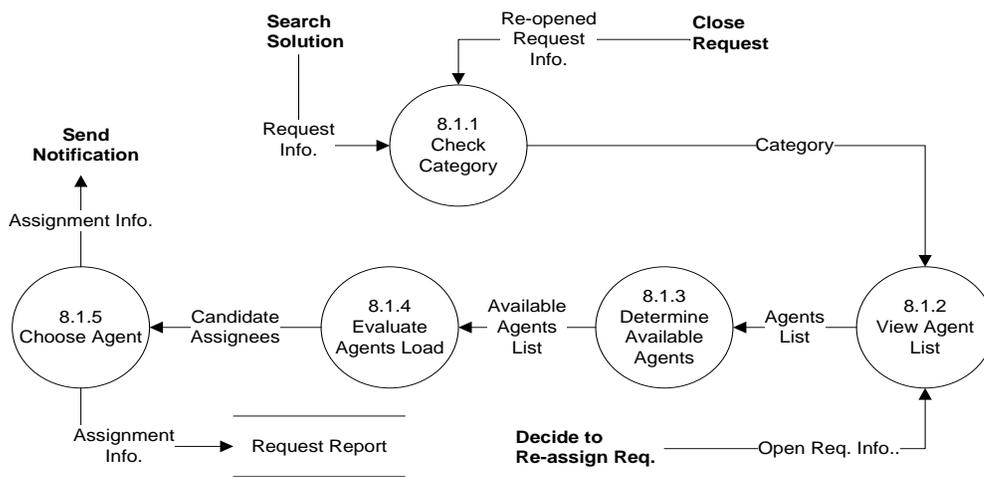
The request may be reassigned to level-3 support agent, but it must be resolved at this level.

9.0 Provide Service

This function represents the service delivery stage of the General Service Quality Management Model proposed on previous section and previously illustrated in Figure 6-16. When the request is assigned to a technical support agent, a notification is fired to alert the agent.

**Figure 6-16: DFD of Function 9.0- Provide Service**
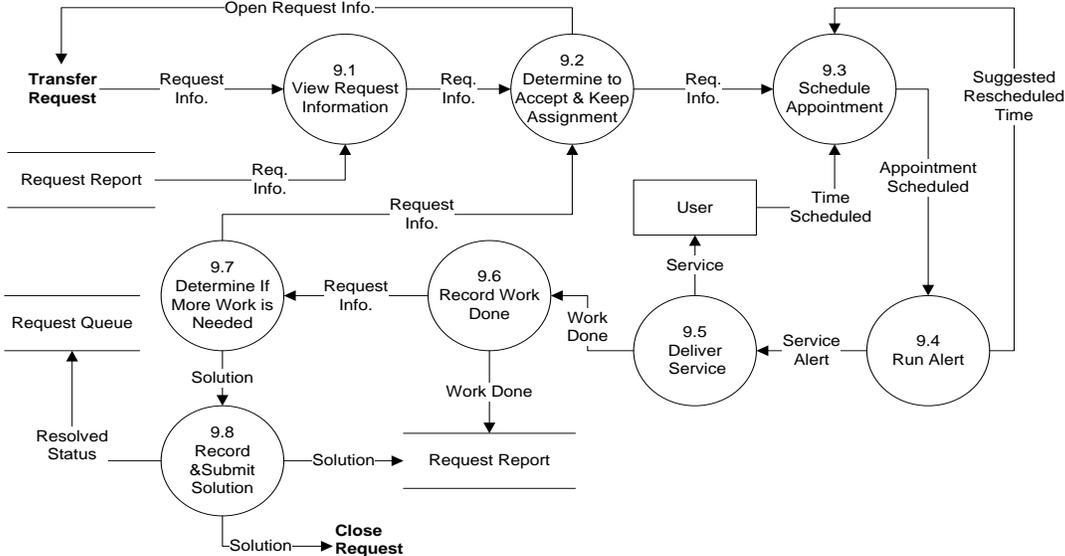
The agent needs to schedule an appointment with the user to provide resolution of the problem. DFD of this function is shown in Figure 6-16. The agent enters the date and time of the appointment when it is set with the user. The system fires an alert 15 minutes before the appointment is up, in order to remind the agent and to allow for enough time to reschedule the appointment if an emergency occurs.

Every time an agent provides service, he/she must record the provided service in the Work Done field of the primary form of the helpdesk system. The same applies on scheduling service appointments, the user need to communication the planned service appointments with the user so that they can set appointments or make

arrangements to provide the service in appropriate time. Figure 6-17 shows function 9.7 - Determine if more work is needed -. If no more work is scheduled, and the agent believes that the problem is completely resolved, then he/she changes the status of the request to resolved, if the problem is a first time problem, the agent records the solution to be sent for the review of the helpdesk supervisor to eventually be posted into the knowledgebase.

**Figure 6-17: DFD of Function 9.7- Determine if More Work is Needed**
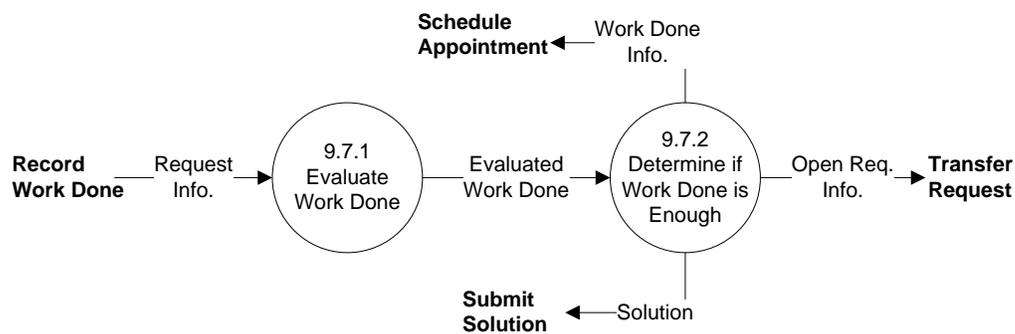
10.0 Close Request

When the technical support agent provides support service to the user, and believes that the problem is completely resolved, he/she submits the solution for the review of the helpdesk supervisor, within the Closing Request function, the solution of the problem is the first data flow that comes into the Review Solution process, after review and approval of the helpdesk supervisor, the solution is posted into the knowledgebase.

Then, as a satisfaction and quality assurance check, the helpdesk supervisor calls the user to make sure that the problem is completely resolved and the user is satisfied with the resolution of the problem. The supervisor may also capture feedback from users in this stage, upon the users feedback, the helpdesk supervisor may switch the status of the request from resolved to closed, or may reopen the request and assign it to another technical support agent if the user indicates that the problem still exists. Figure 6-18 shows the DFD associated with this function. This

function represents the Service Evaluation stage of the General Service Quality Management Model illustrated previously.

Figure 6-18: DFD of Function 10.0- Close Request
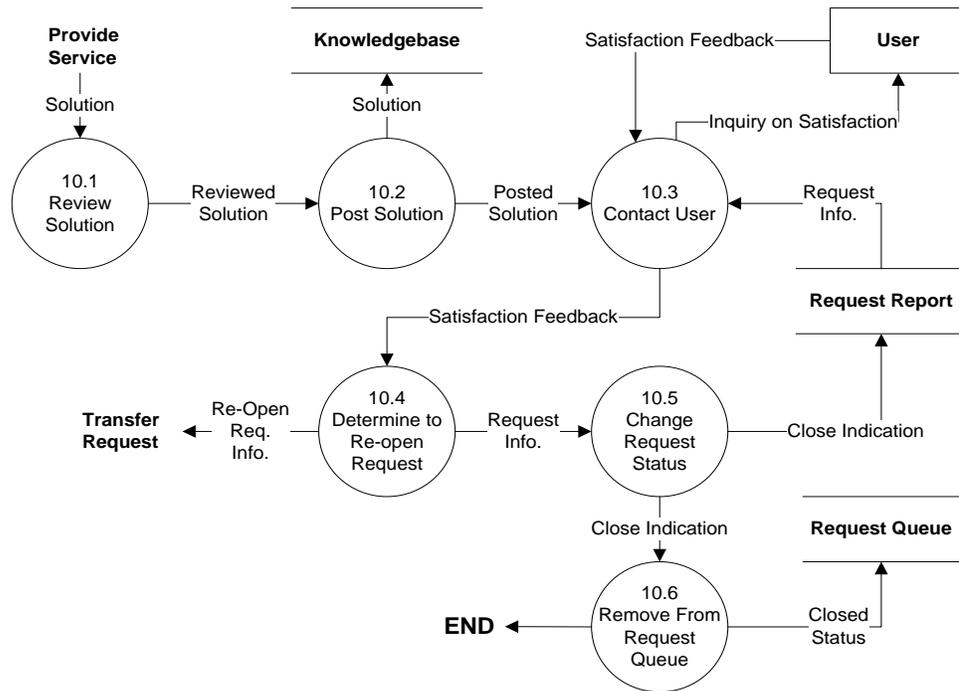
The knowledgebase

The knowledgebase represents a self-help database. Its purpose is to provide a accessible repository of solutions to common requests. The knowledgebase is the first stage in the user support model. If a user needs technical support help, he/she should search the knowledgebase to find solution to the problem in question. Only if users cannot find solutions to their technical support problems, they are encouraged to request technical support service from level-1 support hoping for FCR, if FCR is not possible, the request is assigned to level-2 support agent to be resolved on site. When level-2 support agent performs appropriate solution, he/she logs the solution into the knowledgebase, which will be viewed by the helpdesk supervisor for further technical and language assurance before it get posted to all users.

Entries in the knowledgebase are derived from existing helpdesk requests. Solutions are a subset of all helpdesk requests. For each helpdesk request, the technical support agent has the option to recommend the solution, to be later reviewed by the helpdesk supervisor. If accepted by the helpdesk supervisor, a knowledgebase entry is created comprised of: the category and sub-category, One-line summary, Details, Solution Summary and Solution Details fields. Users can search the knowledgebase by selecting a sub-category and/or by entering keywords in a search form view.

The words of the one-line summary serve as search keywords that help browse solutions, while the Details field, diagnoses the technical support problem, and the Solution Summary field and Solution Details illustrate the resolution methodology in step-by-step format.

6.2. BZU Helpdesk Model

BZU Helpdesk Call Management System

BZU helpdesk started using a call management system in 2007, before that, the helpdesk used to record calls manually on a paper-ticket that is transferred randomly to the technical support staff, if the paper-ticket is lost then a new one is issued and no tracking number is identified. In Aug 2007, BZU helpdesk started using the V-tiger software which is an open source package specialized in helpdesk activities. Unfortunately, BZU helpdesk is not using all features of the V-tiger software. This section explains the workflow of functions of BZU helpdesk and aims to model the main functions of BZU helpdesk through the mean of Data Flow Diagram DFDs.

Access to the V-tiger software is granted to the helpdesk supervisor, the technical support agents, level-3 support personnel, in addition to the computer center director and the information officer at Birzeit University. There is an electronic system through RITAJ - Birzeit University's administrative and academic

portal - where users can submit technical support requests, but it is not widely used by users, in addition, it is not completely developed to efficiently handle functions at the side of the helpdesk. BZU users prefer to contact the helpdesk through the telephone system. Birzeit University's telephone system is not supported with a voice mail inbox, where users can leave messages to the helpdesk supervisor when he/she can't pick up the phone or when the line is busy. In addition, requests that are sent by email are not handled as quickly as if they had been reported over the phone. Users usually express frustration due to the difficulty of contacting the helpdesk.

The use of the V-tiger software aims to organize the workflow at BZU helpdesk in order to reach users' satisfaction. The next sections describe the structure of BZU helpdesk electronic system and illustrate the main functions by modeling them through the mean of DFDs.

Tiers and Support Levels

BZU helpdesk has three levels of support; at tier level-1, the helpdesk supervisor receives the call, if the call cannot be resolved at this level, it is escalated to level-2, in this level, the responsibility for providing service is transferred to one of the technical support agents. The specialty of technical support agents at BZU helpdesk are not defined into categories, only one agent is specialized in printers and network troubleshooting; he also provides other technical support services in addition to his specialty in supporting printers and network issues. If the request cannot be resolved at the tier level-2, it is escalated to level-3, the final level of support. In this level, the responsibility to resolve a request resides with a senior employee in the computer center.

BZU helpdesk operates with one helpdesk supervisor in level-1 support, while four other technical support agents form level-2 support, and 3 senior employees form level-3 support. BZU users usually contact the helpdesk supervisor to report their technical support problems, but not necessary, some users report their

problems immediately to level-2 support agents when they pick up the phone instead of the helpdesk supervisor or when they come by them across a hall or corridor. There is no harm in providing support to users immediately if they come by the technical support agent while providing service to a neighboring employee, the issue here, is that, the technical support agent doesn't document the call, technical support agents rarely log calls into the electronic system, they usually count on the supervisor to do so, who, in some cases, has no idea of the extra calls done by the technical support agent. Moreover, the supervisor himself, stated that he doesn't log all calls into the system especially those resolved at first contact over the phone. If the problem is not resolved over the phone, the helpdesk supervisor logs a ticket into the V-tiger software. Each ticket has a unique ID and a field for choosing one of the categories available on the pre-defined drop down list. Users' information such as name and location are all logged into one field. As mentioned before, technical support agents' specialties are not defined according to problems' categories, therefore, category-agent relationship is not present in BZU helpdesk system.

When the ticket is created, the supervisor first assign the ticket to an anonymous user called "Support Group" meaning that the ticket is not assigned yet to any agent. Agents are given the privilege to select the ticket of their interest. The supervisor checks the ticket queue multiple times daily to make sure that all tickets are assigned to an agent, sometimes negotiations with technical support agents are necessary to accept the assignment of some tickets. When the technical support agent accepts the assignment of the ticket, he provides the service in one visit or through multiple visits. When he feels that the problem is resolved he closes the ticket, consequently, the ticket disappears from the active ticket queue.

