AN OUTCOMES-BASED FRAMEWORK FOR ASSESSING THE QUALITY OF TRANSNATIONAL ENGINEERING EDUCATION AT A PRIVATE COLLEGE

A Dissertation submitted by

Chong Beng Keok, B.E. (Hons), M.Sc.

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ABSTRACT

AN OUTCOMES-BASED FRAMEWORK FOR ASSESSING THE QUALITY OF TRANSNATIONAL ENGINEERING EDUCATION AT A PRIVATE COLLEGE

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The concept of "transnational" education has emerged over the past decade or more as a critical strategy for meeting the growing demand for higher education worldwide. Essentially, transnational higher education allows international providers with outstanding credentials to conduct degree programs at local sites in conjunction with local tertiary institutions. Due to the rapid expansion of transnational programmes and the proliferation of transnational education providers, both governments and parents have, however, raised questions about the quality of education provided through transnational mechanisms.

Rapid technological development, coupled with the recent growth of new engineering specialty areas, has led to the development of outcomes-based criteria for engineering education by a range of international engineering professional bodies. The emergence of outcomes-based approaches requires new instruments to measure the success, or otherwise, of engineering programs offered by universities. This study was conducted at a Malaysian private college (pseudonym "Trans College") with the prime purpose of developing an authoritative measurement instrument for evaluating the quality of transnational engineering education. This study generated a theory-based 11-dimension *Preliminary Conceptual Framework consisting of four Outcomes dimensions and seven Contributory dimensions for Transnational Engineering Education,* and tested the integrity of the theoretical framework through surveys of enrolled students, staff, and representatives of employing agencies. The *Preliminary Conceptual Framework* was found to have a high degree of conceptual validity, as well as some limitations. The findings of the surveys enabled a *Revised Conceptual Framework for Transnational Engineering Education* to be developed through reliability test and validated by using confirmatory and exploratory factor analyses. The revised framework comprises five *Outcomes* and eight *Contributory* dimensions. It has been transposed into a 13-dimension revised survey instrument consisting of 25 *Outcomes* items clustered into five *Outcomes* dimensions, and 49 *Contributory* items clustered into eight *Contributory* dimensions. The developed survey instrument was then used to study the perceptions of students, staff, and employers regarding the quality of the transnational engineering education.

Through performing t-tests, ANOVA, and other statistical analyses, the results of the study indicate that the quality of the transnational engineering education at Trans College was perceived by students, staff, and employers to be generally sound. It was also revealed that the *Contributory* construct can be adopted for measuring the satisfaction levels of students. Students, staff, and employers were also satisfied for the most part with their respective experiences of the programs in question.

The study is believed to have considerable significance. First, it has generated a conceptual framework for measuring the quality of the transnational engineering education. The validated conceptual framework is transposed into a validated instrument that can be adapted for use by a range of other transnational educational providers. Second, it affirms the value of the "transnational" concept while also providing a number of recommendations for the enhancement of such programmes, particularly at Trans College. Third, the conceptual framework for the delivery of successful transnational engineering education derived from this study may help to improve the quality of transnational engineering programmes conducted in Malaysia, and make Malaysia "the centre of educational excellence" in the ASEAN region, with the transnational providers becoming hubs of tertiary education, and their networks spanning the globe.

CERTIFICATION OF DISSERTATION

I certify that the ideas, survey work, results, analyses, software simulation and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

Signature of Candidate

10/11/05
Date

ENDORSEMENT

Signature of Supervisor

16 February 2006
Date

Signature of Co-Supervisor

21/2/06
Date

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ACRONYMS

ABET	Accreditation Board for Engineering and Technology
BEM	Board of Engineers, Malaysia
CFA	Confirmatory factor analysis
CFI	Comparative fit index
EC	Engineering Council, U.K.
EFA	Exploratory factor analysis
FTZs	Free Trade Zones
GATE	Global Alliance for Transnational Education
GDP	Gross Domestic Product
HEQC	Higher Education Quality Council of the United Kingdom
IEAust	The Institute of Engineers, Australia
INQAAHE	International Network for Quality Assurance Agencies in Higher Education
LAN	National Accreditation Board
MNCs	Multinational Corporations
NFI	Normed fit index
NNFI	Non-normed fit index
PDC	Penang Development Corporation
RMSEA	Root mean square error of approximation
SRMR	Standardized Root Mean Square Residual
TLI	Tucker-Lewis index
TNE	Transnational Education
TQM	Total Quality Management

CHAPTER ONE

NATURE AND SCOPE OF THE STUDY

1. 1 Introduction

Higher education is a growing industry. For the past few years, in Malaysia as across much of the globe, the number of public universities, public and private colleges, and corporate universities has been increasing dramatically.

In 1980, when privatisation in university education was a global trend, Malaysia encouraged the establishment and growth of private tertiary institutions in order to respond to a growing educational need within the country. Private colleges began at that time to play an active role in expanding student access to higher education by linking with foreign universities for the conduct of what came to be known as "transnational education".

Because private colleges in Malaysia are financially independent, they tend to be influenced more by market forces rather than by government intervention. Perhaps as a result, some private colleges are very innovative in the type of programmes they offer in response to the ever-changing needs of students. Indeed, it may be said that the privatisation of higher education in Malaysia has led to the rapid development of transnational tertiary education, a trend that continues till today and is expected to carry on in this new era of globalization.

One of the likely consequences of the fast growth of transnational education is a problem of educational quality. Thus, over the past few years, Asian universities have often been criticized for "producing long queues of poorly trained graduates seeking unavailable jobs" (Wang, 1992, p.21). In this process, some Asian universities may indeed have become poor imitations of Western models, unsuited to the socioeconomic conditions and development requirements of the societies concerned. Many responsible educators and other respective authorities are today worried that providers of transnational education may be conducting educational programmes which are not suited to the socioeconomic conditions of Malaysia and hence fail to fulfil the requirements of the Malaysian workforce.

1.2 Exporting Education

Universities operate in a global environment and, as such, they compete for students, funding, and research grants. Advances in information technology have enabled many universities to respond to the challenge of competition by delivering their services very effectively through innovative technology-based processes. Thus, some universities are today exporting education to countries overseas by conducting corporate courses, distance education programmes, setting up branch campuses, and franchising programmes (Lenn, 2002).

The United States, Britain, and Australia are the three leading exporters of higher education in the world at the present time (Lenn, 2002). In the United States (USA), the export of education and training totalled $10 billion in 1999 and was ranked among the USA's top five service exports (Lenn, 2002). In Australia, local and international strategic partnerships or alliances between universities, and/or colleges also emerged in the late 1990s as a means of exporting education. Pratt and Poole (1999), when discussing globalisation and Australian universities, noted that leaders of Australian universities utilised the rhetoric of globalisation to establish the foundations for institutional change, to pursue the repositioning of their institutions, and to develop a new discourse for the sector. The Pro Vice-Chancellor (Research) of the University of Sydney, Professor David Siddle, was appointed to his position at that university to develop strategic alliances in addition to his traditional research responsibilities. A recent Vice-Chancellor of Monash University used the theme of internationalisation as a primary justification for the university's strategic plan (Pratt and Poole, 1999). As part of that plan, Monash University determined to maintain a significant presence in at least seven other countries through the development of off-shore campuses and similar ventures (Pratt and Poole, 1999). In response to global challenges, the Vice-Chancellor of Royal Melbourne Institute of Technology (RMIT), Professor David Beanland, described RMIT as a world class, internationally-focused institution. Similarly, the Vice-Chancellor of Central Queensland University (CQU), Professor Lauchlan Chipman, who had stated that globalisation was the key institutional survival strategy, established 100 alliances with major international education providers in North America and Europe (Pratt and Poole, 1999). Similar strategies are being pursued by other Australian universities in response to the increasingly competitive and complex global higher education environment.

In Britain, the government since the 1990s recognised the importance of exporting education and encouraged British universities to promote the setup of quality education world-wide. British higher education was worth approximately £4 billion in export earnings in 1995 (King, 1995). Many British universities, consortia of universities, and other learning providers were conferring prestigious university awards off campus as part of this trend (King, 1995).

1.3 Importing Education

In 2002, it was authoritatively estimated that Asia's tertiary student population would grow from 17 million to 87 million by the year 2025 (Lenn, 2002). Some Asian countries, such as Japan, responded to predictions of this type by recognising online educational delivery provided by universities in foreign countries. China, on the other hand, encouraged foreign universities to conduct joint degrees with Chinese institutions in order to educate 3 or 4 percent of its 1.2 billion population (Lenn, 2002). The Malaysian government, upon realising that only 6% of the population had access to higher education, allowed foreign universities to export their degree programmes to Malaysia (Lenn, 2002).

In Malaysia, the government was the sole provider of tertiary education until the 1980s. Approximately 30% of the development budget at that time was spent in providing funding for higher institutions and offered as scholarships or loans to deserving students (Lee, 2000). With the subsequent advent of full government support, student enrolments at the tertiary level have risen dramatically to an estimated total of 450,000 (Lee, 2000). Of these 450,000 students, 55% of the places in public universities are reserved for bumiputras (Malays and other indigenous groups) as a result of the ethnic quota system embodied in the Malaysian New Economic Policy. Many non-bumiputras who are qualified to enter local universities are not accepted. Consequently, a large proportion of Malaysian secondary school leavers still do not have the opportunity to attain local tertiary education. The majority of non-bumiputras who are financially secure therefore opted to study overseas under the sponsorship of their families. However, a large number are left with no alternative but to study in a few local private colleges, such as Tunku Abdul Rahman College, KDU College, Inti College, Sunway College, and others for diploma certificates, professional courses and twinning degree programmes.

The increased demand for higher education, especially for foreign degrees, has compelled the Malaysian government to grant many private colleges approval to partner with foreign universities to conduct entire foreign programmes locally. Consequently, students now have the opportunity to pursue foreign degrees without leaving Malaysia, with the foreign partner universities awarding degrees to graduating students. These partnership programmes are known as *transnational* programmes.

Transnational education has been defined by the Global Alliance for Transnational Education (GATE) as any teaching or learning activity in which the students are in a different country (the host country) to the one where the institution providing the education is based (UNESCO-CEPES, 2000; GATE, 1997). Most of the transnational programmes provided in Malaysia vary in scope and are arranged through collaborative forms such as twinning between institutions in the home country and the host country. Several types of transnational programme that have been conducted in Malaysia are twinning programmes, advanced standing arrangement, distance learning progarmmes, "3+0" programmes (Franchised programmes), programmes conducted at branch campuses, and corporate programmes. The programmes can be conducted through a "1+2" arrangement (one year in a local college and two years in an overseas twinning university) or a "2+1" arrangement (two years in a local college and one year in an overseas twinning university) or a "2+2" arrangement (two years in a local college and two years in an overseas twinning university) or a "3+0" arrangement (three years in a local college). Many private colleges partner with overseas universities to conduct degree programmes for provision of Malaysian higher education. As an example, it was reported that there were 246,000 students in the eleven public universities in Malaysia in 2001, and almost the same number of students were enrolled in private colleges (The Star, December 2002).

1.4 Research Problem and Research Questions

With the rapid expansion that has occurred in transnational education in Malaysia, many parents and educators are very concerned about the quality of foreign-linked programmes. Lee (1997a) stressed that quality varies from one programme to another and from one institution to another, depending on the type of supervision provided by foreign partners and the infrastructure provided by Malaysian colleges.

Owing to the variation in quality provided in transnational programmes, the Malaysian government has intervened to regulate and control private education in order to attempt to ensure quality (Lee, 1997b). The Malaysian government now requires all private institutions to be registered with the Ministry of Education and approval must be obtained from the Ministry before any programme can be taught in a private college (Lee, 1997b). The National Accreditation Board was also set up in 1997 to formulate policies dealing with the standard and quality control of transnational courses (Lee, 1997b).

Despite the government's regulatory control over all private education in Malaysia, some educators and parents are still doubtful in regard to the quality of transnational programmes. Many educators and parents continue to regard transnational programmes as an inferior form of education and claim that these programmes are conducted at the expense of quality. Some critics are of the opinion that transnational courses fail to contextualise the content of delivery with course curriculum, reading materials, pedagogical style and allow the language of the Western university to dominate their programmes (Altbach and Philip, 1999).

At this stage, no studies have been conducted to investigate public or professional perceptions regarding the quality of transnational programmes offered at colleges in Malaysia. To investigate all the transnational programmes in existence in Malaysia would be an insurmountable task. A more practical and manageable approach would be to confine the research to the perceptions of client groups associated with transnational programmes offered through a single faculty at one well-established college in Malaysia. Therefore, the research problem of this thesis is:

To what extent are the transnational engineering programmes conducted through an alliance of Trans College and partner-universities meeting the perceived needs of students, staff, and employers in Malaysia?

To address this research problem, the delivery of transnational programmes will be explored from the perspectives of students, employers and academic staff at Trans College. [1]

This study is guided by the five research questions that follow:

Research Question 1: *What conceptual framework for the delivery of transnational engineering education derives from an analysis of literature and research in contemporary higher education?*

[1.] Trans College was the pseudonym used for a college in Penang, Malaysia

Research Question 2: *What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?*

Research Question 3: *What are the perceptions of lecturing staff regarding the quality of the transnational engineering programmes conducted at Trans College?*

Research Question 4: *What are the perceptions of employers regarding the quality of graduates of the transnational engineering education programmes conducted at Trans College?*

Research Question 5: *What revised conceptual framework for the delivery of highly successful transnational engineering programmes emerges from the study?*

1.5 Research Design and Methodology

This research has conceptual, empirical and descriptive elements.

The research is conceptual in that it seeks to develop and validate a conceptual framework for the successful delivery of transnational engineering education. This is done through the creation of a preliminary model for transnational education delivery, based on a comprehensive analysis of literature, and a critique of that model following completion of the processes of empirical and descriptive data collection and analysis.

The descriptive and empirical elements of the study were undertaken within a single case study context. In particular, this study focused on evaluating transnational students' perceptions of their performances and attributes as well as their learning experiences during their undergraduate studies in the transnational engineering programmes at Trans College.

The perception theory of the SERVQUAL instrument (Parasuraman, Zeithaml, and Berry, 1988) was combined with a conceptual model for evaluating successful school reform (Crowther, Andrews, Dawson, and Lewis, 2002) to investigate the perceptions of students, staff, and employers regarding the learning outcomes associated with the transnational engineering programme and the learning experiences of students in the transnational engineering programmes.

Based on Crowther et al's Research-based Framework for Successful School Revitalisation, the survey instruments for the study were designed around *Outcomes and Contributory* constructs.

Four *Outcomes* dimensions, namely "Technical Competencies", "Generic Competencies", "Communication and Social Skills" and "Management and Organization Skills" were adapted from the graduate attributes listed by professional bodies such as *The Engineers, Australia*, *Board of Engineers, Malaysia,* Hawkins' and Winter's *Skill for the Twenty-first Century (1995)*, Harvey, Moon, and Geall's *Graduates' Work: Organizational Change and Students' Attributes (1997a),* and Graaf and Ravesteijn's *Training Complete Engineers: Global Enterprise and Engineering Education (2001*). Seven *Contributory* dimensions were adapted from teaching models such as those of Feldman (1984), Ramsden (1981), and the Endeavor model (Feldman, 1984). The seven *Contributory* dimensions that were identified from the literature were "Course Curriculum", "Learning Resources", "Teaching, Learning and Assessment Practices", "Leadership", "Administrative Support", "Staff and Student Relationships", and "Professional Exposure". These eleven dimensions of the *Outcomes* and *Contributory* constructs of the study provided the basis for developments of instruments that were used for measuring the educational quality of the transnational engineering degree programs.

The survey for this study was conducted at the Trans College because it is the biggest and one of the most established private colleges in Malaysia. The college has been providing transnational education since 1998 and has produced several thousand of transnational graduates. Among the transnational programmes provided at the college, the transnational engineering progarmmes have the highest enrolment and have produced many skilled graduates to meet the needs of the engineering industry in Penang. Only one higher institution is used as using one case organization as the basis of study improves manageability (Yin, 1994). This study was conducted using both closed-ended and open-ended questionnaires. Three separate questionnaires were used for the three sample cohorts. The same basic *Outcomes* section was designed for use by students, staff, and employers. Students and staff completed the same *Contributory* section of the questionnaire, while a different *Contributory* section was constructed for employers (based on feedback provided by some practising engineers in the pilot study).

A pilot study involving the data collection instrument was undertaken. Two students and two staff were invited to answer the questions to ensure that all questions were understandable and could be answered appropriately. Additionally, two practising engineers were approached to contribute their ideas towards the development of the employer questionnaire. Any unnecessary and unimportant items were subsequently deleted from the questionnaire and the survey forms were enhanced with a number of additional items that were regarded as central to transnational engineering education.

This preliminary activity contributed significantly to the establishment of the validity of the questionnaire. The final draft was again piloted with two staff, two students, and one engineer to confirm the validity of the questionnaires' content. Questionnaires were then personally distributed to students, staff, and employers to explain the purposes of the study and to gain their cooperation.

A three-step data analysis approach was used for the quantitative data analysis. The first step involved the use of Cronbach's alpha test for scale reliability analysis, and factor analyses for identifying quality dimensionality and items grouping, to establish indices for reliability and validity. The second step of the analysis involved descriptive statistical analyses of the perceptual data. Comparative analyses such as independent sample t-tests were utilized to make comparisons between two groups, while one-way ANOVA was also employed to enable comparisons involving more than two groups. The third and final step of the analysis involved statistical investigations to uncover relationships between perception scores and satisfaction scores using linear regression analysis.

Apart from these quantitative data analyses, qualitative data analysis was also performed on the open-ended responses, mainly to verify, or deny, the findings of the quantitative data analyses. The analysed results for the quantitative and descriptive aspects of the research were then interpreted and the research findings presented.

1.6 Significance of the Study

There is a growing trend towards transnational education in Malaysia as a result of a shortage of public universities providing tertiary education to a large number of students leaving Malaysian high schools. As transnational programmes continue to expand, offering a quality "product" is widely regarded as vital to Malaysia's well-being. This study presumes to contribute to that end.

This study will provide an overview of current developments in transnational engineering education in Malaysia. It will also investigate how transnational universities educate students at a representative private college, using the perspectives of students, employers, and staff. Through analyses of students' learning experiences by representatives of these three stakeholder groups, conclusions will be drawn regarding the quality of student learning, and recommendations developed will hopefully help colleges and transnational education providers to identify the strengths and weaknesses in their educational delivery. It is hoped that this will enable programme designers to further develop and improve transnational educational delivery. Finally, this research incorporates comprehensive study of internal mechanisms adopted by various transnational educational providers. The conceptual framework for the delivery of successful engineering education derived from this research may help to improve the quality of transnational programmes conducted at private colleges in Malaysia.

This research is timely and important due to the need to ensure that Malaysian engineering qualifications are recognized internationally. With a recognized international qualification, Malaysian educational providers would be able to attract students from the ASEAN region, thereby potentially making Malaysia “the centre of educational excellence” in the ASEAN region. Transnational education providers might be encouraged to use a similar model to operate in strategic alliances with other leading colleges or institutions throughout the world. Foreign universities could then become hubs of tertiary education, located partly in Malaysia but with educational networks spanning the globe. Besides this, this research will also help Malaysia to realize the Vision 2020 of upgrading human resource skills to meet the challenges of globalization (Mohamad, 2004).

1.7 Organization of the Thesis

The chapters of this study are organized as follows:

Chapter 1 provides a brief discussion of developments in education and the rationale for carrying out this study. Chapter 2 contains a summary of previous research into the delivery of transnational programmes and describes measures used to evaluate the quality of engineering education. It concludes with creation of a theoretical framework for the research. Chapter 3 describes the development of the education industry in Malaysia and outlines the major features of the transnational engineering programmes that are offered at Trans College and this provides the basis for the research. Chapter 4 describes the research design, research methodology, and statistical procedures employed in the analysis of empirical and descriptive data for this study. Chapter 5 reports the results from the survey following the statistical and descriptive analyses. Chapter 6 is devoted to discussion of the major outcomes of the research and presentation of the conclusions of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The flow of technology, economy, knowledge, people, values, ideas….across the borders is designated by Knight and De Wit (1999) as the process known as 'globalisation'.

In this era of globalisation, learning and education is borderless. To cope with globalisation, higher education must re-orient its structure and functions to internationalise its provision, in order for the challenges posed by globalisation to be responded to and managed in a timely manner (Knight and De Wit, 1999).

Globalisation of education manifests itself in many forms, of which transnational education is one of the most visible forms. *Transnational education* is defined as the delivery of all forms of higher education study programmes or educational services whereby learners are located in a country different from that of the offering institution (Jones, 2001). It occurs when tertiary institutions take advantage of the opportunities of globalisation and start using technology to deliver courses. Some institutions also enter into collaborative partnerships or joint ventures with universities or colleges in developing countries to expand their delivery dimensions. These partnerships are expanded in scope, from simple one-to-one agreements to complex collaborative arrangements.

The expansion of transnational education has many implications for and impacts on national education development, economic development, lifelong learning, cultural, and social interests. The issue of quality always emerges when educators and parents alike assess transnational education in Malaysia (Lee, 1998). It was recorded that a large number of private colleges did not have adequate facilities and teaching staff, and some colleges might not have the ability to provide all the facilities that its foreign partner would like them to have (Lee, 1997a).

Based on this perception of globalisation and its manifestations in Malaysia, this study was conducted with the aim of investigating the perceptions of students, staff, and employers regarding the extent to which the transnational engineering programmes conducted through an alliance of Trans College and partner-universities have met the needs of students, staff, and employers. A secondary aim of the research is the creation of a conceptual framework that will enable transnational education to be understood and assessed for its quality of delivery.

This chapter provides the theoretical context for the study. Following a brief introductory statement (Section 2.1), the growth of the concept of transnational education in Malaysia is explored (Section 2.2), followed by a review of seven forms of transnational education that can currently be seen in educational practice (Section 2.3). Section 2.4 discusses in detail different viewpoints regarding the issue of *quality of provision* in transnational education while Section 2.5 provides a review of some of the quality assurance mechanisms that have been adopted by relevant authorities to maintain quality in education generally, and transnational education more specifically.

Section 2.6 provides a review of SERVQUAL methodology as an approach to measuring perceived quality in higher education, with a view to using this methodology in the creation of instruments for this research. The importance of stakeholder perceptions, including employers' expectations, and students' perceptions, is addressed in Section 2.7, followed by a review of criteria set by professional bodies for the conduct of engineering programmes (Section 2.8).

On the basis of this multi-faceted literature review, this chapter concludes with a detailed preliminary proposal in Section 2.9 for the conceptual framework for the conduct of the study. The proposal is represented in diagrammatic form in **Figure 2.2: Proposed Preliminary SERVQUAL-TRANS Framework for Assessing Transnational Engineering Education.**

2.2 The Growth of Transnational Education in Malaysia

There is an explosion in the growth of transnational higher education throughout the world. Many developed countries such as the USA, Australia, Britain, and others have established their teaching and training provisions in a number of countries. Transnational programmes such as the Master of Business Administration (MBA) programme are offered by Western and Australian universities in Hong Kong, China, Malaysia, Taiwan, Singapore, Thailand, Phillippines, and elsewhere (Howe and Martin, 1998). An estimated total of 31,500 students had enrolled in Australian transnational higher education programmes through institutions in Singapore, Hong Kong, Malaysia, and China (Australian Education International, 2000). It was reported in May 1999 that 35 Australian universities offered 750 transnational programmes to 31,850 students worldwide (AVCC, 1996), with at least 75 percent of British universities offering validated courses via higher institutions in other countries (Bennell and Pearce, 1998).

Malaysia, due to the onset of the 1997 East Asia economic crisis, is also making provision for the growth of transnational programmes. There is a rapid expansion of private education in Malaysia with the number of private institutions of higher learning growing from 156 in year 1992 to approximately 600 private colleges offering more than 1,000 courses in Malaysia today. Of the 600 private institutions, Lee (1997a) noted that 122 conducted 497 transnational programmes. Similarly, the number of enrolled students has also increased to about 246,000 students by the year 2002 (The Star, December 2002). Transnational education is more prevalent in economically well developed countries such as Malaysia, Singapore, and Thailand.

There are many factors involved with the rapid growth of transnational programmes. As internationalising degree courses is one of the global education movements in many parts of the world, coupled with the decline of home markets in developed countries, reduced government funding, and advances in technology, many universities are developing international strategies by conducting transnational educational programmes. Transnational education, in general, appears as a direct product of the internationalisation of higher education and is regarded as an internationalisation strategy (Zhang, 2003). It is delivered by universities with the intention of producing an international manager (Howe and Martin, 1998) or more simply to raise their international profile and contribute more effectively towards global education. The Finnish Ministry of Education remarked that the internationalisation of education was an aim "*to influence students' attitudes, capabilities, and skills so as to prepare them for operating successfully in an increasingly international society and work place, to improve the quality and effectiveness of education and to diversify the supply*" (Yelland, 2000, p.301). Apart from transferring the best practice, the underlying rationale is to increase student numbers for the purpose of generating higher income from fees (Howe and Martin, 1998). For most of the Australian universities, it is very clear that the internationalisation of education offers substantial income generation opportunities and is perceived as a source for generating revenue for universities (Review of Higher Education Financing and Policy, 1997). Similar findings were concluded by Goddard and Chatterton (1999) from a survey of British universities as to how the universities served regional needs. Nearly all senior managers described their institutions as seeking to contribute to the local educational development and develop the institutions' international strengths. However, the underlying rationale is primarily student recruitment, which translates into economic globalisation (Goddard and Chatterton, 1999).

In many developing countries, higher education has not expanded enough, hence effort has to be made to expand the higher education systems (Jandhyala, 2002). In China, for example only 3-4% of its population has the opportunity to pursue higher studies (Lenn, 2002) and it is not feasible for the Chinese government to provide tuition-free, state-funded higher education to its population. Similarly, the Malaysian government recognises that it is impossible to educate more than 6% of its population at tertiary level. Approximately 15 years ago, the Malaysian government began to encourage the development of private colleges and the formation of partnerships with foreign institutions to complement the state-funded system of higher education (Lenn, 2002). Slovakia has the desire to educate 25-35% of its population aged 18 in higher education (Hrabinska, 2000). Without the delivery of transnational education, most of the secondary school leavers would not be admitted into higher studies as local universities are lacking in resources to finance traditional higher education (Hrabinska, 2000). It is apparent that at the national level, the developing countries benefit through acceleration of the expansion of higher education without incurring any further charges to public finance.

Promoting organisational development initiative is one of the initiatives that is pursued actively by transnational companies. With the "opening up" of China, more and more multinational companies are rapidly branching into China (Zhang, 2003). The increased competition has urged many of China's local as well as multinational companies to start promoting organisational development activities. The Chinese Minister of Education views transnational education as a means to upgrade human resource skills and transnational education is expected to help China comprehensively equip its population with high-level professional training, enabling China to survive in the increasingly competitive environment (Zhang, 2003). In Germany, the government or employers sponsor workers to undertake ongoing training throughout their careers (Jones, 2001). As developed countries are realigning themselves to be knowledge-based societies and developing countries are assuming the roles of performing main-line manufacturing, most of the countries are integrating continuing education into their work-force training programmes (Jones, 2001).

The Malaysian government, in order to further industrialise the country, has incorporated the Vision 2020 into Malaysia's Seventh Development Plan. The plan focuses on accelerating technological upgrading and human resource development in order to meet the requirements of sophisticated manufacturing processes in multinational companies. Most of the multinational companies in Malaysia integrate the continuing education into their work-force training programmes. By establishing transnational education, the government is expecting to upgrade human resource skills to meet the challenges of globalisation and to maintain Malaysia's competitiveness as a manufacturing center. Again, at the national and corporate levels, the expansion of transnational education in developing countries is driven by a strong demand for professionals to further economic development of the multinational companies and countries (Zhang, 2003).

Traditionally, the only recruitment market for higher institutions was high school leavers. However, the enrolment trend has changed and recently the average age of students has been on the increase. The transnational providers are in general providing educational services to other sectors of the education market, not just high school leavers seeking for full-time higher studies. The United States (USA) of Education reported that approximately 81,000 people aged over 65 were enrolled as full-time and part-time students in colleges and universities and 356,000 students were aged between 50 and 64 (Jones, 2001). Levine and Cureton (1998) reported that 44% of today's undergraduate students were over the age of 25 with 54% of them having full time jobs or careers. To continue retraining older adults, transnational education, especially electronically delivered programmes, has proven to be an effective means of providing life-long learning at a comparatively low cost compared to bricks-and-mortar classroom buildings (Jones, 2001). In Hong Kong, the University of London in Britain and Curtin University in Australia were leaders in providing transnational higher study programmes to adults who had missed out on higher education when they were young (French, 1999). This was followed by other universities in Britain, the United States, and Australia in the late 1990s (French, 1999). Apart from educating the above stated group, they were also targeting individuals who were already in employment, and wished to enhance their existing knowledge and skills. Again, globalisation has encouraged most of the older adults to embrace the lifelong learning concept to bolster their credentials in the global work place (Jones, 2001).

2.3 Forms of Transnational Programmes

The rapid growth of information and communication technology has stimulated the formation of a variety of transnational programmes, with different transnational programmes prevalent in different regions of the world. Australia offers transnational programmes via offshore campuses, course franchising, distance learning, and twinning programmes between Australian universities and overseas institutions (Bennington and Li, 2001). Common types of transnational programmes are described as follows:

2.3.1 Credit Transfer Programmes

The transferring collaboration, usually practiced by American universities, allows students with enough earned credit hours to transfer the earned credits to American universities. Students have to study 1 or 2 years in private colleges in the host country and then apply for admission into any accredited USA universities for the final two or three years. The colleges usually help students to secure a place in those strategic partnered consortium universities which number up to 300 or more. Hence, students have the opportunities of choosing the preferred university from a group of USA universities (Lim, 2003).

2.3.2 Twinning Arrangements

Another arrangement, called the twinning arrangement programme is a "locked-in" arrangement, usually formed between private colleges and Australian or U.K. universities. Under this arrangement, local colleges would deliver 1 or 2-year of the university's syllabi locally, and upon completion of the study in local colleges, students would progress to the designated foreign university for the next level of study. The twinning arrangements can be either on "1+2"arrangement (one year in the local college and two years in overseas twinning university) or "2+2" arrangement (two years in the local college and two years in overseas twinning university) (Lee, 1997a). For these arrangements, students normally have to spend another 2 years in the twinning foreign university. The degrees will be awarded by the foreign universities and private colleges are not allowed to confer any degrees.

2.3.3 Advanced Standing Arrangements (Articulation)

Advanced standing arrangement is similar to the twinning degree programme's concepts and objectives except that local colleges do not conduct university's syllabus locally. The private colleges cooperate with a consortium of overseas universities by having courses of private colleges moderated and validated by the foreign universities. Students, having completed the 2-year validated programme in the host country, will be awarded with a diploma qualification by private colleges. The validated status allows students to gain direct entry into the 2nd or 3rd year degree programmes overseas.

2.3.4 Distance Learning Programmes

Distance learning programmes are programmes that are conducted through satellites, computers, correspondences, and some other technology means. Some colleges conduct distance learning programmes by registering students directly with overseas universities. Overseas universities normally provide students with printed course materials and electronic versions of course materials, and employ part-time lecturers to teach the subjects. Victoria University in Australia offered a transnational computer science degree in Hong Kong through this mode via engaging Melbourne lecturers to conduct the subjects and part-time Hong Kong lecturers to assist in providing face-to-face teaching (Miliszewska, Horwood, and McGill, 2003). Private colleges provided coaching to students through organizing face-to-face meetings with tutors in the classroom setting (Lee, 1997a). Some colleges even conducted weekly tutorial classes for students.

2.3.5 "3+0" Franchised Programmes

The onset of the 1997 East Asia economic crisis, had made provision for the growth of transnational programmes in Malaysia. In order to stop the outflow of currency and to promote Malaysia as a centre of education excellence, Malaysia's government encourages private colleges to conduct joint "3+0" (three year in the local college and zero year in overseas twinning university) or "4+0" (four years in the local college and zero year in overseas twinning university) degree programmes leading to an undergraduate degree. The increased demand for higher education, especially the high demand for foreign degrees, has forced the government to give many private colleges approval to partner with overseas universities to conduct the entire foreign programmes locally. This means that students have the opportunity to pursue foreign degrees without leaving Malaysia, with the overseas university awarding degrees to graduating students. The partnership programme is known as "3+0" programme which is a franchised programme whereby an overseas university approves an academic institution in another country as a provider of one or more of the university's programmes to students in another country (Jones, 2001) . It is basically an extension of "1+2" or "2+1" concept, whereby students are not required to go to an overseas host university to complete their degrees. Under this arrangement, students register with both the local private college and the overseas university. Private colleges are responsible for conducting the whole academic programme following the curriculum designed by the overseas university. However, some private colleges articulate their diploma curriculum into the first and second year of the degree program, and use overseas university's curriculum only in the last 2 years of the degree program.

2.3.6 Branch Campuses

Branch campus refers to the establishment of a branch in another country by an established university, usually from the United States, Australia, the United Kingdom or other developed countries. Monash University, Swinburne University, Curtin University from Australia, and the University of Nottingham from U.K. established branch campuses in Malaysia offering their own educational programmes in Malaysia in 2001 (Mazzarol, Souter, Sim, 2003). The University of Nottingham is the first British university to establish its presence in Malaysia in response to economic globalization and challenges as well as to the Malaysian government's plan of establishing Malaysia as a centre of excellence for higher education (World Magazine Bank, 2003). Almost all of the above universities were invited by the Malaysian government to set up branch campuses in Malaysia. Although the branch campus is owned by the university, the majority of the staff working in the campus are local academic and administrative staff.

Apart from Malaysia, Singapore also encourages foreign universities to set up branch campuses in Singapore. Singapore started to allow the establishment of branch campuses by foreign universities in 1997 when the Economic Development Board (EDB) planned to mould Singapore to be the regional hub for education services provision (Mazzarol, et al., 2003). EDB's strategy proved successful when Singapore was able to attract seven "top ten" world universities like Johns Hopkins University, INSEAD, Wharton Business School, University of Chicago Graduate School of Business, George Institute of Technology, Massachusetts Institute of Technology, and

The Netherland's Techniche Universiteit Eindhoven to establish branch campuses in Singapore (Mazzarol, et al., 2003).

2.3.7 Corporate Programmes

Many large corporations are offering educational programmes not only to their own staff but also to the public. The programmes conducted by the business corporates are sometimes linked with academic institutions so that their own employees can obtain formal certification. For the past 13 years in the United States, the number of corporate universities has ballooned from 400 to more than 2,000 (Meister, 2001). Students and working adults can take courses from Motorola University at any of its sites in 13 countries (Meister, 2001).

2.4 Quality of Provision in Transnational Education

The concept of quality has many interpretations. Crosby (1979), Grinroos (1982), and Yi (1990) suggested that to offer good service quality was to focus on meeting the customer needs and requirements. Buzzell and Gale (1987) concluded that quality was fundamentally based on customer perception. Smith and Houston (1982) suggested that a customer's service satisfaction was related to the confirmation or disconfirmation of the customer's expectations; while total quality management (TQM) practitioners suggested that dedication to being the best was the delivering of high quality services that meet or exceed the expectations of customers (Coate, 1990).

The rapid expansion of transnational education has generated much argument regarding its quality. In 1986, the main advisor to the Hong Kong government on education matters, the Education Commission, expressed concerns over the proliferation of overseas education providers offering transnational courses in Hong Kong (French, 1999). The transnational courses conducted were perceived to be of doubtful quality (French, 1999). Slovakia expected transnational education providers to deliver education at a level comparable to that conducted by the mother institution (Hrabinska, 2000). In general, different countries have different points of view with respect to transnational education. Some countries see transnational education as a solution to meet the explosion in the demand for higher education, while others view the operation of transnational education as a threat to national education systems or as a means for generating profits.

Howe and Martin (1998) described a case study of the internationalisation strategy of a small British university business school—Dundee Business School. The school collaborated with an institution in Malaysia in order to conduct the Master of Business Administration programme (Howe and Martin, 1998). Howe and Martin (1998) had identified some features of its operation. They regarded the overseas institutions as profit-making organisations, and recorded that the motives for the joint course development were very commercial. However, the main intention of conducting the transnational courses was to provide a cheaper means for obtaining a foreign degree (Lee, 1997c; Hrabinska, 2000). The programmes are extremely popular among poorer students who could not afford the high fees and living expenses associated with overseas education (Lee, 1997c). From the perspective of potential students, offshore delivery offers a cheaper mode of higher international study and it is convenient as students do not need to leave their home country or job (Bennington and Xu, 2001). Lee (1997c) and Maria Hrabinska (2000) added that transnational programmes had provided students with opportunities to complete a university degree programme in a cheaper manner, and as such it is institutionally effective in terms of value for money as defined by Harvey and Green (1993) - quality as value for money.

2.4.1 Quality as an Aspect of Organisational Alignment

The management research has recorded that culture can influence all aspects of management behaviour and various cultural group might approach similar management tasks in different ways (Adler, 1997; Barlett and Ghoshal, 1987). In China, Chinese senior managers had the typical behaviour of concealing their problems until the problems became serious. They refused to share information and work together. On the other hand, they preferred to keep secrets and accomplished their own goals (Liu and Vince, 1999). Western managers saw this behaviour as a problem that might become an obstacle to develop effective management practices

(Liu and Vince, 1999). It was noted also by Berrell, Gloet, and Wright (2002) that in an Australian and Malaysian collaboration, many Malay managers allowed a sequence of events to run their course, while Australian managers constantly intervened in the same events to influence the outcome of the events. The non-assertive and less critical characteristics of Malay managers to explicitly link between cause and effect might greatly affect the effectiveness of the network organizations and thus the concept of organizational alignment is important for the network organizations as a whole.

The concept of organizational alignment as a key determinant of organizational effectiveness is well-developed in the educational management literature. According to Crowther, it can be traced back to 1946, when Peter Drucker introduced the concept of "harmony": an organization, he reflected, is like a tune – *it is not constituted by individual sounds but by the relations between them* (Drucker, 1946, p.26). Crowther, Andrews, Dawson, and Lewis (2001) have more recently expanded upon this concept, labeling it "alignment" and conceptualizing it in their Research-based Framework for Enhancing School Outcomes (Figure 2.1).
Andrews et al (2000) note that (p7):

> The *Research-based Framework for Enhancing School Outcomes* (RBF) ….. provides teachers and administrators with a way of thinking about their school as an organization, of creating an image of what they want their school to become and of working collectively to build an envisioned future.

As a conceptual model for organizational cohesion, synchronization and alignment, the RBF has been developed in full cognizance of significant global research findings about successful organizational reform (Crevola and Hill, 1998; Cuttance, 2000; Kaplan and Norton, 1996; Newmann and Wehlage, 1996).

In essence, according to Andrew, Crowther, and Postle (2000), schools that have generated both depth and integration across the elements of the organization have been found to produce enhanced sense of identity and greater capacity to pursue high

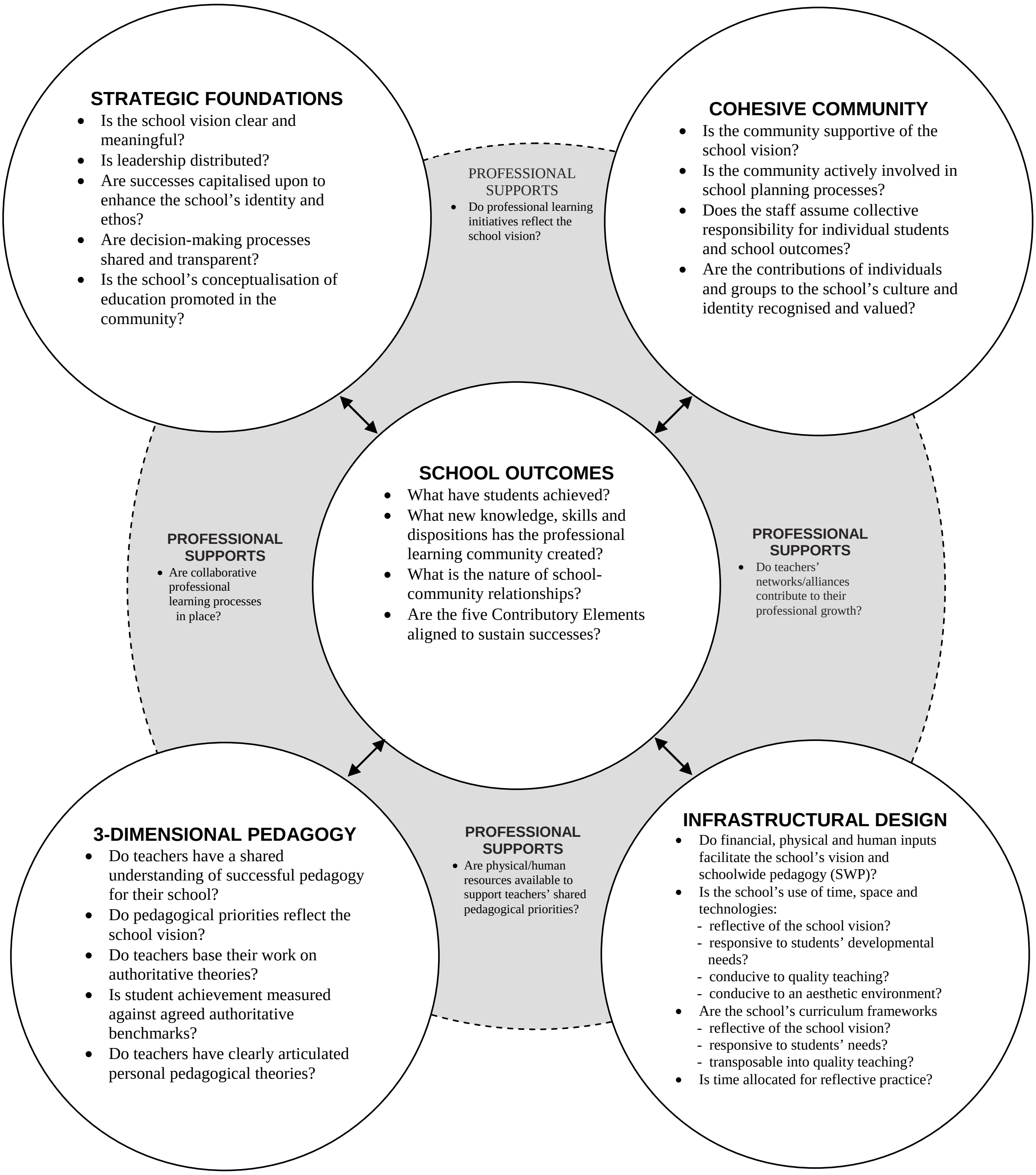

Figure 2.1
Framework for Enhancing School Outcomes

This framework has been developed through a five-year strategic alliance between the University of Southern Queensland's Leadership Research Institute and Education Queensland. The University of Wisconsin-Madison's longitudinal studies of successful restructuring in American schools (e.g. Newmann and Wehlage, 1995; King and Newmann, 2000) have been particularly helpful.
(Crowther, et al., 2002)

expectations for student achievement. While this generalisation has not been tested in higher education, it would appear to have clear relevance to universities, including those that aspire to offer high quality transnational engineering education programmes.