Figure 6-19: BZU Helpdesk Lifecycle
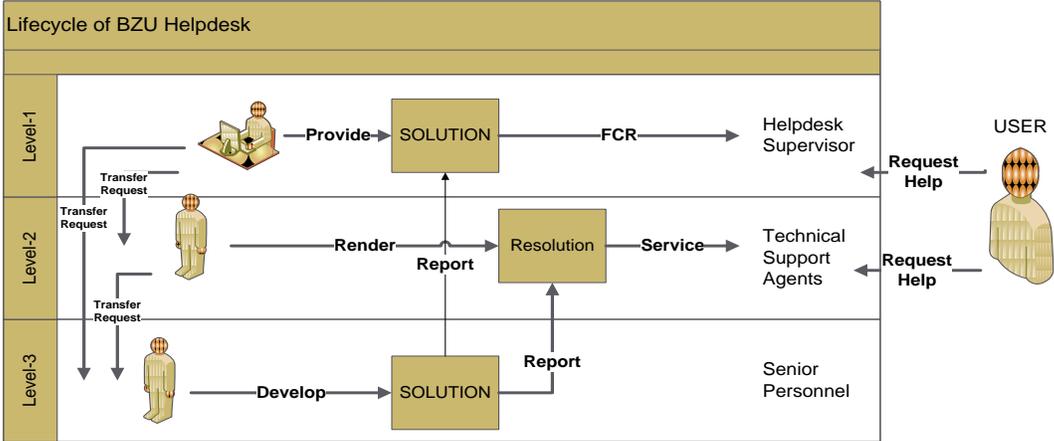
There are multiple channels of contact in the lifecycle of BZU helpdesk; BZU users can make the first contact to report a problem through either the helpdesk supervisor or the technical support agent. The second channel of contact happens when handling critical problems; critical problems that cannot be resolved at level-1 or level-2 support can be immediately transferred to level-3 senior personnel from either the supervisor of any of the technical support agents. Sometimes, the helpdesk staff ask the user to immediately call one of the senior staff at the computer center regarding some administrative issues like: exceptional request to expand the size of the email account, expand the size of a network drive, or other administrative related issues, such communication channel is very rare and is not represented in Figure 3-1 which is an illustration of BZU helpdesk lifecycle.

The electronic helpdesk system interface: forms, fields and trouble tickets

The primary form of the V-tiger software is presented in Figure 3-2. The primary form, which allows for creating a new trouble ticket, consists of three main sections or so called sub-forms, namely: Ticket information, Custom information, and Description information. The first sub-form, which is Ticket information, contains fields to enter the following data: assignee, category, priority, and status. The second sub-form, which is custom information contains only one field which is

location, this field is used not only to enter the location of the problem but also user's information like the name and email or phone number for contact. The third sub-form, which is Description information, is used to enter the description of the problem according to users' feedback.

Helpdesk agents rarely log solutions into the system. The solution field is not part of the primary form and it is not connected to a knowledgebase, but at the same time, it is empowered with a search engine allows for browsing solutions. Unfortunately, even though this feature is available on the V-tiger software, it is not used by BZU helpdesk. Each ticket has a unique identifier, the "ID" field, an integer-type field which value increments with each new trouble ticket entered into the system. The tickets are also viewed on a queue showing their assignee and their status. BZU helpdesk activates four statuses of V-tiger software which are: open, waiting for response, in progress, and closed.

Figure 6-20: Main Form of V-tiger Call Management System Used at Birzeit University

To explain the main functions of BZU helpdesk system, a logical model is created by the mean of Data Flow Diagrams DFDs. Figure 6-21 shows a context diagram of BZU helpdesk system.

**Figure 6-21: Context Diagram of BZU Helpdesk System**
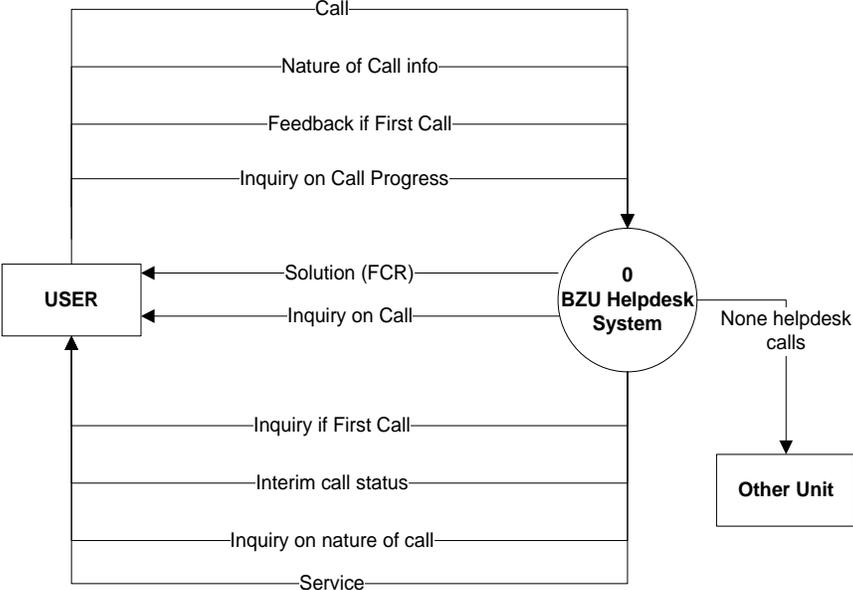
Existing Workflows of BZU Helpdesk system

Existing functions of BZU helpdesk are modeled logically by the mean of Data Flow Diagrams DFDs. Modeling is achieved upon conducting several observation sessions, capturing answers to workflow-related issues, and examining the V-tiger call management software.

Few keywords need to be defined before starting to decompose the system into iterative processes. A Call is the raw data received by users when contacting the helpdesk, once the helpdesk agent decides that the call is helpdesk-related, he creates a ticket, and call information is logged into the ticket before submitting it. The Ticket can be best described by the primary form of the V-tiger software that is illustrated previously. BZU helpdesk system encompasses eight functions, namely: 1.0 – receive call, 2.0- Determine Call Direction, 3.0- Determine if First Call, 4.0- Create Ticket, 5.0 – Determine Ticket Status, 6.0- Transfer Ticket, 7.0 – Provide Service, 8.0 – Close Ticket. Figure 6-22 shows level-0 data flow diagram of the helpdesk system.

Figure 6-22: Level- 0 Diagram of BZU Helpdesk System
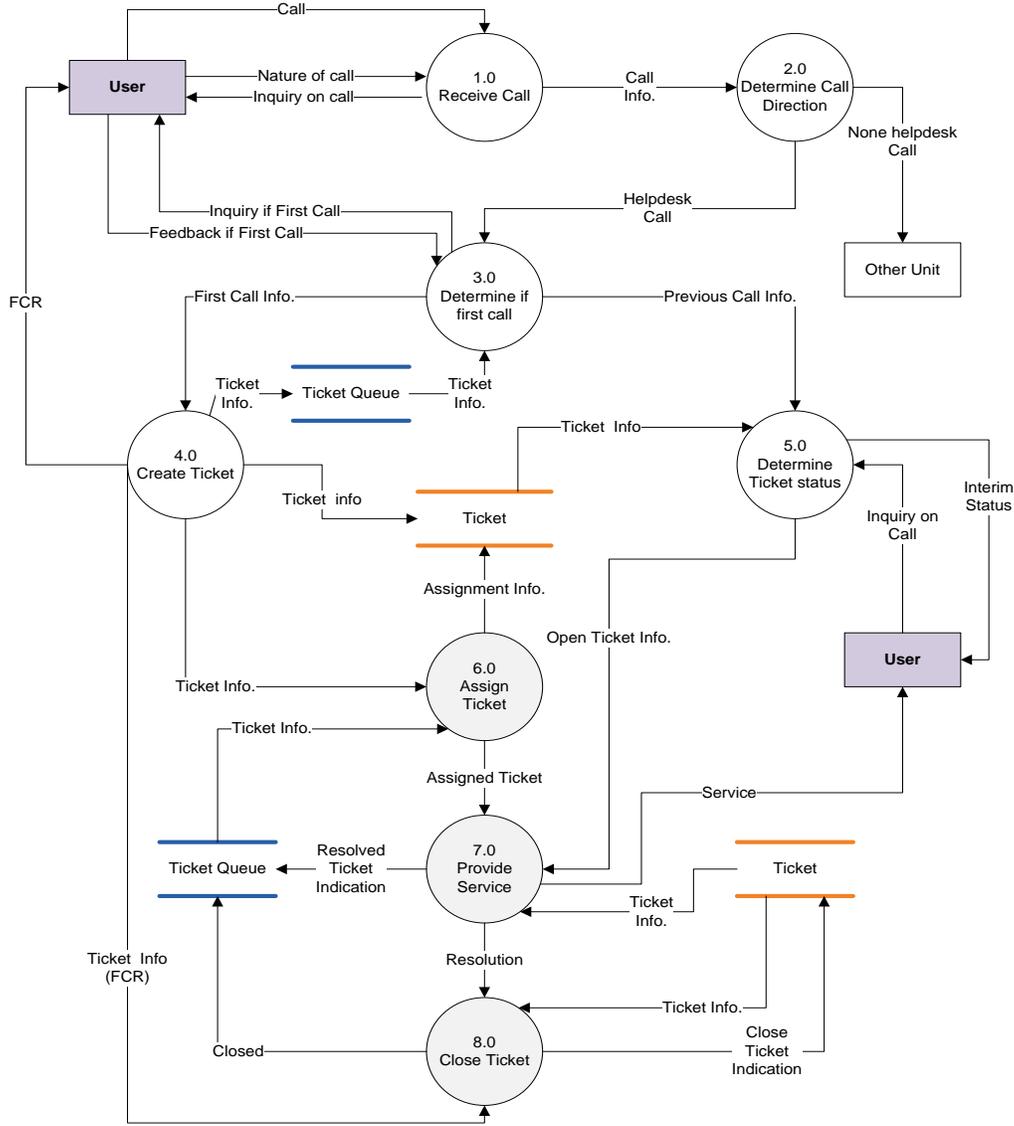
Note: processes of functions 6, 7, and 8 are performed by the helpdesk agents, while processes of functions 1,2,3,4, and 5 are performed by the helpdesk supervisor

An important feature of the V-tiger software is the 'Status' field in the primary form. This field must go through a number of states to complete the ticket. Changes in the state or value of this field are important triggers of the workflow. 'Open' and 'Closed' states of the status field are time stamped. Average resolution time is calculated as the time period between ticket created time and ticket closed

time, but not internally through the system. In addition, FCR is calculated by counting up the number of tickets resolved within 10 minutes or less, there is no option in the status field for FCR.

In the initial process of creating a ticket, the status is set to open, and it is assigned to 'Support Group'. Available technical support agents select the tickets they are willing to handle, then, the ticket is assigned to a support agent instead of anonymous 'Support Group', the status of the ticket is changed from 'Waiting for response' to 'In progress' status; the agent changes the status to 'In Progress' when he starts working on solving the problem, finally, when the agent determines that the problem is completely resolved, he changes the status of the ticket to 'Closed'.

Closing the ticket, consequently, removes it from the open ticket queue. No further follow up is performed after the call is closed. The helpdesk doesn't schedule service appointments before providing the service, Sometimes, agents don't find users in their offices when they come to provide the technical support service, which in some cases, leads to making multiple visits before providing service to users, at the same time, users may not be aware of previous visits made while they were absent which causes users to think that the helpdesk is ignoring their requests and leads to dissatisfaction.

Reassigning a ticket at BZU helpdesk is performed as follows: when the technical support agent determines to reassign the request, he changes the status of the request to 'waiting for response' so that other agents can select the call and work on it, the agent usually informs the helpdesk supervisor of his desire to leave out the ticket, so that, the supervisor can negotiate assigning the ticket to other agents as soon as possible. Further description of the iterative processes of the main functions of BZU helpdesk system is explained in detail in the coming pages, functions explained in this model are those user-centric functions which are performed in routine manner:

1.0   Receive Call

The helpdesk supervisor, who is level-1 support agent, should be the default channel to receive technical support calls. As mentioned before, level-2 support agents may receive users' calls in some occasions. Figure 6-23 is a graphical representation of Function1.0.

Figure 6-23: DFD of Function 1.0- Receive Call
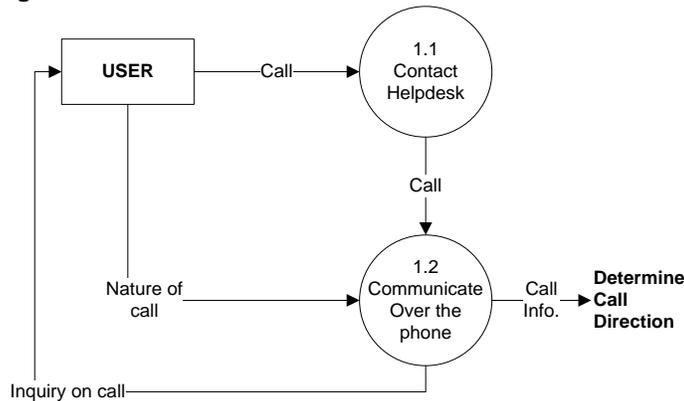
Users usually reach BZU helpdesk through multiple contact methods. Available methods are: telephone system, email system, and through Ritaj system which is rarely used. Emailing the problem or filling in a form through RITAJ system doesn't necessary lead to contacting the user over the phone; over the phone communication happens only when the user calls the helpdesk and request service, when the user sends his/her request in any method rather than the telephone, the helpdesk supervisor logs a trouble ticket into the V-tiger system without returning to the user and waits for an agent to handle it. If the user doesn't provide adequate information about the nature of the call, the helpdesk supervisor skips the corresponding field and logs the call into the system as is.

2.0   Determine Call Direction

As the helpdesk agent receives a call, he analyzes the information, if he finds out that the category of the call is out of the responsibilities of the helpdesk, such as calling for a Ritaj problem or other non IT-related category, then, the supervisor transfers

the call to the appropriate channel. Then, the next function which is to determine if call is a first time call is undertaken. Figure 6-24 shows a DFD of function 2.0 of the system.

Figure 6-24: DFD Function 2.0 – Determine Call Direction
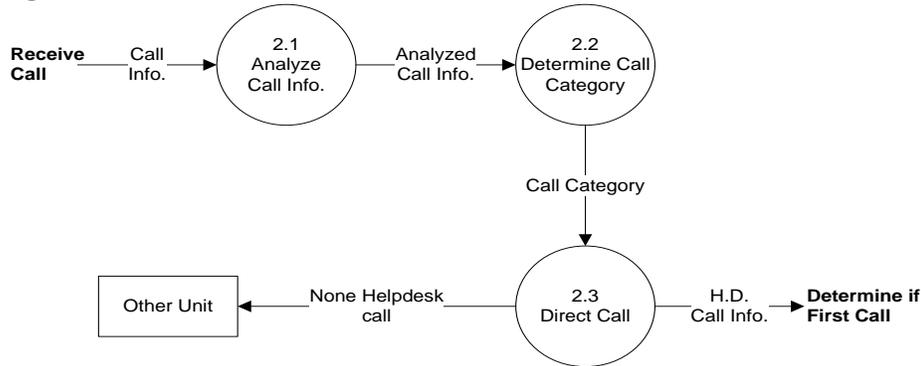
3.0   Determine if First Call

Now the helpdesk supervisor asks the user if it's the first time to contact the helpdesk for such a problem, in some cases secretaries call the helpdesk to follow up on calls of other employees or faculty members and they don't have precise information of whether the call had been recorded, Figure 6-25 represents a DFD of function 3.0 of the system.

Figure 6-25: DFD of Function 3.0 –Determine If First Call
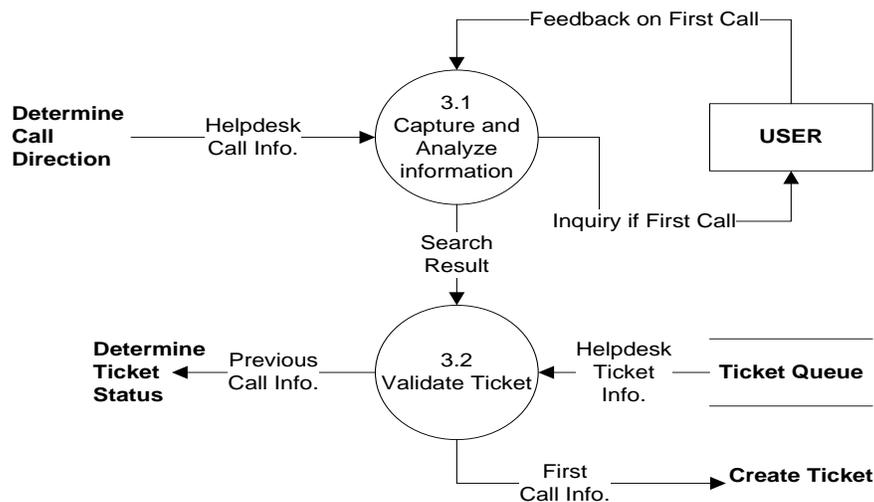
When the helpdesk supervisor exchanges the call information viewed on the ticket queue with the caller, he validates if the call is the same as the ticket listed on the ticket queue, or if not, the helpdesk supervisor goes on to login a ticket into the system. In many cases the supervisor aims to ask the user if it is the first time he/she calls for this matter and counts solely on the feedback provided by the caller, he uses the ticket queue in case the user is not sure whether the call is a first time call or not.

4.0   Create Ticket

IF the call is a first time call, the information acquired from the user is used to create a trouble ticket into the V-tiger system. Before logging the call into the system, the helpdesk supervisor tries to solve the problem at first contact. Due to this practice the helpdesk supervisor may not log all calls solved as FCR into the system. Figure 6-26 demonstrates the flow of this function.

Figure 6-26: DFD of Function 4.0- Create Ticket
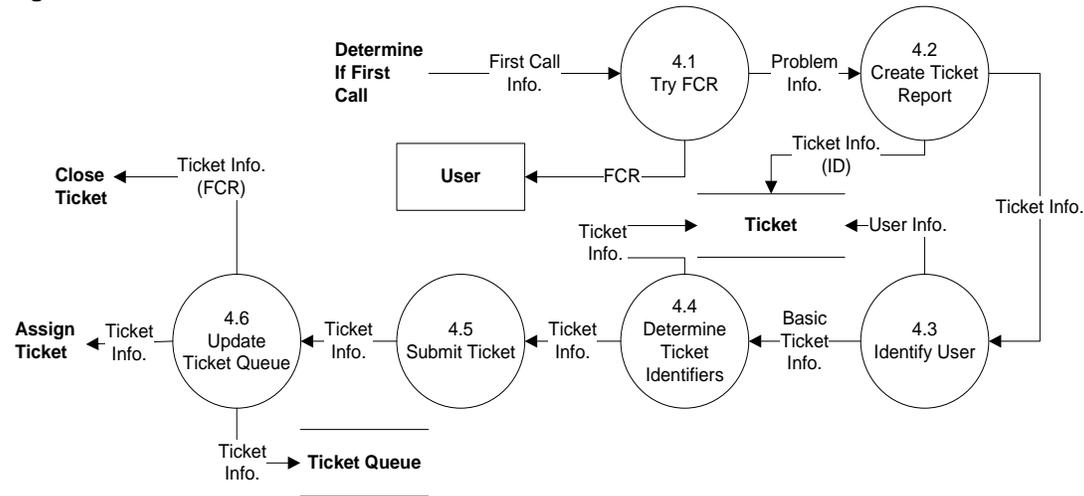
A ticket is created by: entering user's information in the location field, setting a category of the problem, specifying a priority level and entering the problem description into the 'Description' field, and eventually hitting the 'Save' button; these activities take place in the primary form.

5.0 Determine Ticket Status

If the user's call is not a first time call, then the helpdesk agent informs the user with the information available on the ticket of concern. This function is considered a read only function; the agent reads to the user the status of the ticket, and upon the user's call, the helpdesk supervisor informs the assigned agent of the user's call in order to remind him to start resolving the problem. Figure 6-27 shows the DFD of this function.

Figure 6-27: DFD of Function 5.0- Determine Ticket Status
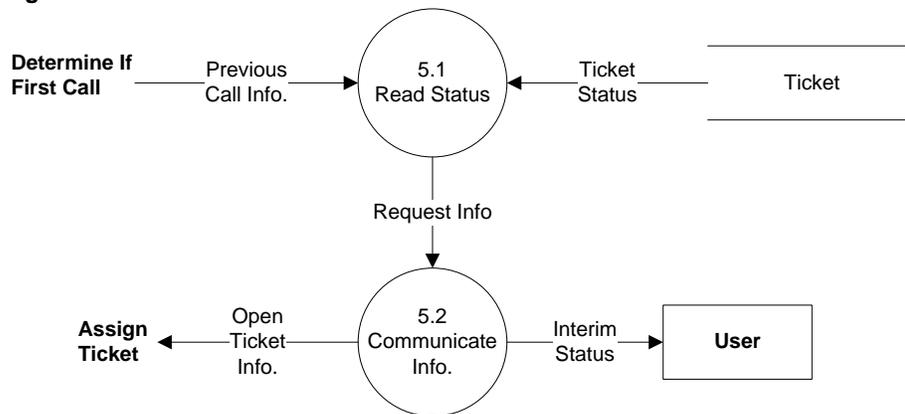
6.0 Assign Ticket

This function receives incoming data flows from 'Create Ticket', the ticket is assigned only once at BZU helpdesk, technical support agents have the privilege to select the ticket of their interest.

Figure 6-28: DFD of Function 6.0- Assign Ticket
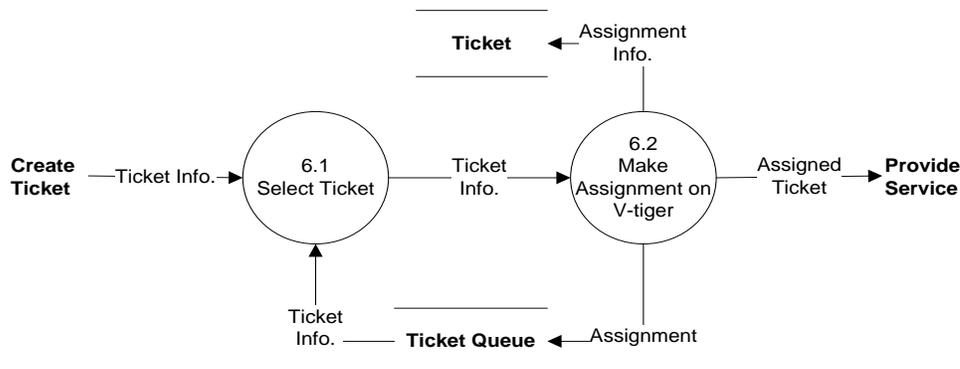
When the supervisor logs a ticket into the system, the ticket appears on the Ticket Queue with an 'Open' status until one of the agents choose to handle the problem. Once the ticket is assigned to an agent, the status of the ticket is changed to In-progress. The agents make sure that they choose a ticket they are capable of handling, they rarely negotiate with other agents the possibility of helping to solve a problem, even when they help each other in solving a problem, the assignee of the ticket stays the same. The Ticket is assigned only once even in case assistant is needed from other agents to solve the problem. Figure 6-28 is a graphical demonstration of function 6.0.

An issue to discuss here is if a ticket is left in the Queue without assignment, in this case, the supervisor negotiate with the agents the possibility of assigning the ticket to one of them, sometimes the ticket stays pending in the Queue for long until the user calls the helpdesk to complain of long waiting time.

7.0   Provide Service

When the technical support agent selects a ticket to handle, the agent views the ticket information and determines its order within his open ticket queue, if any open tickets exist. The agent goes immediately to the location of the problem in order to provide the service, technical support service may be offered in many visits until the agent determines that the problem is resolved. Figure 6-29 illustrates function 7.0 of BZU helpdesk workflow.

An issue to discuss here is if the agent forgets to select a ticket he already assigned to his/her own, in this case, the supervisor reminds the agent to handle the ticket upon a call from the requestor.

Figure 6-29: DFD of Function 7.0- Provide Service
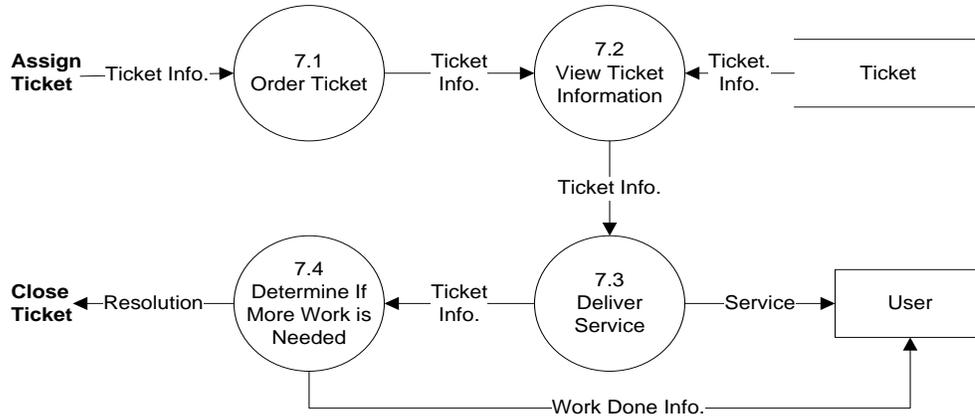
8.0 Close Ticket

When the technical support agent provides support service to user, and determines that the problem is completely resolved, he/she Close the ticket by changing the status of the ticket to Closed.

Sometimes the helpdesk supervisor calls users to make sure the service is delivered, but not all users, the supervisor has no pre-defined bases for service assurance. Figure 6-30 below models this function.

Figure 6-30: DFD of Function 8.0- Close Ticket
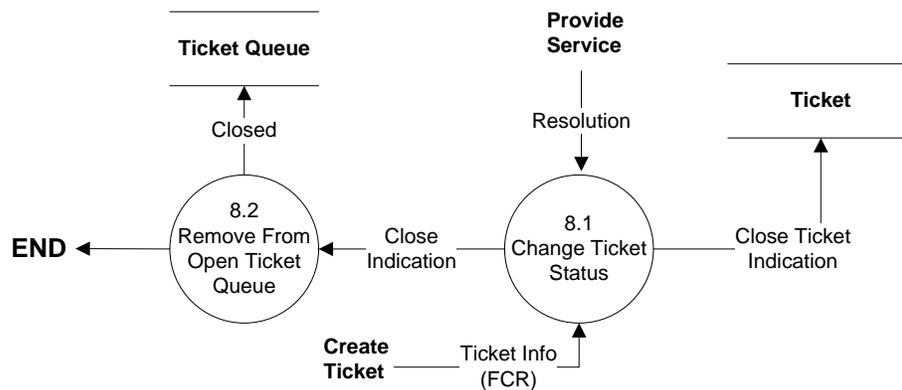
Benchmarking BZU helpdesk Model and the Road Map Model

One area where workflow technology falls a little short is in management reporting. Although technology provides process metrics and monitoring based on audit history, management requires a richer set of information. This study counts on performance matrices beside workflow analysis to evaluate the performance of the helpdesk. In this study, modeling the current BZU helpdesk workflow is done in the following manner; BZU helpdesk model is created by the mean of Data Flow diagrams DFDs and then it is presented to BZU helpdesk staff. The helpdesk staff is then asked to point out to the substitute functions or workflows, if any, implemented instead. The input of the helpdesk staff is used to modify the model and re-presented it to conduct improvements until final approval is gained.