2.4.2 Quality in terms of Curriculum Design and Course Delivery

Howe and Martin (1998) reported that there was a lack of internationalization in the overseas university's course content. It was reported that the transnational university was simply exporting its own western approach to management education without responding much to the local needs. To some extent, the university tried to contextualize the content of the course by involving local academics in the delivery of the course. The university also encouraged university staff to find opportunities not only to interact with students, but they also had to read through the Asian journal articles and newspapers during their teaching-stay in Asia. The experiences gained were then fed back into the programmes (Howe and Martin, 1998). To a certain extent, they were trying to contextualize the content so that it could meet the local market needs and the programmes studied could be useful for students' future career roles (Palihawadana and Homes, 1999).

The same problem arose in Africa, whereby transnational courses conducted invariably failed to take into account African perspectives, aspirations, and goals (Ekhaguere, 2000). It was recorded by Wells (1993) that the majority of the curricula conducted offshore were not adapted to suit the culture, religious or economic circumstances of the country where the courses were conducted. Transnational courses conducted in Africa were sometimes inferior versions of analogous courses offered to their home students (Ekhaguere, 2000). Similarly, in Malaysia, there are many doubts about the quality of transnational education. Lee (1997a, p.16) had repeatedly asked: "Does the quality of the twinning programme measure up to a similar programme offered in the foreign institution?"

An exceptional case was found in the transnational computer science degree offered by Victoria University (Australia) in Hong Kong. The Melbourne lecturer of the project was faced with the problem of maintaining the quality and authenticity associated with the final year project (Miliszewska, Horwood, and McGill, 2003). As the Melbourne lecturer had no intimate knowledge of the business and industrial environment in Hong Kong, and it was impossible to transplant the whole Melbourne project model into the Hong Kong setting, the Melbourne lecturer took the initiative to develop a unique transnational project for students in Hong Kong to accommodate distance and cultural constraints without affecting the project context and project-based problems (Miliszewska et al., 2003).

Generally, opinion on the curriculum design of transnational courses was different. Some urged that the programs had to be tailored to the specific cultural needs of students, while others claimed that the cultural differences can be overcome by good teaching techniques regardless of where the programs were offered (Miliszewska et al., 2003). Through the use of different teaching approaches, students would acquire student-centred learning skills. The teaching approaches from the overseas universities would then be slowly introduced to offshore students.

2.4.3 Quality in the Use of English as a Medium of Instruction

The Malaysian government, in order to establish Malaysian educational identity and to avoid cultural fragmentation, has required all transnational courses to be conducted in the national language unless approval was given to conduct in English or Arabic (Lee, 1997b). In Malaysia, however, private colleges and transnational education providers generally prefer to conduct courses in English to differentiate themselves from the public education, and with the mastery of English many job opportunities will be opened up to graduates (Tadjudin, 2000; Hbrabinska, 2000). In addition to the above requirement, all private colleges also must teach the compulsory subjects required by the Malaysian Education Ministry such as Malaysian studies, Islamic studies, and Moral studies (Lee, 1997b). Compulsory subjects are conducted to fulfill the requirements of the Malaysian Ministry of Education.

2.4.4 Quality in terms of Resources and Facilities

Physical facilities and resources are very important for a good education environment (Joseph and Joseph, 1997). Howe and Martin (1998) summarized that poor library resources, cultural differences, mismatched administrative expectations, and lack of harmonization of administrative systems in colleges had caused difficulties. In Malaysia, Lee (1997a) also reported that many colleges did not provide facilities that its foreign partner would like them to have and a number of private colleges faced shortage of teaching staff, poor management structure, counseling services, library, and laboratory facilities. Campuses were reported to be small, equipped with old computers, which were inadequate to cater for a large number of students. Colleges were often located along the main roads, and hence there was continuous traffic noise. Saffu and Mamman (1999) also reported that resources provided for strategic alliances were inadequate.

2.4.5 Quality in terms of Monitoring Mechanisms

Lee (1997c) discussed the different models of linkages and highlighted the characteristics of active and passive linkages. She generally described the active roles played by the active partner which included on-site supervision to ensure quality and sufficient provision of resources by colleges. Altbach and Philip (1999) remarked that in some twinning arrangements, local academic staff members were used to deliver and read materials provided by the overseas universities. Passive partners allow college lecturers to set and mark assignments and examination scripts (Lee, 1997c). There was little direct supervision or involvement by faculty from the "home" university and the whole operation was similar to McDonald's approach of franchising the "brand name" to a franchisee (Altbach and Philip, 1999). Since there is an existence of both active and passive linkages, definitely there would be variation in quality assurance mechanisms of transnational programmes. So far, only three tertiary institutions, the British Open University, Saint-Louis University (St. Louis, Missouri), and Monash University (Australia) had undergone a process of quality assurance outside their own national contexts (Lenn, 1998). Many transnational providers are not subjected to any internal quality assurance mechanisms on external quality assurance regimes as they do not belong to any official higher education system of any particular country (ESIB, 2003). The European Student Handbook on Transnational Education (2003) had raised a number of quality assurance questions which needed to be solved to ensure a good delivery of transnational education. The questions raised which are related to the current study can be summarized as follows:

a. Given the diversity of the transnational education, what is the best way of ensuring a good quality assurance system in the transnational education provision? Which method and mechanisms will facilitate international comparability of academic qualification?

b. Do the new modes of delivery imply that learning has to be measured by the learning outcomes and competencies of students?

2.5 Quality Assurance Mechanisms in Transnational Education

Most countries are not able to monitor the quality of educational offerings exported to other institutions across their borders (Lenn, 1998). It was recorded that 51% of transnational education programmes offered by Australian universities did not have any adequate quality monitoring mechanisms (David, Olson, and Bohm, 2000). Governments in countries such as Israel and India had criticized British universities for granting franchises to low-quality education providers in developing countries (Lenn, 1998). Whenever a reputable institution delivers education outside its own national borders, the quality of its programmes has to be maintained (McBurnie and Pollock, 2000). It is therefore necessary to establish quality assurance mechanisms in order to maintain a high standard of delivery of transnational programmes by both the providing and receiving countries.

2.5.1 Regulation and Quality Assurance Mechanisms Adopted by Exporting Countries

Complaints from the importing countries on quality problems had driven the British to establish guidelines for greater scrutiny of transnational education (Lenn, 1998). The

Higher Education Quality Council of the United Kingdom (HEQC---now incorporated into the new Quality Assurance Agency), which audited the quality assurance policies and practices of British universities and colleges, also undertook a separate audit on the collaborative institutions of United Kingdom institutions located in the United Kingdom and overseas (Lenn, 1998). After visiting 20 overseas partners of United Kingdom institutions in Greece, Hong Kong, Malaysia, Singapore, and Spain, HEQC published a Code of Practice for Overseas Collaborative Provision in Higher Education (HEQC, 1996a and 1996b).

In the United States, the regional institutional accrediting bodies adopted a "Principles of Good Practice in Overseas International Education Programs for Non-US Nationals" to scrutinize the higher education established in overseas (Lenn, 1988). The transnational accrediting activity is becoming more structured with the accreditor directly accrediting an American program when it travels abroad.

2.5.2 Regulation and Quality Assurance Mechanisms Adopted by Importing Countries

In the majority of the importing countries, very few established comprehensive quality assurance practices related to transnational education are developed and implemented in receiving countries. In Hong Kong, a new ordinance called Non-local Higher and Professional Education Ordinance, which required transnational providers to register the courses they offered in Hong Kong, came into force in December 1997 (French, 1999). The main purpose of having the registration process is to ensure that standards of transnational courses delivered in Hong Kong are maintained at levels comparable with courses conducted in the countries where overseas institutions are situated (French, 1999). Similarly, certain central and eastern European countries have also adopted very strict measures towards the operation of transnational education. Transnational providers are required to submit an application when establishing higher institutions in Slovak Republic. In a case where the application is rejected, the founder is required to dissolve the branch campus of the foreign university (Hrabinska, 2000).

In Malaysia, the development of transnational education is carefully steered and monitored by the government to meet the national education needs and economic development needs. To have a better management and monitoring of the education system, the government had tabled 5 legislations to position Malaysia as a regional higher education hub. Out of the 5 legislations, 3 legislations have affected the establishment, management and development of private colleges, while the other two are related to universities and university colleges[2] and national higher education fund. The first legislation is the National Council on Higher Education Bill which was tabled in 1996 to plan, formulate, and determine policies and strategies for the development of both public and private higher institutions in Malaysia (Malaysia 1996a). The setting up of this council has been able to coordinate and oversee both the public and private higher institutions. The government would like the private colleges to complement and supplement the efforts of the public universities by setting up colleges in the less developed regions of the country and providing more advanced technical education and facilities (Lee, 1997a). The second legislation, Private Higher Educational Institutions Act, was also tabled in 1996. Under this act, all private higher institutions have to obtain approval from the Ministry of Education before they can be set up and before any programme can be conducted. Both private and foreign universities can be set up only at the invitation of the Minister. This is to ensure that all private higher institutions have enough resources, capacity, and expertise to deliver quality programmes. All private higher institutions are also required to conduct their courses in the national language for fear that the usage of English as a medium of instruction may exacerbate social divisions (Zhang, 2003). Private colleges are not allowed to use English as a medium of instruction unless approval is granted to conduct courses in English. To establish Malaysian identity, all private institutions also must conduct compulsory subjects such as Malaysian studies, Islamic studies for Muslim students, and moral education for non-muslim students (Malaysia 1996b). Transnational providers are encouraged to focus on conducting courses which are considered vital to economic growth such as business and technological courses (Zhang, 2003).

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[2]University College is a college with status which has been upgraded to a university by the Ministry of Education, Malaysia.

In view of the rapid expansion in private education and the concern about the quality of transnational programmes, the government established the National Accreditation Board Bill in 1996. The accreditation board was set up to formulate policies, set, monitor, review, and oversee the standard and quality control of courses of study as well as the certificates, diplomas, and degrees awarded by private higher institutions. It introduces Standards and Quality Evaluation for all programmes offered in private colleges. In an effort to have quality control over private education, the government set up a National Accreditation Board (LAN) in 1997 to formulate policies on the standard and control of the quality of transnational tertiary courses conducted at private colleges (Lee, 1997b). All courses leading to a university award or external award require formal academic approval from the National Accreditation Board. The government took this move in order to ensure a minimum quality in terms of teaching and learning experiences, provision of good facilities, management structure, and universities' monitoring process. A set of schema or documents describing general information of courses and course organization (5%), qualifications and teaching experience of staff, staff development and research (30%), curriculum design and delivery methods (20%), facilities and equipment (20%), and college management system (25%) has to be submitted to the National Accreditation Board (LAN) to seek approval before conducting the course (Lembaga Akreditasi Negara, 2002; The Star October, 2000). LAN advises and makes recommendations to the Minister for his approval of courses of study to be conducted by private higher institutions. The transnational providers and the host colleges have to continually meet these requirements in order to get approval and renewal of licences for conducting transnational programmes.

2.5.3 An International Response to Transnational Education -- the GATE Viewpoint

Tadjudin (2000) stressed that some kind of regulations were necessary to protect students who wished to pursue transnational programmes. He was of the opinion that this was an international issue and some attempts had to be carried out by the Global Alliance for Transnational Education (GATE) to solve problems of regulation and quality assurance in transnational education, to ensure that transnational programmes offered by the transnational providers were of high quality, and had added value to students of the host countries. Primarily, GATE was set up with the purpose of addressing the assurance and improvement in transnational higher education (Lenn, 1998). GATE administers the global database of transnational education offerings and conducts of GATE Certification process (Lenn, 1998), which is an international quality assurance process for higher education. The GATE practices are as follows:

(i) depict the characteristics of quality;
(ii) ask the educational entity to conduct a self-evaluation based on those characteristics of quality;
(iii) conduct an external review of the programme (at the "home" institution for virtual offerings and at the foreign site for physically based offerings);
(iv) confer GATE Certification depending on the outcome of the process (Lenn, 1988).

The GATE, after carrying out an in-depth study of characteristics of quality provided by a variety of organizations related to transnational education, has derived the principles for transnational education as shown in Table 2.1.

Tadjudin (2000) further added that GATE should co-operate with the International Network for Quality Assurance Agencies in Higher Education (INQAAHE) in exploring the possibilities of establishing a formal international recognition process for higher education accreditation bodies. The results of the quality control process should then be published openly (Tadjudin, 2000).

Table 2.1
Principles for Transnational Education

No.	Principles For Transnational Education
1.	Goals and Objectives: Goals and objectives of courses are to be provided to prospective students and available for public scrutiny.
2.	Standards: Transnational course is approved by the provider and meets its criteria for educational quality, and that the same standard is applied, regardless of the place or manner in which the course is provided.
3.	Legal and Ethical Matters: Transnational courses must comply with all appropriate laws and approvals of the host country.
4.	Student Enrolment and Admission: Participants in transnational courses must be treated equitably and ethically. In particular, all pertinent information must be disclosed to the participants and each participant must hold full student status or its equivalent with the provider organization.
5.	Human Resources: The provider organization must have a sufficient number of fully qualified people engaged in providing the transnational courses. Faculty members teaching or providing transnational courses must have the academic credentials and experience appropriate to those courses, and are appointed under the supervision of the provider organization.
6.	Physical and Financial Resources: The provider organization must assure an adequate learning environment and resources for the transnational courses, and must provide assurances that adequate resources will continue to be available until all obligations to enrolled participants are fulfilled.
7.	Teaching and Learning: Transnational courses must be pedagogically sound with respect to the methods of teaching and the nature and needs of the learners. Materials and learning resources used should normally be adjusted to be culturally appropriate to the range of students to whom the courses are being offered.
8.	Student Support: The provider organization must ensure that students are provided with adequate support services to maximize the potential benefits they receive from the transnational courses. The effectiveness of student support services is regularly monitored and maintained.
9.	Evaluation: Transnational courses must be regularly and appropriately evaluated as a normal part of the provider organization's activities, with the results of the evaluations being used to improve these courses.
10.	Third Parties: Where third parties, such as agents or collaborating institutions are involved in the TNE, there must be explicit written agreements covering their roles, expectations, and obligations.

Source: Lenn (2002).

2.6 The Measurement of Service Quality – the SERVQUAL Methodology

Service quality is multidimensional (Oliver, 1989; Parasuraman, et al., 1988; Vandamme and Leunis, 1992). There is no general agreement on service dimensions for measuring the service delivered and received. Smith and Houston (1982) suggested that satisfaction of customers in service offered could be generalised by the confirmation or disconfirmation of the customer's expectations. Using the same concept, Grinroos (1982) developed a model for determining service quality by building a customer's expectation of service and perception of service performance into the model. However, the most widely cited measure of service quality is SERVQUAL, proposed by Parasuraman and his colleagues, and the work below on SERVQUAL drew heavily on the work of Parasuraman et al. (1988, 1991a). Parasuraman, Ziethaml and Berry (1988) developed the SERVQUAL model which was a questionnaire designed to measure service quality across a broad range of services and industries, especially marketing and retailing industries, with minor modifications. The SERVQUAL model suggested that the difference between consumers' expectations and the actual performance of a specific organisation influenced the perception of service quality. Customers' expectations were determined by the personal needs of a customer, the customer's past experience of service providers, word-of-mouth communications, and external communications such as communications with a service provider. Perceived service quality, or gap score (usually denoted as Q), was viewed as the degree and direction of discrepancy between customers' perceptions (denoted as P) and expectations, which was denoted as E. Mathematically, Q was calculated as P – E and Q was taken as the indicator of service quality. A positive gap score implied that service provided was exceeding customer expectations, while a negative gap score implied that service quality was below customer expectation.

In essence, the model highlighted the following five gaps in the delivery of service:

1. Consumers' expectations and management's perception of these expectations;
2. The perceptions of service quality held by top management and the translation of these into quality specifications;

3. These specifications and the service delivery at the front line;
4. External communications promised and actual service delivered; and

5. Perceived performance and expectations, which is a function of gaps (1) to (4).

After extensive empirical and psychometric testing, the major determinants of perceived service quality identified was consolidated into the SERVQUAL instrument which had only five broad dimensions that were labeled as responsiveness, reliability, empathy, assurance, and tangibility. The five suggested service quality dimensions were described as follows:

1. Tangibles (physical facilities, equipment, appearance of personnel).
2. Reliability (ability to perform the promised service dependably and accurately).
3. Responsiveness (willingness to help and provide prompt service).
4. Assurance (knowledge and courtesy of employees and their ability to inspire confidence).
5. Empathy (caring, individualised attention provided by a firm to its customers).

The SERVQUAL instrument consisted of 22 items, each of which was related to one of the five major dimensions. The SERVQUAL instrument was the most valuable instrument when it was used periodically to track service quality trends (Parasuraman et al., 1991b). Despite its popularity, Carmen (1990), when applying the SERVQUAL model to surveying customers of a dental school patient, a business school placement center, a tyre store, and a hospital, commented that the five service quality dimensions of the SERVQUAL instrument were not generic and new uses of the instrument should be preceded by reliability tests and factor analysis. She further suggested that more dimensions and items should be added, and the wording of the items also should be changed. Briefly, Carmen (1990) argued that SERVQUAL needed to be customised to the service intended to be measured and could not be applied to any service as originally designed. She added that both technical and service qualities should be integrated to further improve the instrument. Similarly, Finn and Lamb (1991) concluded that the validity of the SERVQUAL instrument should be examined when it was used in different industries to gather consumers' perceptions of service quality. They concluded that retailers and consumer researchers could not treat SERVQUAL as an "off the shelf" measure of perceived service quality.

Cronin and Taylor (1992) studied the conceptualization and measurement approach used in developing SERVQUAL. They assessed service quality without relying on the disconfirmation paradigm of assuming that consumers had certain pre-consumption expectations before actually consuming a service, and concluded that the non-difference score measure produced better results than SERQVUAL. They proposed that service quality should be defined simply in terms of perception and developed the alternative model known as the SERVPERF model (Service Performance model). They argued that the performance-based measure was an enhanced means of measuring service quality. Teas (1993) noted that the P-E measurement specifications of the SERVQUAL model were difficult to operationalise the service expectation concept. In an empirical investigation of the SERVQUAL model, Brown, Churchill, and Peter (1993) indicated that the non-difference score measure of service quality displayed better discriminant and nomological validity properties than SERVQUAL scores. The arguments of Cronin and Taylor (1992), Teas (1993), and Brown et al. (1993) were supported by the study of Lees and Yoo (2000) which compared the gap model with the performance model and showed that the performance model appeared to be superior to the gap model.

Oldfield and Baron (2000) employed the SERVPERF (Service Performance) approach, which was the modified SERVQUAL model, to measure students' perception of service quality in a higher education institution. The study revealed that student perception of service quality in higher education could be labeled by three dimensions namely "requisite", "functional", and "acceptable". It was argued that items within the "requisite" group were essential for students to fulfil their study obligations. Many of these were related to duties carried out by academic and non-academic staff (Oldfield and Baron, 2000). Students expected academic staff to have knowledge of course provision, and both academic and non-academic staff to understand their needs, and to deal with them in a caring fashion (Oldfield and Baron, 2000). The second dimension, “functional”, described a service setting such as a university rule or decision which could not be altered and might have a big impact on customer feelings and perceptions. The third dimension described encounters of students of how inclusively staff treated students, which students acknowledged as desirable but not essential during their course of study.

Chadwick (2002), who used SERVQUAL model for monitoring course delivery of an undergraduate course, revealed that the results of his survey, when it was compared with educational research on dimensions that determined student perception of teaching quality such as class size, teacher response time, and organizational environment, the SERVQUAL model (known by Chadwick as industrial model) appeared to have translated well to an educational context.

Another more direct disconfirmation approach was the importance-performance technique, which was the adapted SERVQUAL model. Wright and O’Neill (2002) used the importance-performance technique to study the conceptualization and measurement of on-line library service quality within the higher education sector in Western Australia. Their results revealed that the importance-performance technique was able to identify how a service was performing along a range of quality attributes and able to differentiate the attributes which were deemed most salient and/or relevant by students in the particular educational service context (Wright and O’Neill, 2002).

Even though SERVQUAL has been widely used to measure service quality throughout the services sector, the applications of SERVQUAL in higher education met with little success (Aldridge and Rowley, 1998). The disconfirmation-based instrument was deemed to be not appropriate for education because of the following reasons:

- The 5 suggested dimensions could not be easily customized for each industry. After empirically testing the SERVQUAL in four different industries, Carmen (1990) found that the dimensions were not general enough to cater for the needs of all industries.

- Expectations must remain constant in the SERVQUAL model. Since education was a long-term service, and expectations changed with familiarity with the service (Carmen, 1990), students' expectations also changed with time. Hence, this instrument was not able to function correctly.

- Expectations were standards against which performance could be measured (Joseph and Joseph, 1997).

These standards were formed on the basis of knowledge and experience with the service. As potential students had little or no previous knowledge or experience with tertiary education, their expectations might lack validity (Joseph and Joseph, 1997). On the other hand, students would become more discriminating and critical of the service delivery once they stayed long in a higher education institution (Aldridge and Rowley, 1998).

The SERVQUAL methodology as an approach to assessing the delivery of organizational services can therefore be seen to be a distinctive strategy that has been tested in a wide range of institutions and institutional settings. It provides a cornerstone for the development of the research instruments that are used in this study.

2.7 Stakeholder Perceptions of the Concept of *Quality* in Higher Education

There are contested views over quality and its measurement by different stakeholders in higher education (Tam, 2001). Harvey and Green (1993) described quality as a 'relative concept' because it conveys different meanings to different people under different circumstances. Different stakeholders in education, ranging from students, employers, teaching and non-teaching staff, and government to assessors from professional bodies, have different viewpoints regarding quality in education (Burrows and Harvey, 1992). Barnett (1994b) viewed quality as a measure of the ability of students to succeed in the world of work. Committed educators view quality in education as the ability of a higher institution to produce a steady flow of people with high intelligence and commitment to continue the process of transmission and advancement of knowledge (Reynolds, 1990). If higher education is conceived as the production of highly qualified workers, then the career earnings of graduates would be related to the quality of the education they have received (Barnett, 1994a and 1994b).