BZU helpdesk model is compared to the proposed Road Map Solution model by: comparing the iterative functions of each main function of the mode, pin point to bottlenecks of the model, and magnifying the importance of adapting to the proposed model. A justification of this methodology can be explained as: the ultimate goal of benchmarking in this study, is not only to apply a benchmarking methodology to show results, but also to adopt the proposed model in order to enhance the workflow of the helpdesk, to pin point to weakness points in order to avoid bottlenecks, and eventually to add value to the service quality provided and to organize the way work is done at the helpdesk.

Therefore, what matters the most is to validate that the missing components in the helpdesk real life experience influences in a way or another the helpdesk performance, the ultimate goal of benchmarking is to show that: the service quality assurance practices that are integrated in the proposed road map solution model, if not applied in real life experience, shall be considered as wasting a chance not only to enhance the current workflow to approach proper model but also failing to achieve leverage to add further value to rendered service at BZU helpdesk.

Benchmarking may be perceived as a step within a series of steps taken for establishing continuous systems improvement process. According to 'AuNet Center', a center housed in the AU- Assumption University which has always engaged in providing total solution to computer networking, published a report in 2002 titled 'Step-by-step Benchmarking AuNet Information Systems', Benchmarking requires: (self-evaluation, identification of weak spots or bottlenecks, definition of metics, identification of processes, policies, and structures of interest).

This research study is concerned with the pure theoretical scope of performance measurement and benchmarking, it suggests a model that can be implemented to achieve excellence but the implementation process is beyond the scope of this study. Planning and Information collection steps are already done in previous stages of the study. On the other hand, this research is concerned with the analysis of benchmarking information.

Analysis of benchmarking information

According to AuNet Center, in the analysis of benchmarking information, the reference benchmarking data gathered from a real system is contrasted with that of the system under the study. In my research, however, Birzeit University's helpdesk system is benchmarked against the proposed road map solution for the helpdesk system, which is a virtual system of my own design which is grounded on scientific theories and its standards are based on solid sources from the literature. The purpose of the comparison in this study is almost the same as this mentioned in Au Net 2002 report which is to identify:

- The performance gaps between the two systems. (Performance Analysis)
- The differences between processes used, and the advantages of implementing different processes. (Process Analysis)
- The difference between the policies applied, and the implications of adopting the reference standard policies. (Policy Analysis)

- The difference between the underlying structures of the two systems, the relative advantages and disadvantages of each. (Structure Analysis)

Performance Analysis

Part of performance analysis is done in previous stages of this study; by generating and applying Gartner Inc. Performance Matrix on BZU helpdesk. Previous sections in Chapter 6 break down the analysis of data and interpret information that relates to the indexes of the modified Gartner Inc. matrix, this section group all measures together in order to evaluate BZU helpdesk performance level. The modified matrix consists of four measures, FCR is an internal measure computed from the analysis of data captured of the electronic call management system, it has the highest weight in the matrix of 35%. User satisfaction, which is the only external measure in the matrix, weights 30%. Then helpdesk staff job satisfaction weights 20% while ART weights 15%.

It worth saying that, in this study the FCR rate in 2009, which is 17%, may not be very accurate; the helpdesk supervisor assured that he expects that the percentage of FCR calls achieved in 2009 is higher than what is captured from the system, he explained that this is because he doesn't log all calls into the V-tiger system, especially those resolved immediately over the phone as FCR. If we look at this task as being one of the most important tasks of the helpdesk supervisor, then we may conclude that there is a weakness in the performance of BZU helpdesk system resulted from the ignorance to log calls into the system, and since this task is not performed in the best efficient way, then, it is feasible to count on the percentage captured form the system, even though it doesn't reflect the actual number of FCR calls, this is because it reflects a downside in the efficiency of achieving tasks at the helpdesk, which has a partial impact on performance measurement even if not mentioned clearly and separately in the performance matrix.

At BZU helpdesk, the average FCR rate is found to be 17% , while Average Resolution Time ART is found to be 40: 39: 47 Hrs: min: sec. The average users' perception of service quality performed by the helpdesk is computed by the factor analysis to be 2.66 and in a 7-point Likert scale, it is equivalent to 38%. While helpdesk staff job satisfaction is found to be 2.94 which in a 5- point Likert scale is equivalent to 58.8 %. Gartner Inc, for instance, in its 2007 statistics report, stated the following as acceptable ratios:

➢ 414 calls per agent per month

➢ 1.15 calls per each user into a Call Center

➢ 63.2% FCR (First Call Resolution) Rate

➢ 7.07% Abandonment Rate

➢ $23.71 Cost Per Call

According to another source of literature, the Erlang C model (Diagnostic Strategies, 2002-2003), has the following formula for the call center: 80% of calls should be answered within 60 seconds. The maximum allowed wait time is 120 seconds, after which we assume callers will abandon the queue. The expected call volume is 100 calls/hour, and the Average Handling Time is 540 seconds. BZU helpdesk system is not efficient enough to generate all information required for Erlang C model, such as the expected call volume because its telephone system is not equipped with an Average Call Distribution ACD software, in addition, the standard Erlang C model assumes certain capabilities and behaviors that cannot always be met in the real world and the concentration of the Erlang model is on telephone trunk service centers. Because of the aforementioned reasons, the researcher will stick with the Gartner Inc. 2007 results as a reference to benchmark BZU helpdesk system performance.

Performance is a measure of how well the helpdesk is meeting the goals of the contract. And since, BZU helpdesk doesn't have a contract with users -'SLA', the references of the best performance is taken from the literature. FCR acceptable

rate is 63%, BZU helpdesk FCR is only 17%, and it falls 46% below the acceptable average of FCR.

The helpdesk staff ratio to users differs from source to another, a number of (35) respondents provided comments in the last section of the users' satisfaction and service quality questionnaire, (11) of which think that BZU helpdesk needs to be aided with more employees because it seems to them that technical support agents are always on the run and rarely available immediately at the time of the call. The helpdesk staff ratio to users according to Gartner Inc, can be calculated by using the following figures:

➢ 414 calls per agent per month
➢ 1.15 calls per each user into a Call Center

For BZU helpdesk, the average number of calls per month until June/2009 reached (164) calls, which yields to an average of (41) calls per technical support agent per month (164/4 = 41), this also means an average of around 10 calls per agent per week. The under based assumption of this calculation, is that: if BZU has 860 employees, then the maximum number of calls received is 989 calls (860 *1.15), the average number of calls per month at BZU is 164 which is 16.5% of the expected maximum number of calls, which aids the following conclusion (grounded upon the assumption that: BZU helpdesk logs all calls into the system): the number of technical support agents is adequate and no more agents are needed to aid the helpdesk. Unfortunately, not all calls are logged into the system, the helpdesk supervisor indicated that he doesn't log all calls into the system especially those which get resolved at the first contact.

Even though Birzeit University helpdesk is not operating in 24/7 or 24/5 timeframe, the researcher will interpret the results of BZU Average Resolution Time ART which is found to be 40: 39: 47 Hrs: min: sec. This ART should be benchmarked against the ART in the SLA where ART is set according to the calls'

severity and priority. Unfortunately, BZU helpdesk doesn't have clear classification for the priority and severity of its incoming support calls; in addition, agents don't set the level of priority of the calls.

As the researcher reviewed the SLA of many Universities in the United states like Stanford, MIT, California and Brown University, I found out that, average resolution time is set out according to the priority level of the calls, such as: calls with severity level 1 is given a 24 hours resolution rate, while calls with severity level 2 is given 48 hours and calls with severity level 3 is given 72 hours. But we need to take into consideration that, these rates are given for helpdesks operating 24/7.

In comparison to BZU helpdesk, the figures will be given a different dimension, the severity level 1 will be assigned 8 hours as the number of operating hours of BZU helpdesk per 1 day, while severity level 2 will be assigned a maximum average of 32 hours (24+8 =32), while severity level 3 will be assigned a maximum average of 56 hours (24+32 =56).

Table 6-1: Benchmarking BZU Helpdesk Performance Matrix

Performance Metric	(1) Weights	(2) Actual %	(3) Acceptable%	(1)*(2) Performance%
Average resolution time	15%	40%	66 %	9.1%
First-contact resolution	35%	17%	60%	9.8%
Employee satisfaction	20%	58.8%	70%	16.8%
User Job Satisfaction	30%	53.91%	70%	16.2%
Total Weightings	100%	Avg. acceptable 66.5%		52%

Another way to benchmark ART, is to set out a minimum number or percentage of calls to be solved within an acceptable period of time. According to a benchmark study conducted in 2006 between MIT and Stanford University in the

United States, it is found that 66% of calls are answered within 3 days of reporting. By considering this benchmark study as a reference to benchmark BZU helpdesk, it is found that only 40% of overall calls (excluding FCR) are resolved within 3 working days of reporting the problem. Table 6-1 shows the benchmarking figures against actual rates of the performance matrix.

Column (1) in Table 6-1, is weights of which the four performance indexes are measured. Column (2) is the actual computed measures at BZU helpdesk of the indexes of the matrix as explained in previous sections of this Chapter. The figures of column (3) are measures that should be captured from the SLA, but since there is no SLA for BZU, the figures are based on the literature; the figures of column (4) are the product of multiplying the calculated values of the measures by their corresponding weights in the index.

If we take a close look at column (3) titled acceptable percentages, the average of acceptable percentages of all measures, is over 60%, which mean an acceptable performance rate of 66.5% is acceptable, (Note: the average of acceptable percentages vary according to the SLA of the service provider). In this case study, the average of overall performance of BZU helpdesk is 52% which is less than 66.5% by % 13 (66.5% - 52% = 14.5%).

Policy Analysis

This is a macro level of the overall approach to information systems, because it is the information systems' policies that determine the processes and lead to differences in performance.

According to AuNet Center (2002), areas of interest for policy analysis (Customers, External environment, Internal communication, Employee relationships, Quality, Innovation, Maintenance, Technological changes)

In this study, the areas of interest are: Customers (BZU users), Quality, Internal Communication, and Technological changes. Policies are derived from

VISION and MISSION statements in order to formulate a SLA with BZU users and supportive units. Policies comparison is to be made against the VISION and MISSION statements, and analyze the process of translating the vision and mission statement into workable policies. Both the process of this translation and the nature of the operational policies are of importance to the benchmarking process. This is the indicator to the top management's fidelity to the organization's vision. Unfortunately, in this case study, BZU helpdesk doesn't have a SLA with users or supportive units.

Structure Analysis

Structure analysis is applied in case BZU helpdesk wants to benchmark its performance against another helpdesk. And since this study is a single case study, BZU helpdesk is benchmarked against the proposed road map solution model. The road map solution model suggests that, the helpdesk has 4 levels of support, starting from level-0 support which is a self-learning and self-helping that is based on a knowledgebase; the knowledgebase stores solutions of problems occurred, in addition to solutions of problems expected to occur in the future. In addition, the model of the processes in the road map solution encompasses the best practices of customers care. It is based on a suggested model based on industrial model for quality of service management. BZU helpdesk system, however, has three tiers of support only, it doesn't have a knowledgebase of solutions, and the V-tiger software lacks many features described in the proposed helpdesk electronic system of the road map solution. Further explanation of the processes' quality assurance practices and structure is demonstrated in the next section of process analysis.

Process Analysis

In analyzing processes, we can use the data flow diagram and process diagram tools available in system analysis and design. In process analysis we use data flow analysis for showing the flow of data in and out of processes, data storages,

and internal and external entities. AuNet suggests that, when the comparison of performance metics shows that the referenced standard is superior, we can investigate how it achieves this superiority by using the modeling process. According to AuNet Center, using the data flow diagram allows us to analyze and compare processes for the same function, and indentify the differences that may be the source of the superior performance.

Table 6-2: In and Out Flows of BZU Helpdesk and Road Map Solution Models

Criteria	Road Map Solution Context Diagram	BZU Helpdesk Context Diagram
N.O. of Data Flows	(7) In data flows and (6) out data flows	(5) In data flows and (5) out data flows
Unique In- flows	Feedback if first call	Confirmation on first call Satisfaction feedback Time scheduled New request related info Latest Work Done
Unique Out-flows	Inquiry if first call	Request ID Inquiry on satisfaction

BZU helpdesk DFD model consists of (8) functions while the road map solution DFD model involves (10). In and out data flows of the two models are identified by examining the context diagrams of the two models. Table 6-2 lists the in and Out data flows of the two models.

The unique in and out flows of the systems give a brief indication about the intensity of communication between the system and the external entities, also the quality of those communications is what matters, the referenced standard shows a quality intensive flows such as: confirmation on first call, satisfaction feedback, and a report on latest Work Done, moreover, the time scheduled data flow is involved in a quality practice where service is served in convenient time for all parties. However, BZU helpdesk unique work flows are criticized by being user oriented.

The functions of the two models also vary, the road map solution is a knowledgebase-centric model, it encompasses an extra function which is Search

Solution that deals with searching the knowledgebase. BZU helpdesk doesn't care about adding new information provided by users to the ticket report, it usually communicates such information verbally, Table 6-3 lists the functions of both models:

Table 6-3: Functions of Road Map Solution Model and BZU Helpdesk Model

Road Map Solution DFD Model	BZU Helpdesk DFD Model
Function 1: Receive Call	Function 1: Receive Call
Function 2: Determine Call Direction	Function 2: Determine Call Direction
Function 3: Determine if First Call	Function 3: Determine if First Call
Function 4: Create Request Report	Function 4: Create Ticket
Function 5: Determine Request Status	Function 5: Determine Ticket Status
Function 6: Record New Information	
Function 7: Search Solution	
Function 8: Transfer Request	Function 6: Assign Ticket
Function 9: Provide Service	Function 7: provide Service
Function 10: Close Request	Function 8: Close Ticket

The following discussion describes the functions of the two models; each function is described with emphasis on the strengths of the road map solution model which is the referenced standard. Weakness points of BZU helpdesk model are also listed in addition to the bottlenecks in the process design of BZU helpdesk.