Conversely, if quality in higher education is viewed as efficient management of teaching provision, then factors such as completion rates, student-staff ratio, and other financial data would be related to the quality of education in an institution (Barnett, 1994b). Barnett (1994b) defined quality in education to be the quality of student experience which was about exposing students to educational experience, developing students' autonomy and integrity, and cultivating intellectual abilities of students to form different perspectives in different situations.

A government might regard a high quality educational institution as one that could produce trained scientists, engineers, doctors or other similar professions as required by society (Reynolds, 1990). To employers, high quality institutions are those which are able to produce graduates with wide-ranging, flexible minds who are adaptable to new methods and needs (Reynolds, 1990). Harvey and Green (1993) in their discussion of the relationship between quality and standard in education identified quality in education as "exceptional" which was linked to excellence, as "perfection or consistency", as "value for money", as "fitness for purpose", and as "transformative" which was interpreted as development of new knowledge.

2.7.1 Measurement of Teaching Quality

In education, many researchers have developed instruments for measuring teaching quality. Ramsden and Entwistle (1981) developed "Course Perception" questionnaire to measure students' experiences in higher education institutions. In their questionnaire, they included items such as "good teaching" in terms of clarity of explanation, level at which material was pitched and others, "openness to students", "freedom in learning", "clear goals and standards", and "appropriate workload" to measure students' learning experiences. They later modified the "Course Perception" questionnaire to include more items like “concern for and availability to students”, “enthusiasm and interest of teachers”, “clear goals and organizations”, “feedback on learning”, “encouragement of students’ independence and active learning”, “appropriate workload and relevant assessment models”, and “the provision of a suitably challenging academic environment” (Ramsden, 1991).

Apart from Ramsden and Entwistle (1981), March and Roche (1993), and Feldman (1984) also contributed to the development of measuring teaching quality instruments by developing “Endeavor model” and “Feldman’s model” respectively. The items contained in their teaching quality measurements are found to have a lot of similarities. These items are summarized in Table 2.2. These models had been reviewed and demonstrated that they had internal consistency, stability, generalizability, and construct validity (Marsh and Dunkin, 1992; Rowley, 1996).

Even though the above models had been demonstrated to have internal consistency, stability, generalizability, and construct validity, and was a valid instrument for improving the quality of higher education, it seemed that the instruments did not capture other highly-relevant features of students’ learning experience (Wiers-Jenssen, Stensaker, and Grogaard, 2002). Hill, Lomas, and Mac (2003) revealed that students perceived quality education to be determined by quality of lecturers; student engagement with learning; social/emotional support systems; library and information technology resources. Lecturers must be well-versed in their subject content, effective in conducting interesting lectures by relating theory to real world applications. They should be able to engage students in learning and build up good rapport with students. Students preferred to have good social/emotional support system and easy access to good library and information technology resources.

Hariri, Khalid, Mohd. Shoki, and Zainab (2003) was of the opinion that traditional method of evaluation, which focused on assessing teaching and learning, was not comprehensive since teaching and learning was not something that occurred solely in the classroom. They reported that a better measurement of the quality of higher education should be from students’ perspective as it was the total student experience with significant components of the service experience delivered to students. The

Table 2.2
Measurement of Teaching Quality

Feldman's model	Ramsden's model	Endeavor model
Stimulation of interest	Enthusiasm and interest of teacher	
Enthusiasm		
Subject knowledge		
Intellectual expansiveness		
Preparation and organization	Organization	Organization/planning
Clarity and understandableness	Clarity of explanation	Presentation clarity
Elocutionary skill		
Sensitivity to class progress		
Clarity of objectives	Clear goals and standards	Organization/planning
Values of course material	Course materials	
Supplementary materials	Course materials	
Perceived outcome/impact		Student accomplishments
Fairness, impartiality	Assessment methods	Grading/exams
Classroom management	Organization	
Feedback to students	Feedback on learning	Grading/exams
Class discussion	Encouragement of students' independence in learning	Class discussion
Intellectual challenge	The provision of a challenging academic environment	Students' accomplishments
Respect for students	Concern for and availability to students	Personal attention
Availability and helpfulness	Concern for and availability to students	Personal attention
Level of difficulty and amount of workload	Appropriate workload	Workload

quality of teaching and learning could be measured by questions that focused on evaluating effectiveness of class delivery; questions that assess services delivered to students, and quality of resources/facilities supporting the teaching and leaning process (Hariri et. al., 2003). They concluded that this comprehensive approach of evaluating the quality of higher education would yield a better measurement of quality, greater efficiency in data collection and analysis.

2.7.2 Employers' Expectations of Graduates from Higher Education

Apart from students, employers too are concerned about the standards of the qualifications offered by higher education institutions. Both students and employers, the main users of the higher education system, need to have confidence and assurance that the programmes of study could lead to qualifications which are effective in enabling a learner to achieve and to demonstrate the achievement (Randall, 2002).

The Dearing Report (Dearing, 1977) on the higher education in Britain emphasised the importance of exposing students to the world of work and identified communication skills, numeracy, capability in information technology, flexibility and adaptability to work as well as team work as important qualities to be possessed by graduates. In view of the increasingly turbulent environment, Cleland and King (1983) stressed that it was important for graduates to master the concept of 'systems approach' for managing complex systems. Greenwood, Edge, and Hodgetts (1987), who undertook several research studies on characteristics or skills which employers expected of business graduates, highlighted that skills expected by employers could be identified under the following four groups:

Group 1: Communication
Group 2: Analysing data, proposing solution, making decisions
Group 3: Planning, developing, organising, coordinating
Group 4: Working with others, motivating

Hawkins and Winter (1995), in their report for the Association of Graduate Recruiters (AGR) on "Skills for graduates in the twenty-first century" concluded that apart from self-confidence, graduates required skills such as negotiating, action planning, and networking to manage work and learning processes. Harvey and Knight (1996) listed willingness to learn, teamwork, communication, problem solving, analytical ability, logical argument, and ability to summarise key issues together with personal attributes such as commitment and energy as important skills for professionals in the workplace. Graaff and Ravesteijn (2001) recorded that engineers should possess the following four categories of competencies in order for them to meet the increasingly higher job expectations of engineering jobs:

(a) Professional knowledge and skills
(b) Science, technology and society abilities
(c) Knowledge and skills regarding organisation and management
(d) Communicative and social skills

Generally, employers expected tertiary education to develop graduates with competencies such as oral communication, teamwork, interpersonal skills, self-management, problem solving, and leadership (Candy and Crebert, 1991; Marginson, 1993). They also preferred employees who could be 'adaptive' in order to fit easily into a workplace, who were 'adaptable' in order to take initiatives to develop new ideas, and who were so 'transformative' that they possessed the ability to inspire others and lead changes in an organisation (Harvey et al., 1997b).

2.7.3 Employers' Perceptions of Higher Education and Graduate Quality

In view of the increasingly high job expectations, higher education was shifting from its role as provider of 'knowledge for contemplation' to providing students with a set of key skills or competencies that belonged to the ideology of "operational competence" (Barnett, 1994a). Higher education has a total responsibility for meeting industry's needs. Increasingly, industry views higher education as a means for producing a seamless transition between education and employment (Gush, 1996).
The Dearing Report (1997) concluded that all institutions of higher education should aim for students' achievement in key skills. In an attempt to conceptualise employers' satisfaction towards quality in higher education, Harvey and Knight

(1996) mentioned that when employers say that they are satisfied, it means that they are satisfied with the standard of graduates or that graduates fulfill the requirements expressed by employers or that employers get a return for the money they invest in graduate recruitment and employment or that graduates assist the organization to adapt to the rapidly changing situation of the 1990s and beyond. The employers could judge their satisfaction by one or more of the above four elements even though the use of all four measures of satisfaction would give a more secure account of employers' levels of satisfaction (Harvey and Knight, 1996).

Hesketh (2000) suggested that one method of measuring quality in higher education was by analysing employers' perceptions of graduate quality. This was the only way to enable a view on quality of higher education to be taken from those not involved in the higher education. In Britain, there was clear evidence that employers still preferred to recruit graduates from institutions which accepted only academically excellent students (Hesketh, 2000). Employers continued to raise doubts regarding the standards of graduates from new universities (IOD/CBI, 1997). However, the most popular type of institutions from which employers preferred to recruit new graduates were institutions which had close ties (include new universities) with employers (Hesketh, 2000).

In Malaysia, the Education Minister, Tan Sri Musa Mohamad criticised that graduates from local universities were unable to think critically or communicate impressively and were lacking in management skills (The Star, July 2003). He urged local universities to use different approaches to teach the young generation skills relevant to industry's requirements. Conversely, the Human Resources Minister, Datuk Dr. Fong Chan Onn, urged local public universities to review their curriculum in order to produce graduates who were more marketable and did not require retraining by the government (The Star, July 2003). Generally, students in local public universities were students with good entry pre-university academic results. However, he said that Malaysian employers preferred to employ foreign graduates and graduates from local private colleges because graduates from local public universities had a poor command of English, lacked soft skills, communication skills, and team spirit (The Sun, August 2003). In view of the positive comments published by The Sun newspaper about the employers' perception of transnational graduates, which is in direct contrast to the negative public concern about the quality of transnational programmes, the measure of the effectiveness of the programmes poses an interesting question that needs more research studies.

2.7.4 Student Satisfaction

Most of the published literature does not differentiate between consumer satisfaction and quality perception (Bolton and James, 1991; Carmen, 1990; Cronin and Taylor, 1992; Mano and Oliver, 1993; Oliver, 1980; Taylor and Cronin, 1994). Spreng and Singh (1993) recorded that satisfaction and service quality were measuring the same thing. However, a number of other researchers believed that satisfaction and service quality were different (Parasuraman et al., 1988; Bitner, 1990; Boulding, Staeling, Kalra, and Zeithamal, 1993). Rust, Zahorik, and Keiningham (1994) suggested that quality was just subordinate to satisfaction. Their finding was supported by Athiyaman's conclusion (1997) that perceived quality depended on satisfaction. He explained that perceived service quality was an overall evaluation of the "goodness" or "badness" of a product or service and customer satisfaction was a short-term evaluation of a specific consumption experience. Wiers-Jenssen et al. (2002) later utilized the longitudinal study to prove that student satisfaction and students' perception of teaching and learning were partly overlapping evaluation factors.

It was recorded that 40% of the Fortune 500 companies were dissatisfied with university education and operated corporate universities themselves to meet their training needs (Newsday, March 1999). Growing private sectors will become predominantly educational institutions if student satisfaction in educational institutions is not improved. Some researchers used the indicators of student satisfaction with both the course and the instructors to determine teaching effectiveness (Feldman, 1989; Abrami, d'Apollonia, and Cohen, 1990). They attributed the characters and traits of academics such as commitment, flexibility, friendliness, and knowledge, to be the main determinant that determined student satisfaction. Rust et al. (1994) identified 8 broad factors such as the traits of the academic, class management, course design, assignments, testing, grading, feedback, and course materials to be the key factors determining student satisfaction. Students expect academics to be able to use various methods to arouse students' interests and help them to understand the real life applications of the topics covered. The course materials provided must be clear, understandable, and relevant to the topics covered. The analysis by Wiers-Jenssen et al. (2002) also revealed that the academic and pedagogical quality of teaching were crucial determinants of student satisfaction.

Lizzio, Wilson, and Simons (2002), on the other hand, recorded that students' perceptions of workload were also linked to students' satisfactions. Higher workload was reported to lead to poorer student satisfaction (Lizzio et al., 2002). Other factors such as social climate, aesthetic aspects of physical infrastructure, and quality of services provided by the administrative staff also had to be considered if an institution wished to improve student satisfaction and opportunity for learning (Wiers-Jenssen et al., 2002). As perception and satisfaction are interdependent, educational institutions need to continue to improve the quality of higher education by measuring perceptions and satisfactions of students.

2.8 Characteristics of a Quality Engineering Programme

The global desire for competitiveness has caused industry, education institutions, and governments in many countries to attempt to assess the quality of engineering programmes. The engineering regulatory bodies such as The Engineers, Australia; the Canadian Council of Professional Engineers; the Institution of Engineers of Ireland; the Institution of Professional Engineers, New Zealand; the Engineering Council of United Kingdom and the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, assess and accredit university engineering programmes in their home countries. There are criteria which are developed to assure quality and to foster the systematic pursuit of improvement in the quality of engineering education. Institutions conducting engineering programmes are responsible for demonstrating that programmes conducted meet the criteria set in Table 2.3. Over time, the accreditation requirements have changed, with most of the accreditation bodies focusing on the essential graduate outcomes as shown in Table 2.4 and evidence of their attainment instead of prescribing detailed programme content or processes (The Institute of Engineers, 1999; ABET, 2002). The accredited programmes enjoy recognition of equivalency within the framework of Washington Accord (ABET, 2000).

In Malaysia, the Board of Engineers Malaysia (BEM) has a duty to ensure the quality of engineering education programmes is at least comparable to a global minimum standard. The BEM has adopted policies and accreditation criteria which resemble the detailed policies outlined by The Engineers, Australia.

Table 2.3
Criteria for Conducting Quality Engineering Programmes

ABET	IEAust	GATE
Criterion 1: Students The institution must evaluate, advise, and monitor students to determine its success in meeting programme objectives. The institution must also enforce policies and procedures to assure that all students meet all programme requirements.	**Criterion 1: Admission and Retention** The admission system must adequately publicize the qualifications required for entry and ensure that only qualified candidates are admitted. The school should be able to demonstrate a reasonable relationship between admission standards and student retention and graduation rates.	**Criterion 1: Student Enrolment and Admission** Participants in transnational courses must be treated equitably and ethically. In particular, all pertinent information must be disclosed to the participants and each participant must hold full student status or its equivalent with the provider organization.
Criterion 2: Programme Objectives Each engineering program must have in place: *detailed published educational objectives that are consistent with the mission of the institution. *a process in which the objectives are determined and periodically evaluated *a curriculum and processes that prepare students for the achievement of these objectives *a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the programme	**Criterion 2: Programme Philosophy and Objectives** There must be a clear statement of the mission and the objective for each programme and of the broad characteristics expected of a graduate.	**Criterion 2: Goals and Objectives** Goals and objectives of courses are provided to prospective students and available for public scrutiny.

Table 2.3 (cont'd)

Criterion 3: Programme Outcomes and Assessment	**Criterion 3: Programme Outcomes and Assessment**	**Criterion 3: Teaching and Learning**
*Engineering programmes must demonstrate that their graduates have attributes that listed in Table 2.4. Each program must have an assessment process with documented results. Evidence must be given that the results are applied to the further development and improvement of the program. The assessment process must demonstrate that the outcomes of the programme listed in Table 2.4 are being measured.	Curriculum design and assessment processes are effective in addressing each of the generic and specialist graduate attributes and adequately ensure that each individual graduate has met the degree requirements. The learning outcomes in relation to professional engineering practice are appropriate and the curriculum provides adequate means for students to attain these outcomes. The criteria and process for the award of honours are appropriate.	Transnational courses must be pedagogically sound with respect to the methods of teaching and the nature and needs of the learners. Materials and learning resources used should normally be adjusted to be culturally appropriate to the range of students to whom the courses are being offered.

Table 2.3 (cont’d)

<table>
<tr>
<td>Criterion 4: Professional Component

*Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic, environment, sustainability, manufacturability, ethical, health and safety, and political.</td>
<td>Criterion 4: Exposure to Professional Engineering Practice
Students must have exposure to professional engineering practice during their studies to enable them to develop an engineering approach and to gain an appreciation of professional engineering ethics. This exposure can be obtain through a combination of activities listed below:

<table>
<tr><th>EXPOSURE TO PROFESSIONAL ENGINEERING PRACTICE</th></tr>
<tr><td>1. Use of staff with industry experience</td></tr>
<tr><td>2. Use of guest lecturers</td></tr>
<tr><td>3. Lectures on professional ethics and conduct</td></tr>
<tr><td>4. Practical experience in an engineering environment</td></tr>
<tr><td>5. Regular use of a logbook in which experiences are recorded</td></tr>
<tr><td>6. An industry-based final year project</td></tr>
<tr><td>7. Industry visits</td></tr>
</table>

It is of paramount importance that the curriculum provides adequate means for students to attain the outcomes in relation to professional engineering practice.</td>
<td></td>
</tr>
</table>

Table 2.3 (cont'd)

Criterion 5: Faculty	**Criterion 5: Faculty**	**Criterion 5: Human Resources**
The faculty must be of sufficient number, have appropriate qualifications and competencies to cover all curricular areas of the program and accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.	The teaching staff must be sufficient in number and with postgraduate qualifications, experience, and professional standing to ensure that quality programme is delivered and the program's stated outcomes are attained. There should be a minimum of 8 full-time equivalent academic staff employed on a continuing basis and academic staff should have Master degrees or higher qualifications. To ensure effective teaching, full-time academic staff to student ratio should be 1:15 or better. Universities are encouraged to engage part-time or sessional staff who are outstanding professionals in engineering and related fields. There must be sufficient qualified experienced members of technical and administrative staff to provide adequate support to the educational programme. Policies and practice in relation to staff recruitment, supervision, promotion, and workload management are appropriate. Staff are undertaking an appropriate range of professional and educational development programmes.	The provider organization must have a sufficient number of fully-qualified people engaged in providing the transnational courses. Faculty members teaching or providing transnational courses must have the academic credentials and experience appropriate to those courses, and are appointed under the supervision of the provider organization.

Table 2.3 (cont'd)

Criterion 6: Facilities Classroom, laboratories, and associated equipment must be adequate to accomplish the programme objectives, and provide an atmosphere conducive to learning.	**Criterion 6: Resources and facilities** Adequate resources are available to meet the programme objectives. Future trends, or steps being taken to address them, indicate continuing viability. Adequate facilities and infrastructure are available to students and staff.	**Criterion 6: Physical and Financial Resources** The provider organization must assure an adequate learning environment and resources for the transnational courses, and must provide assurances that adequate resources will continue to be available until all obligations to enrolled participants are fulfilled.
Criterion 7: Institutional Support and Financial Resources Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the engineering program.	**Criterion 7: Operation Environment** Organisational arrangements in the university and the engineering faculty are consistent with identifiable Structure Criterion. There must have evidence of the university's long-term commitment to engineering as a discipline. There must have evidence of the university's engagement in long-term planning processes.	**Criterion 7: Third Parties** Where third parties, such as agents or collaborating institutions are involved in the TNE, there must be explicit written agreements covering their roles, expectations, and obligations.

Table 2.3 (cont'd)

	Criterion 8: Educational Culture There is a clear evidence of a forward-looking, proactive educational culture and awareness of current developments in engineering education. Approaches to curriculum design and delivery, and to assessment, are holistic not fragmented. Staff are active in role-modeling the generic attributes of a professional engineer. There are active programmes in place to promote the objectives and also community consciousness, nationalization, internationlisation, and student-staff interaction.	

Table 2.3 (cont'd)

	Criterion 9: Quality Systems Processes for programme planning and curriculum development and review are appropriate, and involve all relevant staff. There is a clear evidence that the results of assessment of student performance and learning outcomes are being applied to the review and ongoing improvement of programme effectiveness. There are effective processes for securing feedback from all programme constituents and applying it to the review, ongoing validation, and improvement of programme objectives, curriculum, assessment, and quality of learning and teaching. There are effective advisory mechanism for consulting and involving practicing professional engineers and leading employers of engineering graduates in forward planning and quality management. There are programmes in place or under active development, for benchmarking programme standards against those of other universities, nationally and/or internationally. Graduate employment data and alumni and employer feedback are available. The faculty has an effective records management system.	**Criterion 9: Standards** Transnational course is approved by the provider and meets its criteria for educational quality, and that the same standard is applied, regardless of the place or manner in which the course is provided. Legal and ethical matters: Transnational courses must comply with all appropriate laws and approvals of the host country. Evaluation: Transnational courses must be regularly and appropriately evaluated as a normal part of the provider organization's activities, with the results of the evaluations being used to improve these courses.

Table 2.3 (cont'd)

	Criterion 10: Programme Administration and Statistics Admission policies are appropriate and consistent for students from all backgrounds. Student numbers and estimated forward trends are adequate for a viable programme. Arrangement for progression, graduation, and the award of honours appears appropriate	
	Criterion 11: Program Structure and Content A typical engineering programme should have the following curriculum content: ❖ Mathematics, science, engineering principles, skills, and tools appropriate to the discipline of study; ❖ Engineering design and projects; ❖ Integrated exposure to professional engineering practice, including management and professional ethics; ❖ Laboratory work; ❖ Industrial training; ❖ Business and social environment; ❖ Communication.	

Table 2.4
Comparator Table of IEAust, ABET, SARTOR 3, and BEM Graduate Qualities

1.	**Body of knowledge** • Ability to apply knowledge of basic science and engineering fundamentals (IEAust 1) • In-depth technical competence in at least engineering discipline (IEAust 3) • Ability to apply knowledge of mathematics, science, and engineering (ABET a) • Ability to design and conduct experiments (ABET b) • Ability to use techniques, skills and modern engineering tools necessary for engineering practice (ABET k) • Knowledge of probability and statistics, including applications to engineering (ABET l) • Knowledge of advanced mathematics (ABET n) • Ability to use mathematics as a tool for solving complex problems (SARTOR 3) • Ability to use a wide range of tools, techniques and equipment, including computing software pertinent to the engineering discipline (SARTOR 3) • Ability to acquire and apply knowledge of basic science and engineering fundamentals (BEM a) • Have in-depth technical competence in specific engineering discipline (BEM c)
2.	**Life-long learning** • Expectation of the need to undergo life-long learning and the need to do so (IEAust 10) • Expectation of the need to undertake lifelong learning, and possessing/acquiring the capacity to do so (BEM j) • Recognition of the need for, and an ability to engage in life-long learning (ABET i) • Knowledge of contemporary issues (ABET j)

IEAust: Institute of Engineers, Australia.

IEAust 1, 2, 3….: Graduate attributes listed by Institute of Engineers, Australia

ABET: Accreditation Board for Engineering and Technology

ABET a, b, c….: Graduate attributes listed by ABET

SARTOR 3: Graduate attributes listed by the Engineering Council of U.K.

BEM: Board of Engineers Malaysia

BEM a, b, c…: Graduate attributes listed by BEM

Table 2.4 (cont'd)

3.	**Effective problem solver** • Ability to undertake problem identification, formulation and solution (IEAust 4) • Ability to undertake problem identification, formulation and solution (BEM d) • Ability to design a system, component and process to meet desired needs (ABET c) • Ability to design and conduct experiments as well as analyze and interpret data (ABET b) • Ability to utilize systems approach to design and operational performance (IEAust 5) • Ability to utilize a systems approach to design and operational performance (BEM e) • Ability to identify, formulate, and solve engineering problems (ABET e) • Ability to troubleshoot engineering problems (ABET o) • Ability to foster excitement of discovery and associated creativity (ABET q) • Ability to evaluate and derive information from data to produce useful results (SARTOR 3) • Ability to solve problems of a non-routine nature (SARTOR 3) • Ability to apply engineering principles to create products, systems and services (SARTOR 3).
4.	**Work alone and in teams** • Ability to function effectively as an individual and in multi-disciplinary and multicultural teams, with the capacity to be a leader or manager as well as an effective team leader (IEAust 6) • Ability to function effectively as an individual and a group with the capacity to be a leader or manager as well as an effective team member (BEM h) • Ability to function on multidisciplinary teams (ABET d) • Ability to lead, mentor, and contribute to the development of future engineers (ABET p) • Ability to work in a multi-disciplinary team (SARTOR 3)

Table 2.4 (cont'd)

5.	**Ethical action** • Understanding the principles of sustainable design and development (IEAust 8) • Understanding of the principles of sustainable design and development (BEM f) • Understanding of professional and ethical responsibilities and commitment to them (IEAust 9) • Understanding of professional and ethical responsibilities and commitment to them (BEM g) • Understanding of the social, cultural, global and environmental responsibilities of a professional engineer, and the need for sustainable development (BEM i) • Understanding of professional and ethical responsibility (ABET f) • Understanding of the financial, economic, social and environmetal factors of significance to engineering (SARTOR 3) • Understanding of the relevant legal, statutory and contractual obligations (SARTOR 3) • Understanding of the broader obligations of engineers to society (SARTOR 3)
6.	**Effective communication** • Ability to communicate effectively, not only with engineers but also with the community of large (IEAust 2) • Ability to communicate effectively, not only with engineers but also with the community at large (BEM b) • Ability to communicate effectively (ABET g) • Ability to communicate effectively with clients, colleagues and the public (SARTOR 3)
7.	**International perspective** • Understanding of the cultural, social, global and environmental responsibility of the professional engineer, and the need for sustainable development (IEAust 7) The Broad education necessary to understand the impact of engineering solutions in global and social context (ABET h)

2.9. A Preliminary Framework for Assessing Transnational Engineering Education

The initial conceptual framework that is used to guide this study is drawn from the literature that has been reviewed in this chapter. Three aspects of the literature have proven particularly relevant:

- research literature relating to organizational improvement;
- the professional quality statements of professional engineering bodies;
- the SERVQUAL instrumentation for assessing organisational effectiveness.

In summary:

2.9.1 Research into Successful School Revitalisation

The initial framework that is used to design the study organises the measurement of quality of transnational engineering education into two constructs, namely *Outcomes* and *Contributory* constructs, as conceptualized by Crowther et al (2002).

In summary, Crowther's model is based on school-based research conducted at the University of Southern Queensland by Crowther et al. This research has affirmed that successful educational institutions can be viewed holistically, characterized by two elements"– an *Outcomes* element and five *Contributory* elements, namely Strategic Foundations, Cohesive Community, Infrastructural Design, Three-Dimensional Pedagogy and Professional Learning Supports.

Research by Crowther and his colleagues (2002) has established that where the five *Contributory* elements are in place in an educational institution, and aligned philosophically with each other, the institutions can achieve enhanced organizational capacity and heightened educational outcomes.

Crowther's *Research-based Framework for Enhancing School Outcomes* provides one of the three cornerstones for the development of the conceptual framework that guides this study. In particular, the *Outcomes* and *Contributory Elements* structure of the University of Southern Queensland's model (Figure 2.1) provides the structure for the conceptual framework for this study.

2.9.2 Research into the Quality of Transnational Engineering Education

The preliminary conceptual framework for assessing the quality of transnational engineering programmes in this study is also derived in part from standards statements adopted by professional engineering organizations. Table 2.4 indicates that the following seven qualities are perceived by key engineering organisations to be of utmost importance:

- Body of knowledge
- Lifelong learning
- Effective problem-solving
- Ability to work alone and in teams
- Ethical action
- Effective communications
- International perspective

These seven qualities represent a second cornerstone in the development of the conceptual framework that guides the conduct of this study. They have been used, in particular, to ensure that major elements of organizational effectiveness that are drawn from the organizational effectiveness literature and that are included in the *Outcomes* and *Contributory* constructs of the preliminary conceptual framework are consistent with the requirements of professional engineering education bodies.

2.9.3 The SERVQUAL Methodology

. The 5 SERVQUAL service quality dimensions were described earlier as follows:

- Tangibles (physical facilities, equipment, appearance of personnel).

- Reliability (ability to perform the promised service dependably and accurately).
- Responsiveness (willingness to help and provide prompt service).
- Assurance (knowledge and courtesy of employees and their ability to inspire confidence).
- Empathy (caring, individualised attention provided by a firm to its customers).

While the methodology has recognized limitations, it is believed to have sufficient validity to justify continued use and provides the third cornerstone for the design of this research. In particular, the 5 SERVQUAL dimensions and twenty-two statements have been used in determining the key features of the conceptual framework for the study and the construction of subsequent questionnaire instrumentation.

2.9.4 The Preliminary Framework

The Preliminary Framework for Assessing Transnational Engineering Education Programmes that is used to guide this study comprises *Outcomes* and *Contributory* constructs.

Regarding the *Outcomes* construct, a critical review of the generic attributes recommended by professional bodies reveals that professional bodies such as IEAust, ABET, EC, and BEM, have established that the learning outcomes of the engineering programme should encompass dimensions such as "Body of Knowledge", "Life-long Learning", "Effective Problem Solver", "Work Alone and in Teams", "Ethical Action", and "Effective Communication and International Perspective"[3]. Greenwood et al. (1987), Hawkins and Winter (1995), Harvey and Knight (1996) amplified the importance of possessing communication skills, social skills, management, and generic skills by graduates. These attributes, when integrated with

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[3]Refer to Table 2.4 for graduate qualities listed by the professional bodies.

Graaff and Ravesteijn's (2001) four categories of competencies, (namely (a) Professional knowledge and skills, (b) Science, technology and society abilities, (c) Knowledge and skills regarding organization and management, (d) Communicative and social skills) enable a 4-dimension *Outcomes* construct to be created for use in assessing the outcomes of university engineering education programmes. The 4 dimensions are summarized in this study as "Technical Competencies", "Generic Competencies", "Management and Organisation Skills", and "Communication and Social Skills" (Table 2.5).

Table 2.5
Dimensions for Evaluating the Learning Outcomes of the Programmes

DIMENSIONS FOR EVALUATING THE ATTRIBUTES OF STUDENTS/GRADUATES	DEFINITIONS OF MEASUREMENT PARAMETERS IN THE OUTCOME CONSTRUCT
Technical Competencies	Professional knowledge and skill
Generic Competencies	Knowledge and skills in the field of science, technology, and society
Management and Organisation Skills	Ability to plan and organize work; make sound decision.
Communication and Social Skills	Ability to produce good written report; to communicate verbally; to negotiate.

The second aspect of the proposed Framework for Assessing Transnational Engineering Programmes is the *Contributory* construct, consisting of 7 dimensions. The 7 *Contributory* dimensions are consistent with Oldfield and Baron's (2000) indicators of quality programmes, namely "Requisite", "Functional" and "Acceptable". According to Oldfield and Baron (2000), services which are essential for completion of quality education can be grouped under "Requisite", while "Functional" items are those that define the setting for the education system and "Acceptable" items refer to services would enhance the learning experience.

Hariri et al.'s (2003) theory for tapping students' perceptions, namely quality of resources/facilities, services delivered to students, quality of teaching, student assessment, and lecturer-student relationship are considered to be appropriate in the preliminary determination of concepts that fits *Contributory* construct of the proposed framework. Based on the findings of Hariri et al. (2003), 4 particular dimensions of the *Contributory* construct of the proposed framework, namely "Learning Resources", "Teaching, Learning and Assessment Practices", "Administrative Support" and "Staff and Students' Relationship" were developed.

Additionally, as has been documented earlier in this chapter (Table 2.4), professional engineering bodies emphasise the need to design a carefully structured and sequenced curriculum that enables students to attain the learning outcomes of the engineering programme. The professional bodies further advocate the need to expose students to professional engineering practice throughout the engineering education to enable students to develop "an engineering approach" and to enable them to gain an appreciation of professional engineering ethics. They also stress the importance of establishing a strategic vision and strong, visible leadership if institutional outcomes are to be maximised. In essence, the literature that has been reviewed suggests three additional dimensions for inclusion in the *Contributory* construct of the proposed framework, namely "Course Curriculum", "Leadership" and "Professional Exposure".

Thus, the 7 dimensions of the *Contributory* aspect of the proposed framework for assessing transnational engineering education programmes are consistent with theoretically-based conceptions of excellence in transnational engineering education programmes (Table 2.6).

Table 2.6
Definitions of Dimensions that Contribute to Superior Learning Experience

DIMENSIONS FOR EVALUATING THE STUDENT LEARNING EXPERIENCE	**DEFINITIONS OF MEASUREMENT PARAMETERS IN THE *CONTRIBUTORY* CONSTRUCT**
1. Learning Resources	Physical facilities, availability of suitable facilities, up-to-date course materials, equipment and software
2. Course Curriculum	Content relevancy to the job market
3. Teaching, Learning, and Assessment Practices	Competency of lecturers in subject area and delivery of subject
4. Staff and Students' Relationship	Responsiveness of teachers to students' needs, the empathy between teachers and students, and the ability of lecturers to win students' confidence (assurance)
5. Administrative Support	Responsiveness of administrative and technical staff to students' needs, ability of the staff to gain students' confidence, reliability of administrative staff
6. Leadership	Ability to coordinate and bring improvement to the development of transnational programmes
7. Professional Exposure	Professional development activities that jointly provided by the college and linking university to local staff. Local staff, on the other hand, strive to use the experience gained to provide professional exposure to students

The 4 *Outcomes* dimensions, as illustrated in Table 2.5, when combined with the 7 *Contributory* dimensions listed in Table 2.6, comprise a comprehensive framework for evaluating the quality of the transnational engineering education. The proposed conceptual framework is known as **SERVQUAL-TRANS**.

Figure 2.2

Proposed Preliminary SERVQUAL-TRANS Framework for Assessing Transnational Engineering Education

2.10 Conclusion - General Results of the Literature Review

The above literature on transnational higher education describes in some detail the rapid expansion of transnational higher education throughout the world. The literature describes clearly types of programmes provided by transnational education, and monitoring mechanisms set up by the Malaysian government in order to ensure programme quality (Tan 1997; Mak and Postiglione, 1997; Kulachol 1995). The literature review has provided helpful insights into problems encountered within transnational education and the need for exploring in detail the research problem that guides this study.

The review has also detailed numerous types of instruments that have been used for measuring quality in service industries such as higher education. The expectation-perception based instrument of Parasuraman et al. (1988) is covered extensively in the literature as it is used as a basis for developing the new instrument for measuring the quality of transnational education

Finally, an holistic perception-based measuring instrument, which encompasses an *Outcomes* focus that is emphasized by professional bodies and employers as well as *Contributory* construct that research suggests to have strong impact strong upon the quality of students' learning experiences, is developed to conclude this chapter.

CHAPTER THREE

OVERVIEW OF THE TRANSNATIONAL ENGINEERING PROGRAMMES AT TRANS COLLEGE

3.1 Introduction

This brief chapter provides an overview of the transnational engineering programmes offered at Trans College.

The chapter commences with a description of the economic context of the study – Malaysia's manufacturing industries. This contextual analysis is followed by a broad description of the key characteristics of the transnational engineering programmes offered through the two foreign Universities (Northern and Southern). Management systems employed at Trans College in the delivery of the respective programmes are then described, followed by an analysis of relevant quality assurance and monitoring mechanisms.

3.2 Malaysia's Manufacturing Industries

Malaysia, one of the countries in South East Asia, is rich in natural resources and has a good geographic location, modern infrastructure as well as good telecommunications systems (Figure 3.1). With all its unique characteristics and investment-friendly environment, Malaysia is on its way to becoming the fifth so-called "tiger" in the East Asia region after Taiwan, South Korea, Hong Kong, and Singapore. The government has continued to encourage foreign investment by building 11 Free Trade Zones (FTZs), and granting "pioneer status" (partial exemption from income tax payments), import duties exemption on raw materials, machinery, and other incentives to foreign investors (Kahaner, 1996). This has caused the country to experience an average growth in GDP of 9.6% over the past eight years. Malaysia has also become the world's leading exporter of semiconductors, air conditioners, rubber gloves, and consumer electronics (Kahaner, 1996).

Figure 3.1
Map of Malaysia

To further develop the country into an industrialised one, the government of Malaysia has incorporated the Vision 2020 as part of Malaysia's seventh development plan. The plan focuses on accelerating technological upgrading and human resource development in order to meet the requirements of sophisticated manufacturing processes (Mohamad, 2004). The government is currently putting heavy emphasis on training and education in order to maintain Malaysia's competitiveness as a center for manufacturing.

3.2.1 Industrial Development in Penang

Penang is one of the 13 states in Malaysia. It is the second smallest state and is situated on the North-Western cost of Peninsular Malaysia. It is made up of two physical entities—Penang Island and Butterworth (Figure 3.2).

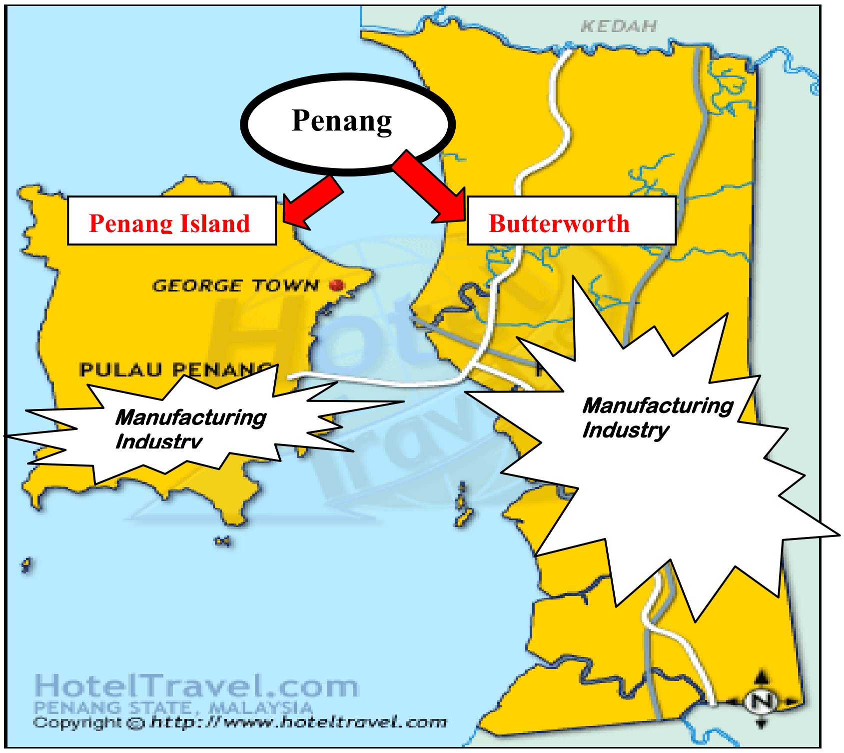

Figure 3.2
Map of Penang State

Penang's economy was experiencing an economic downturn in late 1960s. In November 1969, the Penang Development Corporation (PDC) was established to activate the Penang's economy. The PDC was given the task of making Penang the home of electronics industry. Due to the effort imparted by PDC, five American companies namely National Semiconductor, Litronix, Intel, Advanced Micro Devices, and Hewlett Packard were set up in Penang. One Germany company, Robert Bosch, and another Japanese factory, Clarion, were also set up in Penang in June 1970 (Kahaner, 1996). These seven pioneering factories have grown from strength to strength, and have provided employment to a lot of local people.

The economy slowed down in the mid-eighties due to world-wide recession. The electronics industry was badly hit, however, all the factories were able to ride through the tough period. In 1987, the economy picked up again, and another wave of investment began in Penang. Taiwanese actively participated in setting up of factories, and by the early 1990s, Taiwanese investment was the largest in Penang. With the active spearheading role played by PDC, active participation of Multinational Corporations (MNCs), and competitive edge provided by the Penang manufacturing operations, Penang has transformed itself from an agro-based economy to a world-class manufacturing center (Kahaner, 1996). Manufacturing had then accounted for around 50% of Penang's Gross Domestic Product (as indicated in Table 3.1) and Penang's manufacturing economy had accounted for nearly half of the country's GDP.

Table 3.1
Economy of Penang (1970 – 2000)

	1970	1990	2000
Agriculture	19.7%	3.2%	2.4%
Manufacturing	12.7%	43.0%	45.3%
Construction	5.8%	3.2%	2.4%
Trade/Services	61.8%	50.6%	49.8%
GDP value (RM) (1978 Prices)	1.25B	7.88B	17.31B

Growth Rates	1980-1989	1990-1996	1997	1998	1999	2000
	+7.87%	+10.5%	+7.8%	-4.2%	6.3%	6.7%

Source: Penang Development Corporation

Today, there are many technology giants like Intel, Agilent, Motorola, Hewlett-packard, Advance Micro Devices, Fairchild, Dell, Komag, and Altera setting factories in Penang. It is a base to many multinational companies which support the operation of global semiconductor, computer and computer-related manufacturing companies. To maintain its competitiveness as a center for electronics, computer, and computer-related industries, and to achieve the status of an industrialized nation by the year 2020, human resources have to be continually developed and upgraded. The Penang Skills Development Centre (PSDC) was set up in 1989 to address the need for skilled manpower (Kahaner, 1996). Besides PSDC, other training centers like Malaysian-German Technical Institute and Japan Malaysia Technical Institute were also set up for technical training (Kahaner, 1996). Universiti Sains Malaysia (USM), the only public university in Penang, was set up to provide further studies opportunity to local people. As USM and other Malaysian tertiary public educational institutions are unable to meet the demand for tertiary education, the government gives approvals to a number of private colleges to conduct degree programmes in collaboration with overseas partner-universities. The main goal is to meet the Penang's demand for skilled employees. With an increased demand for skilled employees, engineering education becomes very important and some private colleges start to provide engineering programmes to both school leavers and factories' employees. While conducting the degree programmes, the private colleges are also working with manufacturing industry to provide workshop and degree level training to employees in the factories.

3.3 General Characteristics of the Transnational Programmes

During the East Asia crisis in 1997, "forward integration" was very common in Asia and many private colleges were providing opportunities for students to study foreign degree in their home country (Mazzarol et al., 2003). The increased demand for foreign degrees, had urged Trans College to start conducting the partnership programme known as the "locally completed foreign degree" programme, which was essentially a transnational engineering programme conducted locally with the monitoring of the overseas awarding university. The school started the collaboration with both the Northern University[4], U.K. and Southern University[5], Australia to conduct Bachelor of Engineering programmes.

The Northern University is a regional university in United Kingdom with a global mission. It has a strong international orientation and seeks to equip students to become lifelong learners. The university worked in cooperation with education institutions in South East Asia, Australia, the U.S.A., and Europe. It also has a well established regional and national consultancy practice which helps academic staff to keep abreast of developments in business and technology and also to ensure that the programmes conducted meeting the professional requirements of local professional bodies.

The Southern University is one of the progressive and large universities in Australia and it is renowned for the quality and innovation of its teaching. The university has

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[4]Northern University was a pseudonym used for a linking university of the Trans College.
[5]Southern University was a pseudonym used for a linking university of the Trans College.

been twice named *University of the Year* because of its deep involvement in the use of technology in teaching and learning and its outstanding partnerships with industrial organisations. The awards reflect the University's commitment to building up academic skills and corporate expertise as well as delivering innovative education.

The Southern University is a government funded university and is a member of the Association of Commonwealth Universities. Its degrees are recognized by universities in United Kingdom, Canada, New Zealand, USA, South-East Asia and Europe, as well as by relevant professional associations. In addition, the University has formal links with many universities and other educational institutions throughout the world These links reflect the international standing of the University and its degrees.

Students in the transnational engineering programmes are required to complete a 2-year validated diploma programme at the Trans College, and upon successful completion, they can gain direct entry into the 2^{nd} last year of the transnational degree programme at the Trans College without having to travel to the linking universities to attend a single class. Upon completion of this programme, a Bachelor of Engineering degree is awarded to the engineering student by the linking university. The programme can be taken in a full-time or part-time mode with classes conducted during daytime for full-time students and night time for part-time students. The following provides the characteristics of two transnational engineering programmes.