Function 1: BZU Helpdesk Model   – Receive Call
Function 1: Road Map Solution Model – Receive Call

- This function is modeled the same in the two systems, it consists of two

- processes and leads to the "Determine Call Direction" function, which is also the same in the two systems.

Function 2: BZU Helpdesk Model   – Determine Call Direction
Function 2: Road Map Solution Model – Determine Call Direction

This function is similar in the two systems; it has the same data flows and external entities. The incoming data flows arrive from the "Receive Call" function. At the end

of the function, the data flows, in the two systems, either lead to direct the call to another unit outside the system or to proceed to 'Determine if First Call' function.

Function 3: BZU Helpdesk Model   –Determine if First Call
Function 3: Road Map Solution Model – Determine if First Call

- This function is not similar in the two systems. In BZU helpdesk model, the function involves two lower level functions, it starts by asking the user for answer to the helpdesk inquiry on whether the call is a first time call or not, the caller may or may not provide useful information in response to the helpdesk inquiry, but user's feedback is still the bottom base of information resource.

- On the other hand, the Road Map Solution model starts by searching the 'request queue' for corresponding request of the caller. The supervisor's search result is validated by reading the request details to the user. The caller's role becomes active at later stages of the process; if the caller couldn't make a judgment on whether the request matches the one stacked on the request queue; the issue is left to the helpdesk supervisor to make decision to either proceed as to 'create a Request' if the request is not found in the queue or to 'Determine Request Status' if it exists.

- At BZU helpdesk, the helpdesk supervisor searches the 'ticket queue' upon the user's feedback, however, BZU helpdesk doesn't always validate users feedback by searching the ticket queue, it often takes the users' feedback for granted and proceed to either 'Create Ticket' or 'Determine Ticket Status' upon user's feedback.

Weaknesses

- BZU helpdesk may bother the user by asking on whether the call is a first time call, while it could have incurred information by searching the 'ticket queue'.

- BZU helpdesk counts on the user's uncertain feedback to make decisions to proceed.

Bottlenecks

- Incorrect user's feedback causes the helpdesk to undertake false actions.

- BZU helpdesk electronic system may have duplicate tickets at the queue which may later be handled by different agents. This will cause confusion in the helpdesk and thus will reflect non-professional image to users.

Function 4: BZU Helpdesk Model   – Create Ticket
Function 4: Road Map Solution Model – Create Request

- Both functions aim to log the call into the electronic system; they both receive incoming data flows from 'Determine if First Call'. BZU helpdesk starts with an attempt to provide FCR to the user, if the helpdesk is successful, the call is terminated, if not it creates a ticket by capturing user's identity and other important information like category and details of the problem, and finally submits the ticket. The V-tiger system updates the ticket queue by addition an extra pending ticket to it. A point to clarify here is that BZU helpdesk first assigns the ticket to 'Support Group' which is an anonymous user and sometimes when the FCR is successful, the helpdesk supervisor doesn't proceed to create a ticket and eventually close it.

- This function is handled differently in the Road Map Solution Model; the helpdesk creates the request and plugs in important information to define the request after analyzing the request information. And then, when the request is submitted, the electronic system updates the queue, this task is terminated by determining if more than one request is necessary to provide better and faster service to the user.

Weaknesses

- The function involves not only creating a ticket, but also providing FCR service as well as assignment, thus, the lower level functions are heterogeneous; they differ tremendously in nature, goal and impact.

- In some cases, BZU helpdesk does not proceed to create a ticket especially after successful incidents of FCR.

Bottlenecks

- When FCR is successful, BZU helpdesk changes the ticket status to 'Closed' with no indication to FCR. FCR service delivery time may range from 1 minute to 15 minutes at some incidents, and if the system does not allow for FCR indication, then we will incur inaccurate results by counting solely on the timeframe to calculate the number of FCR incidents.

- Assigning the ticket to 'Support Group', switches the status of the ticket from 'Open' to 'In-progress' which gives false indication about the time when the ticket is first handled.

- Some FCR incidents are performed by a support agent other than the supervisor, agents may not proceed to create a ticket or they may forget to switch the assignee of the ticket to their own in some other cases.

Function 5: BZU Helpdesk Model   – Determine Ticket Status
Function 5: Road Map Solution Model – Determine Request Status

This function is the same in both models; it is basically a read only function, the incoming data flow comes from 'Determine if First Call', and ends by providing interim status to the user. Then, it leads to Transfer Request in the road map Solution model or to Assign Ticket in BZU helpdesk model. The telephone call between the user and the helpdesk is terminated on this function.

Function 6: BZU helpdesk Model   – Assign Ticket
Function 8: Road Map Solution Model – Transfer Request

- In BZU helpdesk model, the technical support agents select the tickets they desire to handle and assign them to their own. Reassigning a ticket is done by changing the status of the ticket to pending and then selecting it by another technical support agent.

- In the road map solution model, Transfer Request function receives data from multiple functions, it receives request information from Search Solution function, and re-open request information from Close Request function, in addition to open request information from Determine Request Status and Provide Service function, the former data flow is a response to the user non-first time call. When the user checks with the helpdesk on the request to make sure that help is on the way; the supervisor checks last modified date on the Work Done sub-form of the request report, and upon last modified date he/she negotiates with the assignee the possibility of reassigning the request to different agent. If negotiations result on keeping the current assignee in charge of the request; the agent proceed to deliver service, if not, the request is assigned to different agent, reassigning a request from Search Solution function and Close Request function start on the same point of the process of assigning an agent, historical assignments are not taken into consideration.

- In the road map solution system, the function of assigning a ticket starts with identifying the category of the request so that the list of appropriate technical support agents is ready for selection. The request is reassigned after taking into consideration the work load on each available agent. A notification is sent by the electronic system to the pager of the assigned support agent as well as to the assignee request queue.

Weaknesses

- The assignment function is over simplified

- It handles incidents of reassigning a ticket similarly, it does not differentiate between assigning a ticket after providing partial service or before proving any potion of service

Bottlenecks
- A ticket may reside in the ticket queue for long before any technical support agent selects it.

- A ticket loses track of its historical assigned agents when it is reassigned in the same way as assigning a new agent to a new ticket, this practice may cause the helpdesk to reassign the ticket over to a former agent who had previously gave up on a ticket. It is important to make sure to keep reassignment incidents to the minimum.

- Reassigning a ticket is impossible after it is resolved. Reassigning a ticket may take place at the close process upon satisfaction feedback; if the supervisor finds out that users are not satisfied with the resolution provided, then the ticket will be reopened and reassigned for resolution.

- Agents are not grouped according to the field of specialization. Agents select whatever call on random or personal bases which causes unbalance in the work load of each agent.

Function 7: BZU Helpdesk Model   – Provide Service
Function 9: Road Map Solution Model – Provide Service

- BZU helpdesk provides service in 4 iterative functions. The agent orders the ticket in his queue manually according to personal-set references. BZU agent provides the service in his convenient time in one or multiple visits. BZU agents do not always log solutions into the V-tiger system due to the fact that

solutions are not stored into a knowledgebase and they are only searched by their main category.

- In the road map solution model, the technical support service is provided in 8 iterative functions. The agent views the request information and accepts the assignment, then he/she schedules service appointment with the user so that the service delivery is performed in appropriate time to both parties. The agent inputs the appointment so that the system can send an alert (15) minutes before the appointment in order to allow enough time for reminding the agent or rescheduling the appointment if necessary.

- The agent records the work done after each service delivery incident, while the step-by-step solution is documented as the last step of providing the service. The status of the ticket is set to Resolved when the service delivery is over or upon submitting the solution.

Weaknesses
- Ordering the tickets is done on random, personal, or location bases; location bases are the most common base due to transportation difficulties within campus.

- Work Done on the call is rarely recorded.

- Solution field in the ticket form is rarely filled with solutions.

Bottlenecks
- BZU helpdesk doesn't schedule service delivery with users; which wastes the time of the agent when the user is not available in office.

- Agents do not share experiences with each other because they don't document the work done or the solution of the problem.

Function 8: BZU Helpdesk Model – Close Ticket
Function 10: Road Map Solution Model – Close Request

- At BZU helpdesk, the ticket assignee closes the ticket when he believes that no more work is necessary and the problem is resolved completely. While in the road map solution, the request status is set to Resolved when the technical support agent is done with the request. The helpdesk supervisor reviews the solution and does any necessary treatment to it before posting it into the knowledgebase, then; the supervisor contacts the user to capture feedback on service quality and user satisfaction. The supervisor closes the call when the user testifies that the problem is resolved and reopens the request if the user demands further service regarding the same problem. When the request is reopened it goes through Transfer Request function for reassignment, while when it is closed, it is removed from the request queue.

Weaknesses
- The assignee closes the request he already assigned to his/her own.

- BZU helpdesk ignores to capture users' satisfaction feedback on every single incident.

Bottlenecks
- The assignee may close the request by mistake, and thus the request is lost in the request queue.

- When the agent closes the ticket, it is not possible to reopen it again.

6.3. Conclusion

The results of the data analysis are not fully useful without benchmarking them against acceptable references. This study proposes minimal acceptable ranges of: 66% of ART, 60% of FCR, 70% of job satisfaction, and 70% of users' satisfaction, this means an average of around 70% of acceptable overall helpdesk performance. Helpdesk management can modify the benchmarking figures within

users' service level agreement. Unfortunately, the results show that the efficiency of BZU helpdesk performance is 52% which is below the acceptable range of 66.5% by almost 14%.

To step forward to improve the performance of BZU helpdesk, a road map solution already explained in Chapter 4 of the study, proposes a DFD model that design the way the service is made and delivered to users. Performance problems can be due to any number of reasons such as an ineffective design of the way work is performed at the helpdesk, a technical architecture, lack of resources issues, and staff experience or education. This study focuses intensively on the design of the workflow of the functions of BZU helpdesk, the assumption is that BZU helpdesk workflow fails to add quality to users and optimize the helpdesk performance. Therefore, the DFD model of BZU helpdesk is benchmarked against the proposed DFD model which is developed as part of the road map solution for the helpdesk system. The road map solution functions are described to emphasis on the strength points of the proposed methodology, while weakness points of BZU helpdesk system are outlined clearly for each function as well as to the bottlenecks of each. The impact of the benchmarking process will be explained in the next chapter.

In conclusion, in order to ensure that the helpdesk is functioning according to the best 'customer care' practices and is providing quality of service that achieves users' satisfaction, it is suggested that the helpdesk follows the suggested DFD logical model. This modeling approach maintains the helpdesk performance efficiency and can easily deploy the service quality indicators into the functions of the systems, moreover, the recommendations and suggestions, drawn in later stages of the study from the analysis of primary and secondary data, can be better implemented in the form of DFDs modeling rather than a list of instructions and guidelines. It is expected that, the DFDs of the proposed helpdesk system of this study can work in harmony with the performance measurement methodology in real life practices. For this case study, BZU helpdesk shall first adapt to the proposed

knowledgebase-centric approach of modeling the helpdesk functions so that it can achieve cultural transition by transforming the academic environment into a self-learning and self-helping one. The use of an electronic helpdesk system also ensures that the helpdesk is gradually reshaping its traditional reactive role to a more proactive and professional service provider.

7. Chapter 7: Recommendations and Implications

7.1. Implications of Data Analysis

The study aims to investigate the performance level of BZU technical support helpdesk by developing a methodology for measuring helpdesk performance. The rendered service of the technical support helpdesk is characterized by the amount of quality perceived by users. Service quality and users' satisfaction both point to the level of performance, the literature demonstrates many debates about the nature of the relationship and the cause and effect relationship between the two constructs, but the most important thing is to validate that both constructs really measures what they intend to.

A one-sample Kolmogorov test for normality of the sample returned high significance which means that the distribution of the data is normal. In order to confirm that service quality and users' satisfaction are related, a correlation analysis and linear regression is done on the two constructs, and the results indicate a positive significant relationship between service quality and users' satisfaction, which also means that the factors of service quality can be used to measure users' satisfaction, moreover, the data analysis shows that the higher users perceive service quality, the higher their level of satisfaction.

To further examine the relationship between service quality and users' satisfaction, a t-test is done to investigate the difference of service quality and users satisfaction across academic and administrative staff, the test returned a higher result of perceived service quality in favor for academic staff members while administrative staff members expressed better satisfaction than academic despite their lower level of perceived service quality. However, the differences of both scores are not very insignificant, thereof, we can't generalize the results of the findings; we can further investigate the reasons behind this slight difference. The reason behind it may be because administrative staff members reside in their offices

more often than academic staff, so that the probability a technical support agent will find an administrative staff in office to provide service at any random time is higher than that of finding an academic staff member who leaves office for lectures, BZU helpdesk agents do not set an appointments before providing the service which also lower the probability of finding the academic staff members in offices and therefore lengthen the resolution time and cause dissatisfaction.

An intensive analysis, based on the IT experience level of BZU users and its relationship to users' satisfaction is performed in this study. The factors that determine the level of users' IT experience are: (1) users' need for IT training, (2) the number of technical support requests per month, (3) the average number of hours of using computers daily, (4) the average time tolerated in waiting for resolution, (5) users' opinion toward self-learning and helping by searching solutions for technical support problems through a knowledgebase, (6) users self-evaluation of their overall IT experience level, and (7) the number of years of work experience at Birzeit University. The data analysis results showed that, the users' satisfaction level is affected negatively when: the users' need for training is low, the satisfaction level is lower with the increase of the number of technical support requests, and when users use computers more often while tolerating longer period in waiting for resolution, it is also found that satisfaction level is lower for those users who are against using a knowledgebase to search for technical support solutions, and the higher users' self-evaluation of their overall IT experience the lower their level of satisfaction, it is also lower for new employees at Birzeit University.

The results of the analysis indicate that users' satisfaction differs across different factors that thought to reflect users' IT experience. The factors that affect users' demands for better service quality affect users' satisfaction negatively. Table 7-1 is a summary of the results of users' IT experience level and its impact on their satisfaction level. BZU needs to provide training sessions for users so that they

become more experienced in IT related field, BZU cannot do any action toward other factors to cause any variance in users' satisfaction.