3.3.1 Course Structure and Curriculum of the Northern University's Engineering Degree Programme

The Bachelor of Electronic and Electrical Engineering study from the Northern University is divided into 3 levels. Each level comprises of 2 semesters. Semester 1 and 2 of Level 1 concentrate on the study of basic principles in the areas of engineering. Courses at this level also contribute to the development of students' study and enhance their communication skills. Trans College does not conduct the Level 1 syllabus of the Northern University, instead it offers its 2-year diploma programme to high school leavers. Its diploma syllabus is validated by the university as equivalent to Level 1 of Engineering courses. The following flowchart demonstrates the pathways leading to completion of the programme:

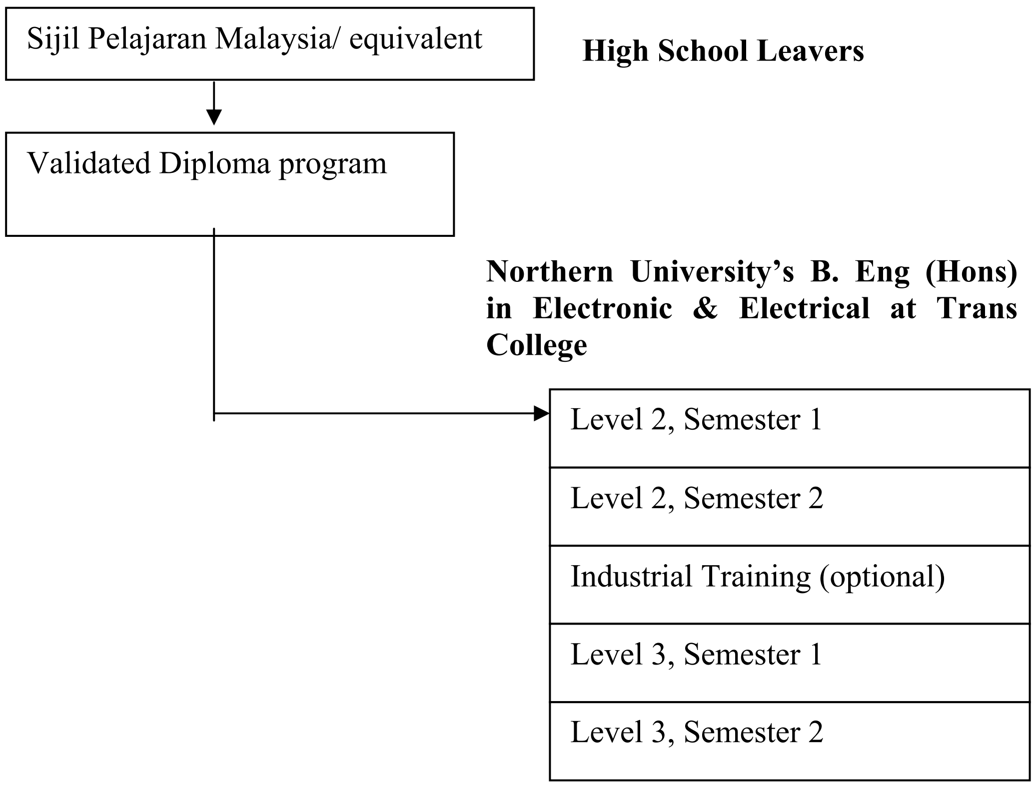

Figure 3.3
Pathway Leading to Completion of the Northern University's Transnational Engineering Programme

Level 2 of the degree program provides a range of courses relating to engineering skills in the areas of electronic engineering, programming, and project management. The two electronic subjects, Electronic Systems and Digital Systems enhance students' electronic applications skill, while the Structured Programming subject gives students a thorough coverage of C++ programming and interfacing using the C++. The Mathematics subjects in Level 2 namely Mathematics 2 and Mathematics 2B, strengthen students' analytical skills. The analytic skills gained are then applied in another two subjects, Systems and Digital Signal Processing. A single unit of Project Management provides the underpinning for Project and Design units in Level 3.

Each degree level has two semesters during which students enrol in the planned subjects and the semester break is at the end of the year. Full-time students have the option of undertaking a minimum of 12 weeks of industrial training during the break, while working students who study part-time are not required to undertake any industrial training. Students would proceed to Level 3 once they have completed and passed all the units in Level 2.

At Level 3, emphasis is focused on the project-based work with individual project contributing two credits and a group project exercise called Design contributing another 2 credits. The electrical units cover two main areas namely power engineering and control engineering. Students taking these units would be able to develop their understanding of power electronics and modern control techniques with their applications in industries. The course structure for the programme is shown in Table 3.2.

3.3.2 Course Structure and Curriculum of the Southern University's Engineering Degree Program

The Southern University's engineering degree programme consists of three major studies, namely Electronics, Computer Systems Engineering, and Robotics Engineering. The degree courses were constructed by the Southern University in accordance with the professional body's guidelines to include the five curriculum elements as listed below:

Table 3.2
Course Structure of Northern University's B. Eng (Hons) in Electrical and Electronic Engineering

Level 2		
Semester 1	**Semester 2**	**Semester 3**
Mathematics 2	**Mathematics 2B**	**Industrial Training (Optional)**
Industrial Organisation	**Systems**	
Structured Programming	**Project Management**	
Electronic Systems	**Digital Signal Processing**	
Power Electronics & Machines	**Digital Systems**	
Level 3		
Semester 1	**Semester 2**	
Design	**Design**	
Project	**Project**	
Industrial Operations Management	**Operations Strategy**	
Industrial Control Electronic	**Control**	
Power Systems	**Power Electronic**	

Category 1: Mathematics, science, engineering principles and skills appropriate to the discipline

Category 2: Engineering design and projects

Category 3: Engineering discipline

Category 4: Professional engineering practice, including management and ethics

Category 5: Elective studies

There is a clear distinction between the three major studies. Each major study builds in 4 electives. The following flow chart shows the pathway leading to the completion of the program and Table 3.3 shows the units studied in the two majors of the program.

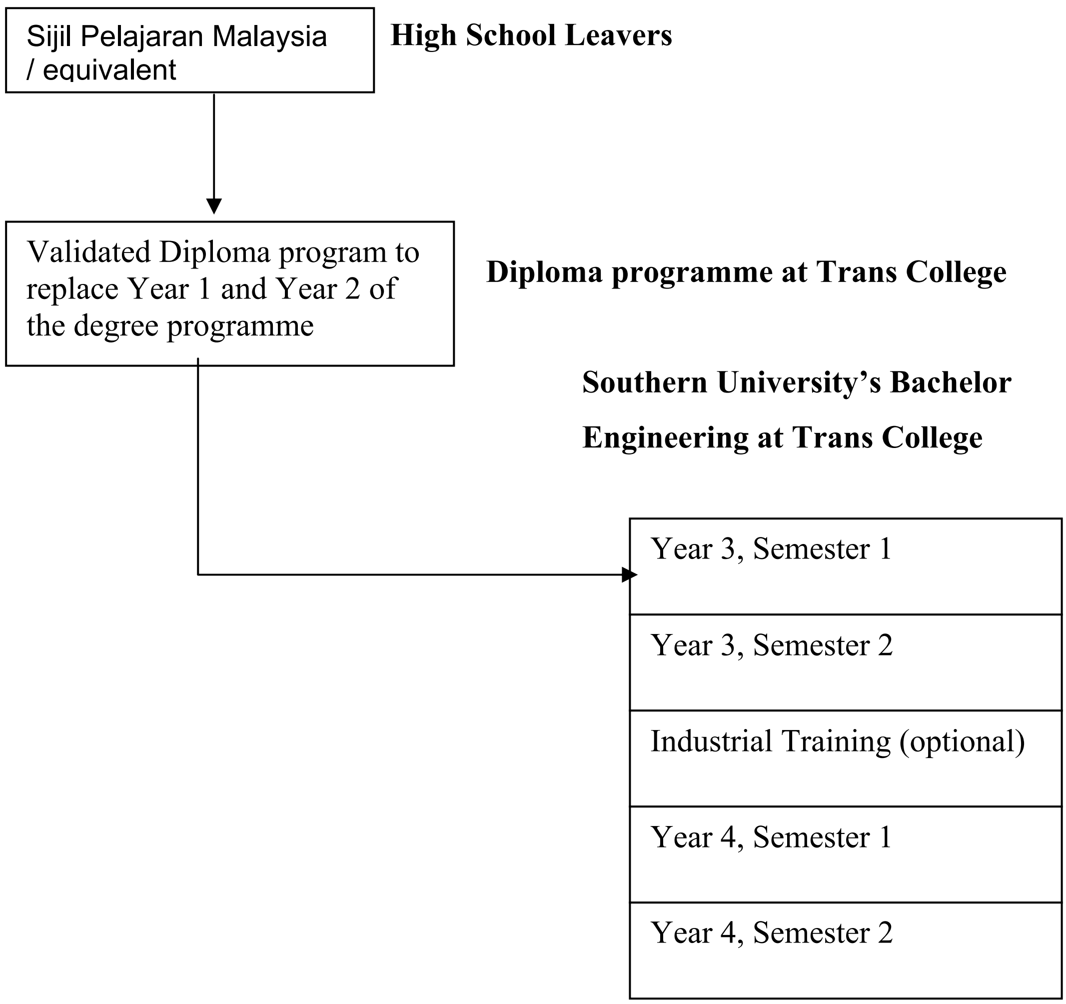

Figure 3.4
Pathway Leading to Completion of the Southern University's Transnational Engineering Degree Programme

Table 3.3
Southern University's Engineering Degree Courses with 2 Major Studies

Bachelor of Engineering (Electronics)	**Bachelor of Engineering (Computer Systems Engineering)**
Year 3 Semester 1:	**Year 3** Semester 1:
Methods of Managerial Decision Making	Methods of Managerial Decision Making
System Development Tools and Techniques	System Development Tools and Techniques
Microprocessor Applications	Microprocessor Applications
Design and Project Methodology	Design and Project Methodology
Semester 2:	Semester 2:
Managing Industrial Organisations	Managing Industrial Organisations
Control Theory and System Design	Control Theory and System Design
Electronic Data Communications	Electronic Data Communications
VLSI Design	***Operating Systems***
Year 4 Semester 1:	**Year 4** Semester 1:
Electronic Systems and Signals)	Electronic Systems and Signals
Advanced Microprocessors	Advanced Microprocessors
Engineering Projects	Engineering Projects
Robotics and Applications	Robotics and Applications
Semester 2:	Semester 2:
Strategic Issues in Engineering	Strategic Issues in Engineering
Electronic Communication Design	Electronic Communication Design
Digital Signal Processing	Digital Signal Processing
Engineering Project	Engineering Project

3.4 Management of the Programmes

In general, the operational framework adopted in most of the transnational education is almost identical across private colleges in Malaysia. At the Trans College, the linking universities generally retain the responsibility of managing the whole programme and the college shares the responsibility of planning and managing the programme by liaising closely with the linking universities. The transnational programme is managed through the International office and academic faculty of the universities. The International office is responsible for matters related to contracts, financing, strategic management, general management, and communication with the Trans College. Overall responsibility for the academic programmes lies with the Dean of the school at the linking university. The academic faculty of the linking university is responsible for development of course content, monitoring the college's academic quality, setting or moderating examination papers, appointing external examiners, and promoting continuous academic staff development.

The partnership's daily operation is managed by a department coordinator who reports to the Dean of the school at the university. The department coordinator of the linking university is in regular contact with the coordinator of the programme at the Trans College and plays a key role in ensuring that the transnational engineering program conducted at the Trans College is subject to the same academic quality control processes as those offered at the linking university, in order to maintain high academic quality and standards. Similarly, the department coordinator at the Trans College is required to liaise closely with the corresponding department coordinator of the university to ensure a smooth and proper management of the programme. The Trans College's department coordinator is also responsible for ensuring that quality academic processes set by the university are implemented at the college.

Overall, the responsibilities of the linking university's coordinator and the Trans College's coordinator can be summarised in Table 3.4.

Table 3.4
Responsibilities of Departmental Coordinators

	Responsibility of department coordinator of the linking university	Responsibility of department coordinator of the college
1.	Oversee the programmes	Oversee the programmes
2.	Approve students to be enrolled in the program	Recruitments and admission of students
3.	Prepare examination timetable	Prepare class timetable
4.	Ensure that adequate course materials are provided to the college	Ensure smooth delivery of lectures and provide adequate resources to students
5.	Ensure timely arrival of assignments and examination papers at the college	Distribute the assignments timely to students and conduct the same final examination at the same time as the university
6.	Liaise with external examiner. Notify the college of the Examination Board decisions	Liaise with the university coordinator. Inform students of their results
7.	Ensure that the learning facilities provided by the college are adequate	Provide students with access to adequate appropriate learning facilities
8.	Approve teaching staff appointed by the college	Recruitment of qualified teaching staff. Give university immediate notification of staff resignations and appointments

3.5 Delivery of the Programmes

It is essential that a comprehensive quality monitoring system be put in place to ensure that staff at the college can work co-operatively with the partner universities to maintain the quality and standard of universities' degree programmes. The linking universities are committed to ensure that programmes are conducted at conducive learning environments. They monitor the delivery of programmes through various approaches which differ from one university to another. Two overriding principles govern the operation. Firstly, the awarding university is responsible for the academic standard of the awards granted. Secondly, the academic standard of the awards for programmes delivered at the Trans College has to be equivalent to the comparable award for programme delivered in the home country.

Staff associated with the two partner universities are provided with same access to physical facilities that are available to regular staff of Trans College. Due to the differences in management styles adopted by the two different universities, some differences are found in administrative supports, leadership styles, course curricula, staff and student relationships, and teaching, learning and assessment practices of the two programmes.

One important difference between the two programmes is that of their commencing dates. Northern University's degree programme was started in 1998, while Southern University's degree programme was started more recently in 2001. Considering the difference in the history of the two programmes, it is understandable that many Northern students have graduated while most of the Southern students were in their third and fourth year of their degree programme at the time of the conduct of the research. Hence, only employers of Northern graduates were surveyed in this study.

3.5.1 Delivery of the Northern University's Degree Programme

The roles of subject lecturers at the Northern University are to determine and develop the content and structure of the program, coordinate and organize assessment of the subject. They provide the Trans College with copies of learning materials, reading lists, and the tentative schedule of a course outline prior to the start of each semester. Trans College will then appoint suitably qualified local academic staff, subject to the university's approval of the appointment, to deliver lecture and facilitate practical/laboratory sessions. A Trans College's tutor has to ensure that he/she possesses a copy of the relevant teaching materials and he/she must be familiar with the structure of the course content. College tutors will normally supplement with their own lecture handouts or laboratory activities as required by the situations. They are fully responsible for setting the pace of course delivery, monitoring students' progress, maintaining proper records of work completed, and liaising regularly with their counterpart at the university to ensure that the course content is delivered correctly.

Assessment is the responsibility of the university. The academic staff at the linking university set assignments and final examination papers only. The college's lecturers mark all assignments and examination papers associated with the module in accordance with the university-approved marking schemes. Trans College's tutors are expected to provide input in the setting of assignments and examination papers and provide adequate feedback to students through giving face-to-face explanation or written comments on the scripts. Results are collated by the college tutors and students are made aware that marks given are subject to the quality regulations of the university. Samples of the marked assignments and examination papers are then couriered back to the university for moderation. The university moderators will second-mark the assignments and examination scripts. They will request further samples of work or all scripts from Trans College if they are not satisfied with the marking of the college tutor. The university moderator has the authority, subject to the views of external examiners, to either upgrade or downgrade the marks to ensure consistency with the University's expectations. Once the moderation is completed, the agreed marks are signed off by the university's unit coordinator and the external examiner. The moderator will then write a short report informing the college tutor of the irregularities and inconsistencies found in the marking of the assessment.

The moderator also identifies any problems and gives remedial advice to the college to enable the college to take remedial action in addressing them. The university will formally inform the college of the final subject results of the students.

3.5.2 Delivery of the Southern University's Degree Programme

Southern University's Bachelor of Engineering is offered off-campus through the distance learning mode. New students are provided with copies of the "Learning Toolkit", "Distance Education Support Services Guide", and "Learning in the Online Environment". Students are taught through a study guide supplemented with a unit guide. All the topics of the modules and timelines for the assignment submissions are provided in the unit guide. Teaching is supplemented by reading materials, review of questions or worked examples, which are posted on the school website by the lecturers. Video technology is used extensively and effectively in the assessment of the presentation and communication skills.

Due to the nature of engineering courses, students receive academic and laboratory facilities support through the Trans College. The support is extensive with students requiring to attend lectures, tutorials, and laboratory sessions weekly. The delivery of study material and practical sessions is enhanced by qualified tutors recruited by Trans College, whose academic qualifications are approved by the Southern University.

Lecturers at the Southern University maintain regular contact with Trans College's tutors throughout the semester via email, visits, and telephone conferences. Southern academic staff visit Trans College at least once in a semester to speak to students and consult with the tutors. During the final year, there is a need for students to attend a two-week on-campus residential stay at Southern University to ensure that students are provided with strong team based, core experiential learning experience.

The lecturers at the Southern University normally set and mark all assignments and examination papers. Tutors at the Trans College help to arrange video recording of students' presentations, laboratory activities, and team discussions. Video tapes are then sent to the lecturers at the Southern University for evaluation and feedback. Southern University's lecturers will then collate the results of examinations and assessments and send the results together with the marked assignments and examination papers back to the college. The solutions for the assignments are then posted in the Southern University's website. Examination answer scripts are then sent back to the Southern University for marking with no involvement of the Trans College.

3.6 Course Reviews

Course reviews are conducted as part of the continuous quality improvement processes. Reviews are designed to monitor each programme and its delivery at the Trans College. The linking university will then identify actions needed to maintain and improve the quality of that programme.

3.6.1 Course Review in the Northern University's Degree Programme

The operation of the "3+0" programme is subject to review at the end of each semester or each academic year. The reviews are designed to monitor the transnational programme and its delivery through the Trans College. At the end of each semester, Trans College will carry out students' evaluations of programmes and the teaching delivery by the college lecturers. The feedback from the student evaluation is then used by the college coordinator to assist the coordinator in recruiting the right lecturers. Both the Northern University's coordinator and the college's coordinator will prepare the "Interim Report" to assess the program's operation.

To further enhance the quality of delivery, an Annual Programme Review is conducted on site. The Review meeting is attended by the university coordinator, university assurance staff, college coordinator, and college tutors. A forum is provided for university staff to discuss with students issues relating to the college and the programme. The college coordinator is then required to prepare a comprehensive report on how the delivery has been conducted, highlighting strategic matters that may affect the proper achievement of the aims of the program, and proposing appropriate actions which may be taken to maintain and improve the quality of the programme. The minutes of the annual review meeting are submitted to the appropriate authority at the university who will be responsible for ensuring that problems are considered and addressed in the university's quality assurance procedures.

3.6.2 Course Review in the Southern University's Degree Programme

Southern University has full responsibility for quality assurance. A rigorous admission process is put in place for evaluating students' background prior to recruitment of students. Entry criteria for admission to the program are determined by the university. The university requires applicants to achieve an appropriate level of competence in the English language before they are admitted to the course. Some weaker diploma students who are unable to meet the admission criteria are required to attend extra classes before gaining admission into the Southern University. Southern University is fully responsible for both evaluating and admission of students.

In this highly competitive environment, universities need to be responsive to the demands upon them. It is the Southern University's culture that comprehensive student evaluation of teaching and units are conducted either online or in paper form at the end of every semester. Trans College's administrative staff assist in conducting the unit survey and send back all the completed survey forms to the Southern University. Many ideas and suggestions for improvement are put forward by students. The compiled results are assessed by lecturers at the Southern University who have the responsibility of ensuring the equivalence of learning outcomes for mixed-mode and off-campus students. The feedback also assists staff at the Southern University to design better programs. Following the student evaluation of units, the university also seeks written input from Trans College for submission into its internal review of quality assurance in relation to its partnership teaching program.

The university is fully responsible for obtaining professional accreditation for the program provided. It monitors and maintains academic standards, and ensures that students complete their studies, which includes a minimum of 2-week on-campus attendance. Southern University invites the home country's professional body to hold a separate accreditation visit to evaluate the equivalence of delivery outcomes achieved by the students at the Trans College.

3.6.3 Differences in Monitoring Mechanisms between the Two Programmes

The two universities use quite different approaches for the delivery of the courses. In essence, Northern University adopts the “distance education” approach, while Southern University utilises the “supported-distance learning” mode of delivery. The differences in the monitoring mechanisms of the two programmes are summarised in Table 3.5.

Table 3.5
Differences in the Monitoring Mechanisms

	Northern University	**Southern University**
1.	Giving the college recruitment rights by providing the college with the recruitment criteria.	Evaluating all the application forms and approving the admission of students.
2.	Approval of appointed teaching staff by the college.	Approval of appointed teaching staff by the college.
3.	Ensuring that adequate course materials are provided to the college.	Ensuring that adequate course materials are provided to the college and students. All students are provided with copies of course materials.
4.	Allowing the college to carry out subject registration.	Students must enrol in units online.
5.	All students are provided with webpage access.	All students are provided with webpage access.
6.	No residential stay requirements	Students must attend 2-week residential stay. Students must give oral presentations of final year projects at the university.
7.	Ensure timely arrival of assignments and examination papers at the college.	Assignments sheets are distributed to students at the beginning of the semester. There is no provision of examination papers to the college.
8.	Inviting college staff’s input for setting of examination papers.	College staff do not provide any input towards setting of examination papers.
9.	Allowing the college to conduct examinations.	The university conducts all examinations.
10	Allowing the college tutors to mark all assignments and examination scripts. Moderating only samples of assignments and examination scripts.	Lecturers of the university mark all assignments and examination scripts.
11.	Open communication among the academic staff at the university and college.	Open communication among the academic staff at the university, college, and students.