Table 7-1: BZU users IT experience level and its impact on their satisfaction level

Indicators of IT experience	The Impact on users' Satisfaction (-)
Need for IT training (-)	The lower the need for IT training, the lower is the satisfaction level
Number of technical support requests (+)	The more the number of technical support requests, the lower the satisfaction level
Number of hours of using computers (+)	The higher the number of hours of using computers, the lower the satisfaction level
Average time tolerated in waiting for resolution (+)	The longer users tolerate waiting for resolution the lower the satisfaction level
Opinion toward using a knowledgebase (-)	Users against using the knowledgebase, experience lower satisfaction level
Self-evaluation of IT experience (+)	The higher users evaluated their IT experience, the lower the satisfaction level
Work experience (-)	The shorter users been working at BZU, the lower their satisfaction level

The multi-variant factors analysis validated the SERVPREF instrument used to measure the helpdesk performance through service quality indicators which in its turn reflects perceived users satisfaction. the SERVPREF instrument shows that BZU helpdesk performance can be described according to the following five construct, ordered in correspondence to the mean of users' satisfaction, (Empathy M: 4.57, Assurance M: 3.86, tangibles M: 3.81, responsiveness M: 3.7, and reliability M: 3.29). The results of the instrument lead us to suggest that: in order for BZU helpdesk to boast its performance level, it needs to concentrate on the service quality factors involved in the reliability and responsiveness constructs and not neglecting enhancing practices necessary for other constructs, therefore, I suggest, upon the results of the analysis of the SERVPREF instrument, that BZU helpdesk take care of the following:

- To adhere to the appointments it sets with users and to respect its promises especially those related to time setting.

- Exert more effort on follow-ups on the problems and make it a policy for all calls.
- Enhance coordination among staff members by making the supervisor the central point of contact for exchanging information and setting appointments.
- Set priority for calls, this is also important in developing SLA where priority and severity of call determines the acceptable average resolution time for the problem.
- Become more initiative, proactive and aggressive in attempting to solve problems of users once and for all.
- Enhance response time on the telephone and in providing service to users.
- Communicate properly with users by avoiding complex phrases and by providing explanation of the causes of the problem and its consequences.
- Enhance first contact resolution FCR which has a big influence on users' satisfaction and employee satisfaction as well.
- Record history of the problem, including assignment history in order to provide better explanation of the nature of the problem, and to offer easy follow-ups.
- Attempt to provide adequate service that guarantee solving the problem for ever.
- Answer all incoming inquiries of users that are received through the telephone, email, or Ritaj system.

It is interesting to notice that the SERVPREF instrument yielded a score of 53.9% of performance for BZU helpdesk based on service quality indicators which is very close to the result of the performance matrix of this study which is 52%, the 1.9% difference can be considered insignificant and it may be due to not logging all calls into the system. This study states that BZU technical support helpdesk needs to boast its performance from 54% to a minimum acceptable of 66.5% (which is the average of all acceptable references of the construct of the performance matrix). In

order for BZU helpdesk to boast its performance, it needs to enhance its service quality through concentrating on the service quality indicators of the SERVPREF instrument. BZU helpdesk also needs to enhance its electronic system and the procedures it follows to deliver technical support service. It is important for BZU helpdesk to adapt to the helpdesk model proposed in the road map solution of this study. BZU helpdesk needs to overcome the weakness points in its functions through the following:

- Make the supervisor the central point of contact.
- Set up appointments with users to provide technical support service at their convenient time.
- Log all calls into the system even those with FCR. FCR incidents are best closed by setting their status to 'FCR' and not 'closed' like other tickets. This is because FCR incidents may vary in correspondence to the time spent in resolution which will make it hard to classify them against other calls especially that the technical support agents at BZU helpdesk picks up the phone and perform FCR just like the supervisor.
- It is important to record the work done and solution of the problem in order to build a foundation for the knowledgebase.
- It is important to record assignment history and to consider reassignment when the call resolution takes long, and when the agent cannot pursue the service or when the user is not satisfied.
- Not to let the assignee close the ticket of his/her own. The supervisor should contact the user to get feedback on satisfaction and the ticket will be either closed or reassigned upon the users' satisfaction feedback.

It is expected that, if BZU helpdesk follow the suggestion of this study, it would be able to boast its performance level and achieve better users' satisfaction level. In order to boast its performance, BZU helpdesk needs to focus on improving the infrastructure of network facilities, (24%) of overall problems facing BZU users

are related to networking and internet issues, the computer center infrastructure officer stated that the computer center invested $280,000 in advancing BZU network infrastructure, it may be feasible if the computer center evaluate the basis under which the budget is allocated, in addition, the questionnaire showed that the second most common problem is related to printing, which requires more attention from the computer center. The computer center director, before conducting the questionnaire, stated in the preliminary interview that: printing services is on the top of priorities, one of the technical support agents is dedicated for printing services in addition to performing basic support tasks.

The questionnaire also shows that only (21.6%) of respondents request technical support from designated technical support agents in their departments or faculty building. This is a dangerous indicator; I suggest that an investigation is conducted to study the feasibility of such decentralized technical support centers. As a basic investigation approach, technical support agents are required to log their daily calls into a spreadsheet so that they keep a record of the number of incidents they deal with and the nature of problems they usually encounter. Benefits of decentralized service centers need to be re-evaluated.

I strongly suggest that BZU helpdesk adopt to the knowledgebase-centric approach of the technical support helpdesk, 90% of BZU users indicated their willingness to self-help themselves when they face a technical support problem by logging into a knowledgebase and search for a step-by-step solution to their problem. Only (2.1%) of users indicated that their IT experience falls in the basic zone while the rest of the sample think that they have medium to high IT experience level, therefore, we can conclude that BZU community can adhere to the practices of the knowledgebase-centric approach, in addition, training workshops will improve the users' skills, (90%) of respondents indicated their support to establish a specialized training center for users and (52) respondents out of (97) expressed their need for IT training.

The performance matrix used in the study indicates that BZU helpdesk needs to boast its performance from being 54% to a minimum acceptable of 66.5% (which is the average of all acceptable references of the construct of the performance matrix) by enhancing its FCR, average resolution time ART, users' satisfaction, and employee satisfaction. FCR, ART and users' satisfaction can be improved by adhering to the best practices of service quality. While enhancing employee satisfaction of BZU helpdesk staff can be achieved by concentrating on the following:

- Provide training for staff in technical support troubleshooting and skills, in addition to customer care.
- Share strategic goals and expectations with staff and get them involved in the planning process.
- Enhance the promotion system, a suggestion may be to promote staff according to the number of calls performed, average resolution time and users satisfaction toward single incidents.
- Expand flexibility in scheduling shifts; this aspect is one of the least aspects scored in the staff questionnaire.
- Paid vacation is also one of the least aspects scored by staff in the job satisfaction questionnaire, the computer center management need to investigate the reasons behind employees' discomfort toward this aspect and deal with it properly.

The next section of the chapter concentrates on the strategic role of the helpdesk and the importance of boasting its performance in correspondence to strategic driven activities.

7.2.   Helpdesk Strategic role

The past five years have seen enormous changes in the helpdesk and technical support industry, due to factors such as technological evolution, the need for more efficient business practices and changing customer requirements and demands. Customers are demanding service level agreements SLAs and require detailed reports on how the technical support helpdesk is or is not meeting its needs. Helpdesks and technical support centers must understand and master all these factors in order to perform their jobs with excellence. Another key change factor is represented by the increasing use of common performance matrices in helpdesk and support centers.

"The helpdesk of yesterday was focused on problem resolution", said Ron Muns, founder and CEO of HDI, the world's largest membership association for service and support professionals and the premier certification body for the industry. "Today, successful helpdesks are transforming into full function strategic helpdesk, where they need to focus on much more than just calls and problems, they need to focus on much larger issues such as promoting the benefits of the helpdesk to the organization overall, and most importantly, understanding and aligning with and supporting the larger business objectives".

The strategic role of the academic environment resides in enhancing the teaching experience at the University by successful implementation of technology tools into the academic experience and facilitating communication among the University's community and with external bodies through technological enablers. A technical support helpdesk supervisor may be responsible for building a support center from scratch, but more likely he/she is being charged with transforming the helpdesk from a small, traditional, reactive stage to a larger, more proactive stage or from a proactive to a knowledgebase-centric center that aims to transform the community into self-learning and self-helping one. Technical support helpdesk supervisor needs to implement strategies for delivering quality service and support to

users. He/she also needs to master negotiating skills for maximizing helpdesk staff relationships. Understanding the role of new tools such as knowledge management and how to implement them into the support environment is also crucial.

The technical support helpdesk supervisor at Birzeit University is identified as an experienced management position directly responsible for providing strategic leadership to the helpdesk. Maintaining the performance of the technical support helpdesk is a non stopping task of the helpdesk supervisor, it requires a strategic vision and advanced team management skills, not only does the helpdesk supervisor need to implement quality strategies, he/she also needs to measure performance against goals and or according to a well-defined performance matrix, and make the changes necessary to keep the support service up to a users' satisfactory level.

The helpdesk supervisor should generate periodic reports from the system and analyze data proceeded from the call management system periodically. Assessment of performance level is necessary on periodic bases so that the helpdesk can identify the most active agents and the average resolution time consumed in providing service. This performance report need to indicate strength and weakness points by touching on the things that the helpdesk had been performing either good or bad in. The report may also include proactive practices of most common problems appeared lately in campus. The report must be transparent and shared with users despite its readings.

Due to the increasing demands placed on helpdesk supervisor position and evolution of helpdesks as they become increasingly strategic, a set of best practices and industry standards was needed for this position. Benda (2004) mentioned in his article "transforming the Help Desk" that HDI members and support industry experts developed a set of standards to ensure helpdesk management best practices across the industry. These best practice standards fall into four categories: customer (user), financial, planning and leadership. Helpdesk operating in the academic environment

handles the financial part differently than those operating in commercial revenue driven environments.

New BZU helpdesk agents, especially new graduates, need to undergo an intensive training program in technical support service skills and customer care best practices in order to become more productive and to build a career in IT service industry. Training is considered part of the development opportunities that influence staff job satisfaction. It absolutely adds on the value of service provided, trained staff are faster performance because they acquire advanced skills in troubleshooting and repair techniques, they follow customer care best practices to enhance the service delivery experience. Certified staff adds up to the assets of the helpdesk, certifications reflects a sense of professionalism and motivate self-confidence of helpdesk staff. It also retains staff loyalty and lower voluntary turn over.

7.3.   Helpdesk Environment

There is no doubt that enhancement in the surrounding work environment of the helpdesk influences productivity & performance, satisfaction, and its interrelated relationships. SLA is an essential element of any management plan or strategic vision, it is the basic factor by which business units present identity, explain goals and mission, communicate vision and strategic objectives, and state quality assurance practices and indicators. All service units at Birzeit University should write an internal contract with its clients in addition to its subordinates, the helpdesk is no exception, BZU helpdesk should start writing SLAs soon in order to step forward toward a professional position in IT service industry. Knowing that the helpdesk has been providing service for over than 10 years without having a SLA is a depressing fact.

BZU helpdesk also needs access to more resources in order to enhance their reliability. A method transportation between campus buildings should be offered, the transportation problem causes long average resolution time, less reliable service, low

job satisfaction and therefore influence the overall helpdesk performance by encouraging users' dissatisfaction. This problem can be avoided by either offering the helpdesk a transportation vehicle in campus or by allowing the helpdesk to use BZU security vehicle which will also allow for maximum resources exploitation at Birzeit University.

Collaboration tools highly aid the functions of helpdesk; the telephone is the most used method to contact the helpdesk not only at Birzeit University but elsewhere. A user waiting for long on the helpdesk busy line causes dissatisfaction, calls distribution softwares are very efficient in distributing calls exponentially among staff members when more than one call is waiting on the line. It is also useful in counting the number of answered calls and abandoned, in addition to average queue time, which is more important for call centers. Helpdesk staff is not obligated to call many times to schedule service appointments if the user is not available in office, thus, Installing a voice mail system that is empowered with ID identifier serves as an acceptable solution. Users and helpdesk staff can leave messages on the voice mail and read messages stored in their inboxes at their appropriate time. This mechanism enhances the helpdesk responsiveness. The telephone is the most common method of contacting the helpdesk, 46% of calls are reported via the telephone. Empathy construct in the user satisfaction and service quality questionnaire, which mainly measures the efficiency of BZU helpdesk in using the telephone system, is measured to be (65%) which is the highest among the remaining four constructs. However, on the bases of overall performance of the helpdesk over the phone, the results of the analysis show a satisfaction score of 3.89 out of a 7-point Likert scale, which indicates a low users' satisfaction level. It is highly suggested that Birzeit University uses voicemail boxes for each telephone number in campus so that users can exchange messages with the helpdesk at any time.

In the user satisfaction and service quality questionnaire, (52) users out of (97) stated their need for training; this need is considered beyond the responsibilities

of the helpdesk. It should be looked at as a non-stopping activity, a suggested solution to continuously enhance users IT experience is through two approaches. The first is carried out by a specialized business unit at Birzeit University to develop high quality customized IT training programs targeting two groups, the first is new employees who are also new users for the helpdesk, and the second is current users who construct the majority of BZU community. The helpdesk should also develop appealing multimedia tutorials on new services and for proactive solutions to encourage users to capture skills and extend their knowledge.

Birzeit University needs to solve the problem of the helpdesk transportation between buildings in campus, so that the average resolution time will be reduced tremendously. Upon providing the needed service, BZU helpdesk should capture satisfaction feedback from users for each technical support request; this practice helps describe the service quality provided more efficiently. BZU helpdesk should not allow the assignee of the ticket to close the ticket upon completion; it is recommended that the helpdesk supervisor closes the requests upon capturing satisfaction feedback from users.

In conclusion, BZU helpdesk is advised to organize the way it performs its functions by following the road map solution proposed in this study in order to become more responsive, provide reliable service, and attain users' satisfaction. It should also empower the helpdesk supervisor with the skills and qualifications that make him/her able to bring the best out of the helpdesk staff and to present the strategic role of the helpdesk that has an impact on the overall performance of the University. There is no doubt that, enhancing the general situation of the helpdesk requires top management support especially that, improvement activities should include other units beside the helpdesk.

7.4. Contribution and Outcomes

The study reflects a set of characteristics and facts about the helpdesk in the academic environment. It suggests a framework that put important performance characteristics together in order to formulate a roadmap solution for the academic helpdesk, the main objective of the roadmap is to be used to: plan for service-rendering procedures, order priorities, define the nature of relationships within the helpdesk and with external units, flag bottlenecks in procedures to re-design the framework, and most importantly, to not neglect planning for crucial situations and to suggest possible alternative plans in case of emergency. The following section illustrates a personal vision of what a roadmap solution for the academic helpdesk could be; however, this personal vision is not totally a subjective construct, it is a drive of the outcomes of the analysis of the performance index of the helpdesk in the academic environment which is also a focal baseline in this study and a major contribution as well.

A Road Map Solution for the Academic Helpdesk

It is necessary for the helpdesk system to have a mission statement, strategic vision, and short-term goals. Technical support services at the helpdesk are heterogeneous, therefore, they need a designated channel to manage and organize the workflow at the helpdesk, the helpdesk supervisor, should be in such a control position, the power of the helpdesk system resides in the technical experience of the helpdesk staff and the professional management of the helpdesk supervisor.

A suggested road map solution for organizing the workflow at the helpdesk is illustrated in the benchmarking section of the study. The road map solution consists of the following components:

- Define technical support services provided by users

- Define business units that interact with the helpdesk to provide technical support service

- Order tasks in each process and identify the outcomes

- Build a sufficient mechanism to guarantee assurance

- Develop a substitute mechanism if necessary

The five components are distinct and separate but dependent. The road map starts with defining the technical support services provided to users, and as mentioned in previous chapters; this can be professionally done by creating service level agreement SLA. The SLA states the responsibilities of each party toward the other, determines the timeframe of providing services and maintains service quality indicators. SLA is considered the baseline of building blocks of the road map solution.

The second component is to define the relationship with the subordinates who contribute their efforts in aiding helpdesk services. The quality of the helpdesk service is affected by the quality of services provided by other units; moreover, the perception of service quality comes solely from that final service delivery by the helpdesk who is the service provider front line. Being the front line of service delivery makes the helpdesk responsible not only for its own technical support services but also for services provided by other supportive units due to its contribution in the service delivery process. Because of that a SLA should also be defined between the helpdesk and its subordinate units, in addition, subordinate units should have SLAs defined for their service delivery with all their subordinate units. Setting SLAs or what so-called service contracts, is not only important for the helpdesk but also to all service units at the University. Setting policy for all service units strengthens the strategic vision of service units and the deployment of service quality practices.

Figure 7-1: Road Map Solution of the Helpdesk in the Academic Environment
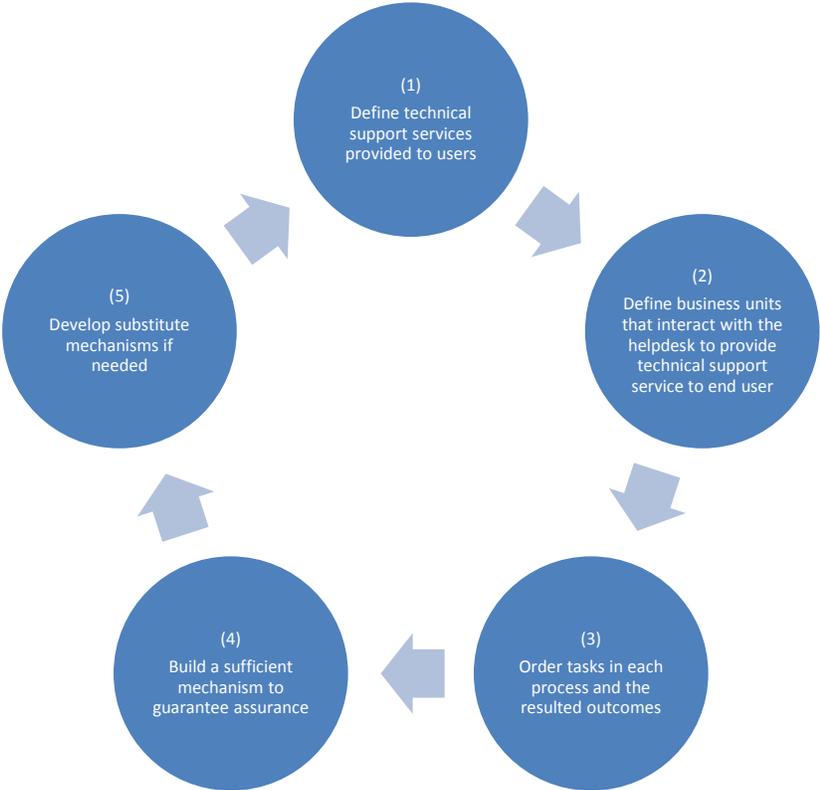
The third component in the road map solution is to model the helpdesk system in an attempt to put all tasks and functions in order. Modeling the helpdesk system, by the mean of DFDs, organizes the logical workflow of the helpdesk through ordering the flow of the functions to perform a specific technical support service. The suggested model differs from traditional views of modeling the helpdesk system, in that; it is designed as a knowledgebase-centric and not only user-centric model. The purpose behind integrating knowledgebase into the helpdesk model is to transform the University's community into a self-learning and self-helping one, it also enhances the proactive reaction to aggressively avoid repetitive inconvenient incidents.

In an effort to complete the road map solution of the helpdesk system, a general quality service management model is proposed to set up the baseline of an

overall technique to guarantee service quality management. The description of the processes' involved in the proposed helpdesk system involves quality assurance practices that the helpdesk should take care of along the way while delivering technical support service. Brainstorming workshops for the helpdesk staff and a steering committee from the community are very effective in defining the best practices of service delivery, helpdesk technical support agents should be encouraged to adapt to them in providing services in the pre-service and service delivery stages.

The only aspect of quality assurance that the helpdesk's DFD model comes short on is the reporting component of the service evaluation stage of the general service quality management model, this missing aspect is covered in performance measurement methodology, generating periodical reports is a pure administrative task of the helpdesk supervisor, the task of capturing and analyzing calls' statistics is done on periodical bases to point to indications of different performance aspects of the helpdesk system. The helpdesk should share the performance reports with users; this will effectively influence staff productivity.

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9. Appendix A: BZU Users' Satisfaction and Service Quality Questionnaire

من : مساعدة نائب الرئيس للشؤون الأكاديمية للتطوير الأكاديمي

إلى: أسرة الجامعة

الموضوع: المشاركة في استبيان تقييم جودة الدعم الفني
المقدم من Help Desk

ضمن توجه الجامعة لدعم أعضاء الهيئة التدريسية والكادر الإداري المساند بكافة الوسائل الممكنة لتسهيل مهامكم، ندعوكم للإجابة عن استبيان تم تحضيره لتقييم جودة الخدمات التكنولوجية التي يقدمها قسم الدعم الفني **" Help Desk "**.

نرجو المشاركة الواسعة في الاستبيان الذي تم توزيعه على وحداتكم ودوائركم وتسليمه إلى نـــور شركـــس /مكتب عميد كلية الهندسة.

مع فائق الاحترام،

د. ميرفت بلبـل

استبانة عن جودة الخدمة التي يقدمها قسم الدعم الفني
في مركز الحاسوب/ جامعة بيرزيت

تنـــويه

يقصد بقسم الدعم الفني "Help Desk" القسم التابع لمركز الحاسوب والذي يقدم المساعدة الفنية والخدمات التكنولوجية . كما ويقصد بالأجهزة التكنولوجية جميع الأجهزة بمختلف أشكالها من جهاز حاسوب وطابعة و Scanner و LCD، وغيرها.
أرجو الإجابة عن جميع أسئلة الاستبانة والتي ستستخدم نتائجها في تقييم جودة خدمة قسم الدعم الفني لتحديد النقاط التي تحتاج تطويرا .
مع العلم أنه سيتم مراعاة الخصوصية.

القسم الأول: الاتصال بقسم الدعم الفني

لم تستخدم أبدا	أكثر استخداما دائماً 5	غالباً 4	عادةً 3	أحياناً 2	أقل استخداما نادراً 1	(.1.) ما مدى استخدامك للوسائل أدناه للوصول إلى قسم الدعم الفني ؟
☐	☐	☐	☐	☐	☐	(a) الهاتف
☐	☐	☐	☐	☐	☐	(b) البريد الإلكتروني
☐	☐	☐	☐	☐	☐	(c) الحضور شخصيا
☐	☐	☐	☐	☐	☐	(d) عبر نظام رتاج تحت عنوان "request technical support"
☐	☐	☐	☐	☐	☐	(e) طريقة أخرى: (حدد/ي) _____

مرتفعة 7	6	5	4	3	2	منخفضة 1	إذا كان **الهـــاتف** هو أحد الطرق التي تستخدمها للوصول إلى قسم الدعم الفني، يرجى الاجابة عن معايير التقييم التالية:
☐	☐	☐	☐	☐	☐	☐	(.2.) عند طلبك الخدمة عبر الهاتف، يطرح قسم الدعم الفني أسئلة أو يزودك بمعلومات واضحة عن طبيعة المشكلة
☐	☐	☐	☐	☐	☐	☐	(.3.) ثقتك بكفاءة الشخص الذي يجيب على هاتف القسم في مجال الصيانة
☐	☐	☐	☐	☐	☐	☐	(.4.) السرعة في الإجابة على الهاتف و استقبال مكالمتك
☐	☐	☐	☐	☐	☐	☐	(.5.) نسبة الحلول الصحيحة المقدمة مباشرة عند الاتصال بالهاتف لطلب خدمة
☐	☐	☐	☐	☐	☐	☐	(.6.) تطابق التشخيص الأولي للمشكلة على الهاتف مع حقيقة المشكلة
☐	☐	☐	☐	☐	☐	☐	(.7.) ثقتك بأنه يتم توثيق المشكلة ومتابعتها بعد المكالمة

لم تحدث	دائماً 5	غالباً 4	عادةً 3	أحياناً 2	نادراً 1	(.8.) ما هي المشاكل الفنية التي تواجهك أثناء العمل وتدفعك لطلب الدعم الفني؟
☐	☐	☐	☐	☐	☐	(a) شبكة الانترنت والبريد الإلكتروني
☐	☐	☐	☐	☐	☐	(b) نظام رتاج
☐	☐	☐	☐	☐	☐	(c) برامج الحاسوب – software problems
☐	☐	☐	☐	☐	☐	(d) عطل جهاز الحاسوب
☐	☐	☐	☐	☐	☐	(e) عطل في الطابعة
☐	☐	☐	☐	☐	☐	(f) مشكلة / مشاكل أخرى (حدد/ي) _____

القسم الثاني: الرضى عن جودة الخدمة المقدمة

الرضى عن مستوى جودة الخدمة المقدمة							يرجى الاجابة عن معايير التقييم التالية لمدى رضاك عن جودة الخدمة التي يقدمها قسم الدعم الفني:	
مرتفعة						منخفضة		
7	6	5	4	3	2	1		
☐	☐	☐	☐	☐	☐	☐	السرعة في حل المشكلة وتقديم خدمة الصيانة	(.9.)
☐	☐	☐	☐	☐	☐	☐	السرعة في تقديم الخدمات الإدارية من تحضير اسم مستخدم جديد، تسيير طلبات شراء أجهزة وغيرها	(.10.)
☐	☐	☐	☐	☐	☐	☐	حل المشكلة عند الزيارة الأولى	(.11.)
☐	☐	☐	☐	☐	☐	☐	توضيح أسباب المشكلة وشرح ما يترتب عليها	(.12.)
☐	☐	☐	☐	☐	☐	☐	الربط بين المشكلة الحالية التي تواجهك والمشاكل السابقة المتعلقة بالعطل أو المشكلة الحالية	(.13.)
☐	☐	☐	☐	☐	☐	☐	الخدمة المقدمة كفيلة بحل المشكلة على المدى البعيد وتجنب تكرار حدوثها	(.14.)
☐	☐	☐	☐	☐	☐	☐	الحصول على إجابة للاستفسارات المطروحة	(.15.)
☐	☐	☐	☐	☐	☐	☐	المتابعة معك أولا بأول لإعلامك باخر المستجدات المتعلقة بمراحل حل المشكلة	(.16.)
☐	☐	☐	☐	☐	☐	☐	معاودة الاتصال بك للتأكد من أنه قد تم تقديم الخدمة التي طلبتها بشكل كامل ومرض لك	(.17.)
☐	☐	☐	☐	☐	☐	☐	التزام قسم الدعم الفني بالمواعيد التي يحددها	(.18.)
☐	☐	☐	☐	☐	☐	☐	التعاون والتنسيق بين موظفي المركز لحل المشكلة	(.19.)
☐	☐	☐	☐	☐	☐	☐	اعتقادك بأن موظفي القسم يعطون أولويات صحيحة للمشاكل الأكثر حساسية (مثلا التي تؤثر على مستخدمين أكثر أو معلومات حساسة)	(.20.)
☐	☐	☐	☐	☐	☐	☐	ثقتك بالمعرفة والخبرة الفنية لموظفي قسم الدعم الفني	(.21.)
☐	☐	☐	☐	☐	☐	☐	تواصل الموظفين معك باستخدام لغة تواصل واضحة وسهلة لتوصيل المعلومات والارشادات	(.22.)
☐	☐	☐	☐	☐	☐	☐	مبادرة موظفي القسم لمساعدتك بشتى الوسائل الممكنة	(.23.)
☐	☐	☐	☐	☐	☐	☐	لباقة موظفي قسم الدعم الفني	(.24.)
☐	☐	☐	☐	☐	☐	☐	مستوى ثقتك بموظفي القسم للمحافظة على خصوصيتك وبياناتك على الأجهزة	(.25.)
☐	☐	☐	☐	☐	☐	☐	إعطاء التوجيهات اللازمة للمحافظة على امن وسرية المعلومات والبيانات المحفوظة على أجهزة الحاسوب	(.26.)
☐	☐	☐	☐	☐	☐	☐	تقديم مقترحات لتحسين سير العمل باستخدام التطبيقات التكنولوجية المتاحة في الجامعة	(.27.)
☐	☐	☐	☐	☐	☐	☐	مدى حاجتك لخدمة الدعم الفني فيما يتعلق بأمور العمل في غير ساعات الدوام الرسمية أو خارج حرم الجامعة	(.28.)
☐	☐	☐	☐	☐	☐	☐	بشكل عام، ما مدى رضاك عن جودة الخدمة التي يقدمها قسم الدعم الفني	(.29.)