3.7 Summary

The above sections describe in some detail the transformation of Malaysia, particularly the Penang state, from an agro-based economy country into a world-class manufacturing center. It also gives a description on how the rapid expansion of manufacturing activities in Malaysia has caused the government to place a lot of emphasis on training and education in order to meet the demand for tertiary education and skilled manpower needs. The increased demand for skilled manpower has urged many private colleges to start conducting transnational programmes such as transnational engineering programmes.

This chapter also describes clearly the different characteristics of the two transnational engineering programmes offered at Trans College. It introduces to us the general information on the programme contents and the pathways leading to the completion of the degree awards. These descriptions have also provided information regarding the course structures and curricula of both Northern and Southern Universities' engineering programmes.

Finally, the chapter details the two different types of programme operation and management processes that have been adopted by Trans College and the two partner-universities for checking their own practices and procedures. It will help in the identification of weaknesses of the operational and management processes at Trans College and in the generation of appropriate actions for ensuring that the programmes are effectively monitored, organized and managed in the future.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the key elements of research design and methodology for the study.

Following this brief Introduction, the key elements of the research design are detailed (Section 4.2). These include a description of the application that is made in the study of the perception theory of the SERVQUAL model (Parasuraman et al., 1988), survey sample comprised 260 engineering students, 80 employers and 31 academic staff, and the sampling approaches that were employed in the study.

In Sections 4.3, 4.4, 4.5, and 4.6, the research methodology is outlined, encompassing instrument preparation, pilot study procedures, data collection strategies, and data analysis tools. The descriptions are followed by a summary of the timeframe for the research in Section 4.7 and a chapter summary in Section 4.8.

4.2 Research Design

The research problem on which this study was based was:

To what extent are the transnational engineering programmes conducted through an alliance of Trans College and partner-universities meeting the perceived needs of students, staff, and employers in Malaysia?

The research design and methodology described in this chapter are influenced by particular attributes of this problem-statement – most notably its evaluative focus, its emphasis on perceptual forms of evidence, and an implicit expectation that an idealized form of transnational engineering education programmes can be conceptualized as a result of the study.

4.2.1 Conceptual Design

In developing a research design that is responsive to this problem, the conceptual framework was developed from the authoritative literature analysis in Chapter 2 (as shown in Figure 2.2), with particular emphasis on the perception theory of the SERVQUAL model (Parasuraman et al., 1988).

In education, most of the measuring instruments focus on evaluating the quality of course delivery. Hariri et al. (2003) suggested that total student experience should be taken as the indicator of quality in education instead of focusing on evaluating teaching and learning process alone. Similarly, Tam (2001) was of the opinion that it was essential to investigate numerous aspects of student experience in higher education and the necessary conditions in institutions in order to promote quality learning in students.

The perception theory of the SERVQUAL model (Parasuraman et al., 1988) was adapted to evaluate students' learning experiences (rather than the 'perception-expectation' theory of the SERVQUAL model) on grounds that it is difficult to assess both a 'desired level' and an 'existing level' in a single student survey (Babakus and Boller, 1992). Psychologically, most students would rate 'desired level' higher than 'existing level' (Babakus and Boller, 1992), and hence the expectation scores would consistently be higher than the perception scores.

In service industries, customers' expectations are known to change over time in accordance with customers' past and present experiences (Iacobucci, Grayson, and Ostrom, 1994; Oliver, 1989; Parasuraman et al., 1994; Rowley, 1997; Tse and Wilton, 1988). When customers' experiences suggest better-than-expected services, their expectations rise, until the previous 'better-than-expected' service eventually becomes the new norm (Boulding et al., 1993). Iacobucci et al. (1994) pointed out that expectations were not always on the rise over time, dynamism also implied the possibility of decrease. Haller (1993), when studying the dynamics of student evaluation of service quality in higher education, concluded that students' expectations on process-oriented criteria such as "easy contact with tutors", "motivations by tutors", "promptness of review of exercise", and others appeared to increase over a period of years. Similarly, when examining students' expectations on academic factors (including teaching quality, course content, teaching method, feedback), Hill (1995) suggested that students' expectations appeared to be fairly stable with respect to academic-related factors while students' expectations on non-academic factors (such as financial services) had a significant increase over the time of study.

Thus, due to difficulties faced by students in establishing expectations, the measurement of perception is more effective than measurement based on a combination of perception and expectation (Cronin and Taylor, 1992). For this reason, only the 'perception' aspect of the SERVQUAL model was adopted in this study for evaluating students' learning experience.

The conceptual framework for the empirical aspect of this research has been labeled as SERVQUAL-TRANS (total service quality for transnational engineering education) and was derived from the literature analysis that is described in Chapter Two. This framework, encompassing *Outcomes* and *Contributory* constructs, provides the conceptual basis for the study.

The SERVQUAL-TRANS conceptual framework proposes that the quality of transnational engineering education can be measured by assessment of the perceptions of stakeholder groups on four *Outcomes* dimensions (namely "Technical Competencies", "Generic Competencies", "Management and Organisation Skills", and "Communication and Social Skills",) and seven *Contributory* dimensions (namely "Course Curriculum", "Learning Resources", "Staff and Students' Relationship", "Administrative Support", "Teaching, Learning, and Assessment Practices", "Professional Exposure", and "Leadership".)

Athiyaman (1997) explained that perceived service quality was an overall evaluation of the "goodness" or "badness" of a product or service and customer satisfaction was a short-term evaluation of a specific experience. The "perceptions" feature of

SERVQUAL-TRANS, as shown in Figure 4.1, assumes two forms in this study. The first relates to perceptions of program quality, while the second relates to satisfaction with program delivery. The first form, perceptions of program quality, is defined as P1, P2, and P3:

"P1" measures the perceptions of students relating to the quality of the transnational engineering programmes at Trans College

"P2" measures the perceptions of staff relating to the quality of the transnational engineering programmes at Trans College

"P3" measures the perceptions of employers relating to the quality of the transnational engineering programmes at Trans College

As has been noted, most of the published literature does not differentiate between consumer satisfaction and quality perception (Bolton and James, 1991; Carmen, 1990; Cronin & Taylor, 1992; Mano and Oliver, 1993; Oliver, 1980; Taylor and Cronin, 1994). It is partly for this reason that satisfaction levels, denoted S1, S2 and S3, are also surveyed in this study. However, only the relationship between perception and satisfaction level of students was analysed statistically. In Figure 4.1:

"S1" measures the satisfaction level of students with the programmes,

"S2" measures the satisfaction level of staff with the programmes,

"S3" measures the satisfaction level of employers with the programmes.

"PS" measures the relationship between perception of program quality and satisfaction level of students.

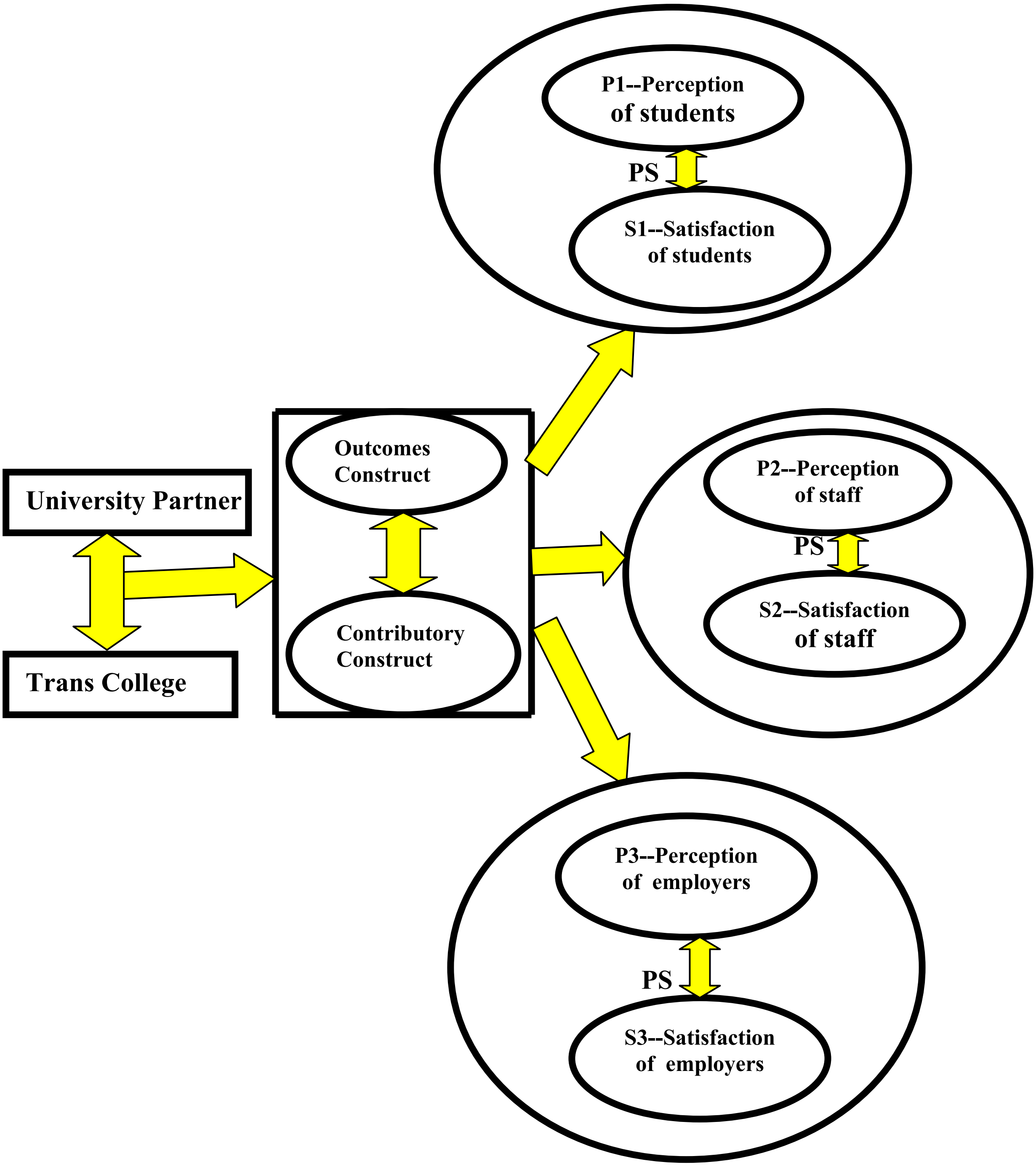

Figure 4.1
Conceptual Framework for SERVQUAL-TRANS Research Design

4.2.2 Research Samples

The sample for this study comprised three different cohorts.

The first cohort consisted of 260 undergraduate students studying in the School of Engineering at Trans College. Only one higher institution was used in the study because using one case organization as the basis of study could improve manageability (Yin, 1994). Moreover, Trans College is the biggest private college in the northern region of Penang. Equal number of students from the two programmes was selected, with 130 students in each group randomly drawn, using simple random sampling technique, from students pursuing their transnational engineering degree studies with Northern University and Southern University respectively. The students were either full-time or part-time students who were pursuing their studies in the transnational engineering programmes conducted jointly by the Trans College and the Northern University or Southern University. Full-time students were students who continued their studies at the Trans College immediately after their secondary education. Part-time students were working students who had years of working experience. They were either self-sponsored students or sponsored by their employers for their studies. Only third year and fourth year students were chosen to be surveyed in view of the fact that these students had been exposed to the programmes for a period of time and were therefore thought to be able to clearly describe the quality of learning opportunities that were provided to them.

The second cohort consisted of around 80 employers in Penang who employed Northern University's transnational engineering graduates in their companies. Over the last six years, about one thousand transnational engineering students have graduated from the Northern University's transnational engineering degree programme. Most of these graduates are now working with local or multi-national companies. Employers of transnational engineering graduates were included as a research cohort because they had direct job supervision of a wide range of university graduates, and should know whether graduates are equipped with appropriate skills and competencies to meet industry needs. They were also thought to be able to differentiate the job performance of public university graduates from that of transnational graduates. The employer research sample included multi-national firms that were actively participating in electronic, electrical, and computer development industries. The firms were randomly extracted from the Factories Penang Malaysia, published by the Penang Development Corporation[6].

The third research cohort consisted of 31 academic staff who were actively involved in lecturing transnational engineering courses and managing the two transnational engineering programmes. All the staff members were qualified academic staff members who had been given approval by both the universities and the Ministry of Education, Malaysia, to teach transnational engineering courses. They were familiar with the academic systems adopted by the two different universities and understood thoroughly the key operations involved in each programme.

4.3 Research Methodology – Instrument Preparation

4.3.1 The Research Questions

In light of the literature reviewed, and in full consideration of the research problem, the following research questions constitute the framework for investigation:

i. What conceptual framework for the delivery of transnational engineering education derives from analysis of authoritative literature and research in contemporary higher education?

ii. What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?

iii. What are the perceptions of lecturing staff regarding the quality of the transnational engineering programmes conducted at Trans College?

[6]Penang Development Corporation is the industrial development agency of Penang State

iv. What are the perceptions of employers regarding the quality of graduates of the transnational engineering education programmes conducted at Trans College?

v. What revised conceptual framework for the delivery of highly successful transnational engineering programmes emerges from the study?

In brief, the research questions are explored as follows:

<u>Research Question 1</u>: *What conceptual framework for the delivery of transnational engineering education derives from an analysis of authoritative literature and research in contemporary higher education?*

Based on the analysis of literature in Chapter Two, the SERVQUAL-TRANS research design that is contained in Figure 4.1 was developed to guide the study. The SERVQUAL-TRANS framework that was derived in Chapter Two was transposed into a research instrument that comprises four *Outcomes* dimensions and seven *Contributory* dimensions. Twenty-eight *Outcomes* items were selected for the four *Outcomes* dimensions. Similarly, 50 *Contributory* items were determined from the teaching models in the literature and criteria set by professional bodies.

Exploratory factor analysis and confirmatory factor analysis were used to identify key underlying dimensions and items that could validly be used for evaluating the educational quality of the transnational engineering education. Following these statistical analyses, the integrity of the conceptual framework for the transnational engineering education was thought to be adequate to justify application for survey purposes.

<u>Research Question 2</u>: *What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?*

<u>Research Question 3:</u> *What are the perceptions of lecturing staff regarding the quality of the transnational engineering programmes conducted at Trans College?*

Research Question 4: What are the perceptions of employers regarding the quality of graduates of the transnational engineering education programmes conducted at Trans College?

Research Questions 2, 3, and 4 were explored through both quantitative and qualitative survey procedures. To test Research Questions 2, 3, and 4, two null hypotheses and one affirmative hypothesis were developed:

Hypothesis 1: There are no significant differences between the perceptions of Northern and Southern students relating to the quality of transnational engineering education programmes conducted at Trans College.

Hypothesis 2: There is a significant relationship between the perception of programme quality and the satisfaction levels of students undertaking transnational engineering education programmes at Trans College.

Hypothesis 3: There are no significant differences between the perceptions of Northern students, Northern staff, and employers regarding the quality of transnational engineering education programmes conducted at Trans College.

Following the collection and analysis of data relating to Research Questions 2, 3, and 4, and Hypotheses 1, 2, and 3, it was possible to re-consider the integrity of the preliminary conceptual framework for the study. Thus, the study concluded with a consideration of the following issue:

Research Question 5 : What is the revised framework for the delivery of highly successful transnational engineering programmes that emerges from the study?

4.3.2 Construction and Validation of Questionnaires

In this study, the SERVQUAL-TRANS conceptual framework was transposed into measurement instruments for evaluating the perceptions of students, staff, and employers regarding the quality of transnational engineering education programmes at Trans College.

The first step in developing the questionnaire was to identify a pool of items which would reflect the content domain of the 11 dimensions of the SERVQUAL-TRANS *Outcomes/Contributory* conceptual framework. This was done by reviewing the literature for graduates' attributes listed by professional bodies or sought after by employers. Similarly, attention was also paid to teaching assessment models devised by Ramsden (1991), March and Roche (1993) and Feldman (1984). Service quality models that were used to measure the service quality in higher education (Chadwick, 2002; Wright and O'Neill, 2002) were also taken as references for constructing and designing the research questionnaire.

4.3.2.1 Identification of *Outcomes* topics and items

In the field of engineering, professional engineering bodies such as Institute of Engineers, Malaysia, The Engineers, Australia, ABET, and Engineering Council, U.K. emphasise the importance of having engineering graduates equipped with professional engineering attributes. As it is necessary to equip students and graduates with attributes desired by professional bodies, four sources of researched materials were used to compile a list of skills and attributes desired by employers (Table 4.1). These are: graduate attributes listed by professional engineering bodies; Hawkins and Winter's *Skills for the Twenty-first Century* (1995); Harvey et al.'s *Graduates' Work: Organizational Change and Students' Attributes* (1997a); and Graaff and Ravesteijn's *Training Complete Engineers: Global Enterprise and Engineering Education* (2001). The items shown in Table 4.2 represent a synthesis of these authoritative statements and were used to determine the *Outcomes* items for the survey instrument before the factor analyses. An initial pool of 28 items was identified for the four *Outcomes* dimensions (i.e. "Technical Competencies", "Generic Competencies", "Management and Organisation Skills", and "Communication and Social Skills). The complete set of items can be found in Table 4.2 and the full instrument is included in Section B of Appendix A. Exploratory factor analysis and confirmatory factor analysis were then used to finalise the *Outcomes* items for inclusion in the questionnaire (see Table 4.2).

Table 4.1
Comparison of Graduate Qualities

Outcomes Dimension	ABET	EC	IEAust	BEM	This Study
Body of Knowledge	Ability to apply knowledge of mathematics, science, and engineering (ABET a) Ability to design and conduct experiments (ABET b) Ability to use techniques, skills and modern engineering tools necessary for engineering practice (ABET k) Knowledge of probability and statistics, including applications to engineering (ABET l) Knowledge of advanced mathematics (ABET n)	Ability to use mathematics as a tool for solving complex problems (SARTOR 3) Ability to use a wide range of tools, techniques and equipment, including computing software pertinent to the engineering discipline (SARTOR 3)	Ability to apply knowledge of basic science and engineering fundamentals (IEAust 1) In-depth technical competence in at least engineering discipline (IEAust 3)	Ability to acquire and apply knowledge of basic science and engineering fundamentals (BEM a) Have in-depth technical competence in specific engineering discipline (BEM c)	Under "Technical Competencies": Q1, Q2. Q3, Q4, and Q5

Table 4.1 (cont'd)

Life-long learning	Recognition of the need for, and an ability to engage in life-long learning (ABET i) Knowledge of contemporary issues (ABET j)		Expectation of the need to undergo life-long learning and the need to do so (IEAust 10)	Expectation of the need to undertake lifelong learning, and possessing/acquiring the capacity to do so (BEM j)	Under "Generic Competencies": Q13 and Q14
Effective Problem Solver	Ability to design a system, component and process to meet desired needs (ABET c) Ability to design and conduct experiments as well as analyze and interpret data (ABET b) Ability to utilize systems approach to design and operational performance (IEAust 5)				

Table 4.1 (cont'd)

Effective Problem Solver	Ability to design a system, component and process to meet desired needs (ABET c) Ability to design and conduct experiments as well as analyze and interpret data (ABET b) Ability to utilize systems approach to design and operational performance (IEAust 5) Ability to identify, formulate, and solve engineering problems (ABET e)	Ability to evaluate and derive information from data to produce useful results (SARTOR 3) Ability to solve problems of a non-routine nature (SARTOR 3) Ability to apply engineering principles to create products, systems and services (SARTOR 3)	Ability to undertake problem identification, formulation and solution (IEAust 4) Ability to utilize systems approach to design and operational performance (IEAust 5)	Ability to undertake problem identification, formulation and solution (BEM d) Ability to utilize a systems approach to design and operational performance (BEM e)	Under "Generic Competencies": Q8 and Q10

Table 4.1 (cont'd)

	Ability to troubleshoot engineering problems (ABET o) Ability to foster excitement of discovery and associated creativity (ABET q)				
Team Work	Ability to function on multidisciplinary teams (ABET d) Ability to lead, mentor, and contribute to the development of future engineers (ABET p)	Ability to work in a multi-disciplinary team (SARTOR 3)	Ability to function effectively as an individual and in multi-disciplinary and multicultural teams, with the capacity to be a leader or manager as well as an effective team leader (IEAust 6)	Ability to function effectively as an individual and a group with the capacity to be a leader or manager as well as an effective team member (BEM h)	Under "Management and Organisation Skills": Q20 and Q22

Table 4.1 (cont'd)

Ethical Action	Understanding of professional and ethical responsibility (ABET f)	Understanding of the financial, economic, social and environmental factors of significance to engineering (SARTOR 3) Understanding of the relevant legal, statutory and contractual obligations (SARTOR 3) Understanding of the broader obligations of engineers to society (SARTOR 3)	Understanding of professional and ethical responsibilities and commitment to them (IEAust 9)	Understanding of professional and ethical responsibilities and commitment to them (BEM g)	Under "Generic Competencies": Q6 and Q7 Under "Management and Organisation Skills": Q25
Effective Communication	Ability to communicate effectively (ABET g)	Ability to communicate Effectively with clients, colleagues and the public (SARTOR 3)	Ability to communicate effectively, not only with engineers but also with the community of large (IEAust 2)	Ability to communicate effectively, not only with engineers but also with the community at large (BEM b)	Under 'Communication and Social Skills": Q26, Q27, Q28

Table 4.1 (cont'd)

International Perspective	The Broad education necessary to understand the impact of engineering solutions in global and social context (ABET h)		Understanding of the cultural, social, global and environmental responsibility of the professional engineer, and the need for sustainable development (IEAust 7)		Under "Generic Competencies": Q9, Q11, Q15
Management and Organization Skills	Extracted from Hawkins and Winter (1995) and Graaff and Ravesteijn (2001)				Under "Management and Organisation Skills": Q16, Q17, Q18, Q19, Q21, Q23, Q24
Reliability	Adapted from Harvey and Knight (1996) and SERVQUAL items				Under "Generic Competencies": Q12
Empathetic Capacity	Adapted from Harvey and Knight (1996) and SERVQUAL items				Under "Management and Organisation Skills": Q25

Table 4.2
Items Included in the *Outcomes* Dimensions

A. TECHNICAL COMPETENCIES
1. I am able to apply mathematics, science and engineering knowledge in modeling and analyzing engineering problems.
2. I am able to use software simulation tools to analyze engineering problems and develop solutions to the problems.
3. I am able to use test and measurement equipment to design, conduct experiments and analyze experimental data.
4. I am able to use given specifications for designing a prescribed engineering system.
5. I am able to design alternative systems based on technical and non-technical criteria.
B. GENERIC COMPETENCIES
6. I know how to apply ethical and moral principles in professional activities.
7. I have learned about professional engineering ethics. .
8. I can integrate and apply technical advice provided by the academic staff in solving technical problems.
9. I understand the impact of engineering on business and economics in both local and global environments.
10. I am able to undertake problem identification, formulation and develop solution to problem.
11. I understand the needs of the engineering industry and community as a whole.
12. I am able to demonstrate quality-assurance criteria in relation to engineering practice.
13. I demonstrate continuous learning to overcome the obsolescence of changing technologies.
14. I have developed lifelong learning skills.
15. I am aware of the impact of global environmental changes on the development of engineering.