القسم الثالث: بيانات أخرى

(أرجو تحديد أحد الخيارات المتاحة)

	مكان العمــل في الجـامعة :	(.30.)
☐ (7) مبنى الإدارة ، أرجو تحديد القسم --------------	☐ (1) مبنى كلية التجارة والاقتصاد	☐
(8) مبنى كلية تكنولوجيا المعلومات ومركز نجاد زعني	☐ (2) مبنى كلية الهندسة	☐
(9) مبنى المكتبة الرئيسية	☐ (3) مبنى كلية الاداب	☐
(10) مبنى دراسات المرأة	☐ (4) مبنى كلية العلوم	☐
	(5) مبنى كلية الدراسات العليا	☐
☐ (11) مبنى اخر (حدد) --------------------------	(6) مبنى كلية الحقوق والادارة العامة ومعهد الحقوق	☐

☐ نعم ☐ لا	هل تعتقد /ين بأنك بحاجة لتدريب في مجال التكنولوجيا ؟	(.31.)
---	إذا كانت الإجابة "نعم" للسؤال السابق، يرجى تحديد المجال الذي تحتاج /ين لتدريب فيه :	(.32.)
☐1- 3 ☐ 4-9 ☐ 10 فأكثر	تقريبا، كم مرة شهريـــا تحتاج /ين لمساعدة فنية للأجهزة التكنولوجية:	(.33.)
☐أقل من ساعة ☐2-5 ساعات ☐ 6 فأكثر	ما معدل عدد الساعات تقريبا الذي تستخدم/ين فيه الأجهزة التكنولوجية يوميا سواء في العمل أو خارجه ؟	(.34.)
☐ 15 دقيقة ☐ 30 دقيقة ☐ 1-2 ساعة ☐ خلال يوم ☐ لليوم التالي ☐ لا فارق ☐ غير ذلك، (حدد): _____	ما هي المدة الزمنة التي ترضى/ين خلالها أن يقوم قسم الدعم الفني بحل مشكلة تكنولوجية تعطل عملك على جهاز الحاسوب خاصتك؟	(.35.)
☐ نعم ☐ لا	هل تستعيض/ين أحيانا عن الخدمة التي يقدمها قسم الدعم الفني بمصادر أخرى للمساعدة؟	(.36.)
☐مسؤول الصيانة الخاص بوحدتك ☐ زملاؤك في العمل ☐ الطلبة ☐ غير ذلك، (حدد): _____	إذا كانت الاجابة "نعم" للسؤال السابق، يرجى تحديد مصدر المساعدة:	(.37.)
☐ نعم ☐ لا	هل تؤيد /ين وجود قاعدة بيانات تحتوي على حلول خطوة بخطوة لمختلف المشاكل التكنولوجية في جامعة بيرزيت والتي تستطيع/ ين من خلالها حل المشاكل التكنولوجية بنفسك؟	(.38.)
☐ بسيطة ☐ متوسطة ☐ عالية ☐ خبير	بشكل عام، كيف تقيم درجة معرفتك باستخدام الأجهزة التكنولوجية وبرامجها المتعلقة بعملك؟	(.39.)
☐ نعم ☐ لا ☐ غير ذلك _____	هل تؤيد إنشاء وحدة متخصصة للتدريب على الخدمات التكنولوجية لمساندة أسرة الجامعة ؟	(.40.)
☐ نعم ☐ لا	هل تعرف/ين أو تم اطلاعك على "سياسة تكنولوجيا المعلومات" في جامعة بيرزيت؟	(.41.)
☐ نعم ☐ لا ☐ غير ذلك _____	هل تأمل /ين بأن يتم تغيير في الخدمة المقدمة من قسم الدعم الفني إثر معرفة نتائج هذا الاستبيان؟	(.42.)

(43.)	مجال عملك في الجامعة :	☐ إداري	☐ أكاديمي	
(44.)	سنوات عملك في الجامعة تتروح بين:	☐ 1- 2	☐ 3- 9	☐ 10- 15 ☐ 16 فأكثر

القسم الرابع: اختياري

يرجى تزويدنا بملاحظاتك ومقترحاتك .

_____

_____

_____

_____

_____

_____

_____

ملاحظة: لك خيار تزويدنا باسمك ووسيلة اتصال بك وخاصة في حال رغبتك بالمتابعة معك فيما يتعلق بملاحظاتك ومقترحاتك.

شكرا جزيلا لمساهمتك الفاعلة في تقييم خدمة قسم الدعم الفني

أرجو ارجاع الاستبانة حتى تاريخ 5/30/ 2009على العنوان التالي:

نـــور شـركـــس
مكتب عميد كلية الهندسة /جامعة بيرزيت

10. Appendix B: BZU Helpdesk Staff Job Satisfaction Questionnaire

Helpdesk Staff Job Satisfaction Questionnaire

By completing a job satisfaction questionnaire; you'll be able to identify those aspects of your current job that are rewarding as well as those that contribute to dissatisfaction. The results will help you to clarify the aspects of a job that most directly contribute to your career satisfaction. You can also use this exercise to predict how you might respond to potential occupations and the degree of satisfaction that a potential job is likely to provide.

PART I

GENERAL INFORMATION

Occupation:

_____

How long have you worked for BZU? _____

What previous positions have you held within BZU? _____

_____

_____

_____

What is your current job title?

_____

How long have you held your current position?

_____

Briefly describe your work responsibilities:

_____

PART II

RATING YOUR JOB SATISFACTION

1	2	3	4	5
not satisfied at all		somewhat satisfied		extremely satisfied

Using the scale shown above, rate your level of satisfaction with the following aspects of your job.

GENERAL WORKING CONDITIONS

_____ Hours worked each week
_____ Flexibility in scheduling
_____ Location of work
_____ Amount of paid vacation time/sick leave offered

PAY AND PROMOTION POTENTIAL

_____ Salary
_____ Promotion Opportunities
_____ Benefits (Health insurance, life insurance, etc.)
_____ Job Security
_____ Recognition for work accomplished

WORK RELATIONSHIPS

_____ Relationships with your co-workers
_____ Relationship(s) with your supervisor(s)
_____ Relationships with your subordinates (if applicable)

USE OF SKILLS AND ABILITIES – DEVELOPMENT OPPORTUNITIES

_____ Opportunity to utilize your skills and talents
_____ Opportunity to learn new skills
_____ Support for additional training and education

WORK ACTIVITIES

_____ Variety of job responsibilities
_____ Degree of independence associated with your work roles
_____ Adequate opportunity for periodic changes in duties

OTHER ASPECTS OF THE JOB RELATING TO YOUR LEVEL OF SATISFACTION

_____
_____
_____
_____
_____
_____
_____

Optional Section

Review your ratings. List the items for which your level was a 4 or a 5:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Now list the items below for which your satisfaction level was a 1 or a 2.

_____

_____

_____

11. APPENDIX C: Correlation Matrix

Correlation	Tech Service Response Time	Admin Service Resp. Time	Resolution in the first visit	Provide Explanations	Problem History Recognition	Long Term Resolution	Answers to Queries	Follow-ups	Assurance of Service Completion	Time Respect	Coordination among Staff	Priority Setting	Trust in Staff Experience	Communication Language	Initiative	Courtesy	Privacy	Data Security	Suggestions	Tel-inquiry	Tel- Trust in Exper.	Tel-Troubleshooting
Tech Service Response Time	1.000	.651	.555	.565	.541	.534	.593	.575	.538	.609	.592	.624	.502	.529	.530	.327	.280	.374	.467	.564	.549	.500
Admin Service Resp. Time	.651	1.000	.502	.469	.420	.468	.527	.468	.358	.489	.498	.464	.344	.512	.536	.394	.335	.388	.402	.343	.415	.453
Resolution in the first visit	.555	.502	1.000	.685	.635	.636	.604	.420	.374	.425	.516	.592	.644	.555	.528	.518	.532	.433	.396	.536	.569	.572
Provide Explanations	.565	.469	.685	1.000	.645	.642	.607	.539	.451	.550	.504	.540	.560	.506	.379	.389	.378	.396	.391	.374	.415	.370
Problem History Recognition	.541	.420	.635	.645	1.000	.676	.535	.446	.484	.389	.476	.394	.502	.406	.513	.418	.391	.427	.522	.598	.564	.535
Long Term Resolution	.534	.468	.636	.642	.676	1.000	.679	.616	.539	.604	.687	.606	.593	.477	.584	.386	.315	.325	.323	.489	.464	.450
Answers to Queries	.593	.527	.604	.607	.535	.679	1.000	.676	.472	.520	.610	.539	.614	.568	.586	.359	.342	.334	.342	.420	.495	.454
Follow-ups	.575	.468	.420	.539	.446	.616	.676	1.000	.723	.665	.643	.618	.467	.495	.623	.285	.259	.363	.436	.292	.349	.361
Assurance of Service Completion	.538	.358	.374	.451	.484	.539	.472	.723	1.000	.607	.605	.522	.459	.388	.544	.162	.185	.337	.467	.284	.270	.306
Time Respect	.609	.489	.425	.550	.389	.604	.520	.665	.607	1.000	.693	.638	.369	.468	.546	.263	.132	.234	.335	.313	.209	.252
Coordination among Staff	.592	.498	.516	.504	.476	.687	.610	.643	.605	.693	1.000	.769	.662	.551	.699	.393	.383	.392	.402	.376	.473	.388
Priority Setting	.624	.464	.592	.540	.394	.606	.539	.618	.522	.638	.769	1.000	.632	.636	.601	.452	.464	.464	.403	.423	.421	.421
Trust in Staff Experience	.502	.344	.644	.560	.502	.593	.614	.467	.459	.369	.662	.632	1.000	.690	.661	.542	.589	.526	.558	.531	.607	.550
Clear Communication Language	.529	.512	.555	.506	.406	.477	.568	.495	.388	.468	.551	.636	.690	1.000	.721	.601	.490	.457	.521	.576	.548	.472

Initiative	.530	.536	.528	.379	.513	.584	.586	.623	.544	.546	.699	.601	.661	.721	1.000	.524	.385	.376	.498	.548	.573	.462
Courtesy	.327	.394	.518	.389	.418	.386	.359	.285	.162	.263	.393	.452	.542	.601	.524	1.000	.765	.597	.479	.506	.453	.421
Privacy	.280	.335	.532	.378	.391	.315	.342	.259	.185	.132	.383	.464	.589	.490	.385	.765	1.000	.794	.504	.395	.445	.534
Data Security	.374	.388	.433	.396	.427	.325	.334	.363	.337	.234	.392	.464	.526	.457	.376	.597	.794	1.000	.788	.315	.360	.397
Suggestions	.467	.402	.396	.391	.522	.323	.342	.436	.467	.335	.402	.403	.558	.521	.498	.479	.504	.788	1.000	.321	.313	.334
Tel- inquiry	.564	.343	.536	.374	.598	.489	.420	.292	.284	.313	.376	.423	.531	.576	.548	.506	.395	.315	.321	1.000	.753	.741
Tel- Trust in Exper.	.549	.415	.569	.415	.564	.464	.495	.349	.270	.209	.473	.421	.607	.548	.573	.453	.445	.360	.313	.753	1.000	.791
Tel- Troubleshooting	.500	.453	.572	.370	.535	.450	.454	.361	.306	.252	.388	.421	.550	.472	.462	.421	.534	.397	.334	.741	.791	1.000
Tech Service Response Time		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.000	.000	.000	.000	.000
Sig. (1-tailed)																						
Admin Service Resp. Time	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000
Resolution in the first visit	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Provide Explanations	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Problem History Recognition	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Long Term Resolution	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.001	.001	.000	.000	.000
Answers to Queries	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000
Follow-ups	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.002	.005	.000	.000	.002	.000	.000
Assurance of Service Completion	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.058	.035	.000	.000	.003	.004	.001
Time Respect	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.005	.099	.012	.001	.001	.021	.007
Coordination among Staff	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Priority Setting	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Trust in Staff Experience	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
Clear Communication Language	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
Initiative	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
Courtesy	.001	.000	.000	.000	.000	.000	.000	.002	.058	.005	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
Privacy	.003	.001	.000	.000	.000	.001	.000	.005	.035	.099	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
Data Security	.000	.000	.000	.000	.000	.001	.001	.000	.000	.012	.000	.000	.000	.000	.000	.000	.000		.000	.001	.000	.000
Suggestions	.000	.000	.000	.000	.000	.001	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000		.001	.001	.001
Tel- inquiry	.000	.000	.000	.000	.000	.000	.000	.002	.003	.001	.000	.000	.000	.000	.000	.000	.000	.001	.001		.000	.000
Tel- Trust in Exper.	.000	.000	.000	.000	.000	.000	.000	.000	.004	.021	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000		.000
Tel- Troubleshooting	.000	.000	.000	.000	.000	.000	.000	.000	.001	.007	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	

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