Table 4.2 (cont'd)

C. MANAGEMENT AND ORGANISATION SKILLS
16. I am able to plan and organize tasks efficiently and effectively.
17. I am able to work under minimal supervision.
18. I am able to cope with uncertainties, stress, and pressure.
19. I take initiative to explore opportunities and develop new ideas.
20. I have learned to work in teams through the college's extra-curricular activities.
21. I am able to contribute multidisciplinary viewpoints in problem solving.
22. I am able to brainstorm ideas in groups.
23. I have the capacity to work within deadlines fixed by the linking university.
24. I have developed study skills in preparing for examination papers set and marked by the linking university.
25. I have concern for personal actions and consequences after studying Moral Studies.
D. COMMUNICATION AND SOCIAL SKILLS
26. I have acquired good oral communication skills through individual and group presentation of assignments in class.
27. I am able to speak and write good English after a period of study in the degree program.
28. I have acquired good report writing skill.

4.3.2.2 Identification of *Contributory* topics and items

Most of the research studies that have been carried out in the past used instruments that did not incorporate the totality of students' learning experience (Ramsden, 1991; March and Roche, 1993; Feldman, 1984). Some other recent research studies used the SERVQUAL instrument (Parasuraman et al., 1988) to measure the service quality in higher education as an aspect of perceived satisfaction (Chadwick, 2002; Wright and O'Neill, 2002).

In this study, survey items which are relevant to evaluation of teaching quality and student learning experience are extracted from the combined version of different teaching models (Table 4.3)—particularly Feldman's model (Feldman, 1984), Ramsden's model (Ramsden, 1991), the Endeavor model (Feldman, 1984), the SERVQUAL model (Parasuraman, 1988), quality items for engineering education by Owlia and Aspinwall (1998), and a new concept proposed by Hariri et. al. (2003). The items extracted from analysis of these authoritative statements were then incorporated into the relevant dimension under the seven *Contributory* dimensions of the conceptual framework - namely "Course Curriculum", "Learning Resources", "Staff and Students' Relationship", "Administrative Support", "Teaching, Learning, and Assessment Practices", "Professional Exposure", and "Leadership" as shown in Table 4.4. In each dimension, a minimum of three items was identified since, for content validation reasons, there must be sufficient number of variables included in the dimensions to allow for error (The University of Texas, 1995).

The final set of items for the seven *Contributory* dimensions is included in Table 4.4 and Section C of Appendix A.

Table 4.3
Comparison of Service Quality in Higher Education

Contributory Dimensions	Quality items derived from Feldman (1984); Marsh & Roche (1993); Ramsdem (1991)	Quality items derived from SERVQUAL instrument (Parasuraman, 1988) by Chadwick (2002)	Quality Items for engineering education by Owlia et al. (1998)	Quality items for SERVQUAL model (Parasuraman, 1988)	Quality Items for This Study
Academic Resources/ Tangibles	Adequacy of teaching accommodation Up-dated computing facilities Easy access to computing facilities Availability of library stock Effective information service in library	Provided with dental instruments Provided with dental materials Good operative laboratory Provided with course materials	Sufficiency of academic equipment e.g. laboratories, etc Ease of access to equipment Degree to which the equipment are modern looking Ease of access to information sources e.g. books, journals… Sufficiency of academic staff.	Modern looking equipment Visually appealing facilities Staff who have a neat, professional appearance Visually appealing materials Convenient hours for access	Under "Learning Resources": Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20
Reliability	Well planned course structure Clear aims of course High intellectual standard of courses Relevance of courses to information in prospectus	Consistent course teaching in all aspects Deliver accurate information during lecture and practical classes Classes take place as scheduled		Providing promised services Showing a sincere interest in handling users' service problems Performing services right the first time	Under " Teaching, Learning and Assessment Practices": Q21, Q22, 23

Table 4.3 (cont'd)

Responsiveness to your needs	Information on aims of course. Adequate guidance on selection of courses Appropriateness of teaching approaches Appropriateness of workload. Information on assessment of coursework Appropriateness of assessment methods	Prompt response to help by tutor Tutor willing to give help		Providing services at the promised time Maintaining error-free records Keeping users informed about when services will be performed Prompt service to users Willingness to help users Readiness to respond to users' requests	Under "Teaching, Learning, and Assessment Practices": Q22 Q24 Q25 Q27 Under "Administrative Support": Q36 Q38 Q39 Q40
Attitude	Appropriateness of scheduling for assignments Relevance of examination papers to course contents		Extent to which academic staff understand students' academic needs Degree of academic staff's willingness to help Availability of academic staff for guidance and advice Extent to which academic staff give personal attention		Under "Teaching, Learning, and Assessment Practices": Q24 Q25 Q27

Table 4.3 (cont'd)

Contacts with teaching staff	Availability of lecturers Prompt feedback Helpfulness of feedback Information on academic progress				
Assurance		Tutor's knowledge Course tutors give student confidence Standard of practical skill		Staff who instill confidence (trust) in users Making users feel comfortable about seeking for help Staff who are consistently courteous Staff who have the knowledge to answer user questions	Under "Teaching, Learning, and Assessment Practices": Q21 Q23 Q26 Under "Administrative Support": Q37

Table 4.3 (cont'd)

Competence			Theoretical (relevant) knowledge of academic staff Practical (relevant) knowledge of academic staff Extent to which academic staff are up-to-date in their subject Expertise of academic staff in teaching/ communication		Under "Teaching, Learning, and Assessment Practices": Q21 Q23 Q26
Empathy		Caring, individualized attention Courtesy of tutors		Giving users individual attention. Staff who deal with users in caring fashion. Having the user's best interests at heart. Staff who understand the needs of their users	Under "Teacher-Student Relationship": Q41 Q42 Q43 Q44 Q45 Q46

Table 4.3 (cont'd)

Content Primary			Degree to which the programme contains knowledge/skills Degree to which the programme contains ancillary knowledge/skills Extent to which students learn communication skills Extent to which students learn team working Relevance of curriculum to the future jobs of students Applicability of knowledge learnt to other fields		Under "Course Curriculum": Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10
Leadership					Under "Leadership": Q31 Q32 Q33 Q34 Q35

Table 4.4
Items Included in the *Contributory* Dimensions

Course Curriculum
1. The prescribed degree curriculum is updated systematically to reflect the perceived needs of students and local employers.
2. The curriculum conducted at the Trans College mirrors the linking university's curriculum in its own country.
3. Courses offered in the degree program at Trans College are of the same quality as of the courses offered at the linking university.
4. The degree program is delivered and assessed in the English language.
5. The course content is related to technical jobs in the local market.
6. Coursework problems to be solved by students are real-life work related problems.
7. Students are being assessed at the same standard as students at the linking university.
8. The format of the final year project is the same as that at the linking university.
9. College lecturers are given opportunity to provide input to the development of course curriculum.
10. The number of Wajib subjects[7] prescribed by the local authority for the program is appropriate.

[7]Wajib subjects are Moral Studies, Malaysian Studies and Bahasa Malaysia which are compulsory for students to take during their tertiary studies.

Table 4.4 (cont'd)

Learning Resources
11. Library facilities, multimedia teaching aids, computing and engineering laboratory provision are up-to-date.
12. Sufficient computers and engineering equipment are available to cater to students' needs.
13. Sufficient qualified local teaching staff members are hired for teaching the courses.
14. The course materials provided by the college tutors are comprehensive.
15. The course materials provided by the linking university are comprehensive.
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff.
17. Sufficient college teaching staff with extensive industry experiences are available to teach students.
18. Linking university staff visit the college often enough to provide students with advice on daily questions.
19. The linking university provides students with adequate electronic access to its library.
20. Course materials are posted effectively on the webpage of the linking university.

Table 4.4 (cont'd)

Teaching, Learning, and Assessment Practices
21. College teaching staff are able to effectively implement good pedagogical practices.
22. College tutors work hard to make lectures very interesting and stimulating.
23. College lecturers have strong theoretical and practical knowledge of their subjects.
24. College teaching staff give helpful comment and feedback to students on their work.
25. Marked assignments with proper feedback and comments are returned promptly to students.
26. College lecturers are able to facilitate discussion and group interaction in class.
27. Day and night lectures and practical classes are conducted to allow both full-time and part-time students to attend classes conveniently.
28. Input into the development of assignments and examination papers by the college teaching staff is adequate.
29. Input into assignments and examination question papers by the linking university staff ensures consistency in standards.
30. The responsibility for marking and moderation of students' scripts by the college tutors and linking university staff and external examiners is appropriate.

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Table 4.4 (cont'd)

Leadership
31. College leaders make clear to staff and students their vision and goals for the degree program.
32. Academic and management staff demonstrate a shared responsibility for ensuring the provision of quality engineering education to students.
33. The engineering degree education is clearly linked to the growth of engineering industries locally and globally.
34. There is strong collaboration link between the linking university and the college.
35. The excellence of the engineering degree education is promoted to students and the community.
Administrative Support
36. There are appropriate administrative arrangements to secure student feedback and to respond to students' feedback immediately.
37. The administrative and records management system maintains student records effectively.
38. Adequate student services such as hostel accommodation, laboratory support, course and career advice are provided by the college.
39. Administrative and technical services are provided promptly and efficiently.
40. Transcripts and degree certificates are issued promptly by the linking university to graduating students.

Table 4.4 (cont'd)

Staff and Students' Relationship
41. Linking university staff meet with students privately to gather their views and address their concerns.
42. College tutors play active roles in addressing students' requests with the help of university's teaching staff.
43. University lecturers give prompt responses to students' requests.
44. Students receive prompt, individualized attention from the college tutors.
45. The college course tutors give students' confidence and motivate students to achieve at a high level.
46. Open and honest communication among college staff, university staff, and students is a feature of the transnational program.
Professional Exposure
47. Students understand professional and ethical responsibilities through formal and informal guest lectures conducted by the linking university.
48. Students understand professional engineering practice through professional exposure activities such as industry visits organized by the school.
49. Adequate student exchange systems are in place to facilitate professional development.
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession.

4.3.2.3 The Likert scale format

In this study, student, staff, and employer perceptions of educational services were measured through responses to 28 items of the *Outcomes* dimensions and 50 items of the *Contributory* dimensions.

All the *Outcomes* items contained in Section B of the questionnaire in Appendix A were measured by using five-point Likert-type scales ranging from "Outstanding" to "Poor". Similarly, the *Contributory* items contained in Section C of the questionnaire in Appendix A were measured by using five-point Likert scales ranging from "Strongly Agree" to "Strongly Disagree".

Regarding the *satisfactio*n element of the instrument, which can be found in Section D of the questionnaire in Appendix A, a five-point Likert scale ranging from "Very Satisfied" to "Very Dissatisfied" was used to enable respondents to indicate their satisfaction with the programmes, while the overall standard of the course curriculum was measured by the Likert scale ranging from "Extremely Good" to "Extremely Poor".

The following questions were designed for Section D to assess the satisfaction levels of students and staff with the overall quality transnational engineering programmes:

a. How satisfied are you with the transnational engineering degree programme in terms of **overall academic course delivery services** provided by the college and the linking university?

b. How satisfied are you with the transnational engineering degree programme in terms of **overall administrative services** provided by the college and the linking university?

c. How would you rate the **overall standard of the course curriculum** of your degree programme?

d. Overall, how **satisfied are you with the quality** of your degree programme?

Likert-scale 5-point continuum was used to enable respondents to indicate their perceptions of these questions.

4.3.2.4 Construction of the open-ended questions

Data relating to the perceptions of students, staff, and employers were also gleaned through soliciting their responses to open-ended questions.

The question “What do you regard as the three most distinctive, successful features of your degree programme?” was used to enable students and staff to make descriptive comments on such matters as “Course Curriculum”, “Learning Resources”, “Teaching, Learning, and Assessment Practices”, “Staff and Students’ Relationship”, “Leadership”, “Professional Exposure”, and “Administrative Support”. To encourage employers to provide more detailed descriptions on graduates’ performances, they were further asked to comment on the question “What are some other important skills which you think should be possessed by the transnational engineering graduates of the Northern University from the Trans College?”

Students, staff, and employers were also invited to comment on possible weaknesses of the transnational engineering education by answering the question “What aspects of your degree programme would you change in order to enhance its effectiveness?” As employers are not involved in the programmes, only students and staff were invited to describe problems and difficulties that are faced by them during the teaching and learning process by answering the question “Are there any aspects of the degree programme that are hindering your study/your teaching?” Finally, all three parties were invited to contribute their ideas and opinions for improvement of the transnational engineering education by answering the question “What is the best way for an overseas university to conduct engineering courses for students in Malaysia?”

4.3.2.5 Instrument validation

Reliability

The two standard measurement criteria for assessing the appropriateness of any measurement instrument are reliability and validity.

Reliability indicates the precision of measurement scores. It indicates the accuracy of the scores when they are reproduced with repeated measurement. Reliability analysis, to determine internal consistency of the quality dimensions (Norusis, 1990a and 1990b), was carried out by using SPSS. To test the reliability of the SERVQUAL-TRANS scale and the internal consistency of the dimensions, Cronbach's coefficient (Cronbach, 1951) for each dimension was computed using all the perception data. A dimension is demonstrated to have reliability if its composite alpha value exceeds 0.70 (Nunnally, 1978). Total scale reliability was calculated by combining the alphas values of all the scale items.

Reliability of the scale items was further examined by analysing the items to total scale correlation. The scale items are considered to be internally consistent and have high correlation if the items are positively correlated to each other and the correlation value is above the 0.35 cut-off value as suggested by Saxe and Weitz (1982). If the average inter-item correlation is low, alpha will be low. Cronbach's alpha will be high when the inter-item correlation is high, which indicates good reliability. The reliability coefficients for students' perception scale items were calculated and recorded. After considering the internal consistency of the quality dimensions, items with an alpha value of less than 0.70 were deleted. Factor analysis was then applied to test the validity of the items which were grouped under each dimension (Owlia and Aspinwall, 1998; Parasuraman et. al., 1988; Carmen, 1990; Babakus and Boller, 1992).

Validity

SERVQUAL-TRANS was developed to facilitate the evaluation of perceptions of educational quality of the Trans College transnational engineering programmes.

Factor analysis was used to uncover the number of dimensions of a set of variables. It was used to reduce a large number of variables to a smaller number of factors or dimensions by grouping variables with similar characteristics together and to produce a small number of factors. Factor analysis can be used to detect relationships between the variables and is capable of explaining the observed variance in the larger number of variables. It enables validation of the scale by demonstrating that its constituent items load on the same factor or dimension and dropping scale items which cross-load on more than one factor (Garson, 2004) Two types of factor analysis namely Confirmatory Factor analysis and Exploratory Factor analysis were used in this study.

Confirmatory factor analysis

In common factor analysis, a small number of dimensions are extracted to account for the inter-correlations among the observed variables. It is used to identify the latent dimensions and group the correlating items together into each individual dimension. In this study, confirmatory factor analysis is used to formulate a hypothesis about the number of dimensions, the relationships between the observed items and dimensions (the factor pattern), and the correlations among the dimensions.

Before confirmatory factor analysis (CFA) was carried out in this study, the dimensions and items were formulated in advance as factor structure. It was recommended by Thurstone that there be at least three variables per factor for the CFA to be carried out effectively (Kim and Mueller, 1978). The confirmatory factor analysis was performed to test and validate the hypothesized framework which consisted of 11 dimensions. Each dimension was tested for its validity individually. If each dimension could be confirmed, then a combined model could be evaluated.

Several commonly used goodness of fit indices such as comparative fit indices (CFI) and non-normed fit indices (NNFI) were used as comparative indices of fit, while root mean square error of approximation (RMSEA) was used to evaluate an individual model (Steiger and Lind, 1980). It was suggested that CFI should be 0.90 or higher, possibly close to 1, to indicate that more than 90% of the co-variation was explained by the model (Marsh and Yeung, 1996). Alternatively, they can be conceptualized as reliability estimates for the factor structure, with values above 0.90 to suggest that the solution is reliable enough (Marsh and Yeung, 1996). RMSEA should be 0.08 or less, SRMR should be 0.05 or less, and NNFI should be 0.90 or higher for the model to be an acceptable model fit to data (Hu and Bentler, 1999; Browne and Cudeck, 1993). As the chi-square is sensitive to sample size and it does not provide stable value regarding the degree of fit (Long, 1967; McDonald and Marsh, 1990), the ratio of chi-square to the degrees of freedom as low as 2 is used to indicate an acceptable model fit (McDonald and March, 1990). A ratio of 2 was used as a cut-off value in this study. If the original factor structure could not be confirmed, the next step would be to perform exploratory factor analysis (EFA).

Exploratory factor analysis

Exploratory factor analysis (EFA) is a technique used to summarize a large, complex group of variables using a relatively small number of dimensions. Thurstone recommended that there should be at least three variables per factor (Kim and Muller, 1978) in order to perform EFA. EFA is used when the original factor structure cannot be confirmed by the confirmatory factor analysis.

Determining the number of factors

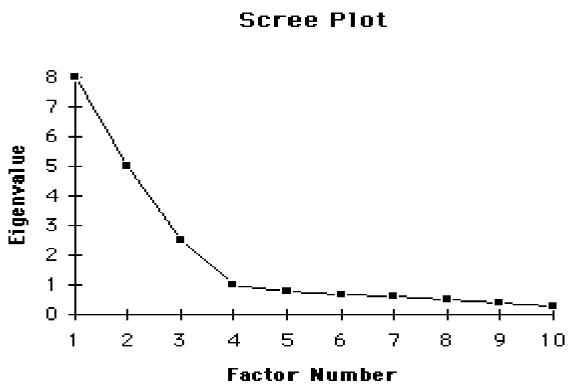
In EFA, there are several criteria for deciding the number of factors to be extracted. The most commonly used guidelines are the Kaiser-Guttman rule, the scree test, percentage of variance, and the size of the residuals.

(i) Kaiser-Guttman rule

The Kaiser criterion, which was proposed by Kaiser (1959), was most commonly and widely used to determine the number of factors to be extracted for analysis or to be dropped from the analysis. This criterion is used to help determining the number of factors for analysis in this study. The Kaiser rule states that the number of factors to be extracted should be equal to the number of factors having an eigenvalue (variance) greater than 1. Only factors with eigenvalues greater than 1 would be retained because a factor must have variance at least as large as that of a single standardized original variable (Kaiser, 1959).

(ii) Scree Test

The Scree Test is another method which is used to determine the number of factors to be extracted. In the Scree plot, eigenvalues are plotted against the corresponding factors. In this study, the dimensions are plotted along the x-axis and the corresponding eugenvalues are plotted along the y-axis. The rate of decline tends to be fast for the first few factors from left to the right of x-axis, but then levels off. The "elbow", or the point at which the curve bends, is considered to indicate the maximum number of factors to extract (Dunteman, 1989). The curve at which the clear elbow occurs normally has an eigenvalue around 1. The Cattell rule indicates that the number of factors is determined by picking up all factors prior to where the plot levels off (Garson, 2004). An example of the following Scree plot shows that the curve bends at an eigenvalue of 1 and the factor number is 4.



(Extracted from http:www.utexas.edu/cc/docs/stat53.thml) *(iii) Rotation of factor*

Once the number of factors to be extracted has been decided, the next step is to determine the method of rotation. By rotating the reference axes of the factor solution, the factor structure can be simplified and a more meaningful, interpretable solution can be achieved. Oblique rotation is used as it produces a better estimate of the true factors and better simple structure when the factors are correlated (The University of Texas, 1995). In this study the dimensions were uncorrelated, therefore orthogonal rotation such as Varimax rotation was used in this study as Varimax was the most common orthogonal rotation option. After the rotation, if a factor loading is high (above 0.3), then the variable is considered to describe the factor well. On the other hand, if a factor loading is below 0.3, the variable can be ignored as the variable does not correlate well with the factor. Variables with low communalities (below 0.1) are also removed from the analysis as low communalities indicate that the variables have little in common with other variables in the dataset. In Exploratory Factor analysis (EFA), high loadings on the predicted factors indicated *convergent validity* (Garson, 2004).

Following implementation of these validation and reliability procedures, followed by adjustments to the survey instruments, the SERVQUAL-TRANS questionnaire was judged to be suitable for administration.

4.4 Pilot Studies

The questionnaire was pilot tested by asking a small sample of students and staff to complete the draft questionnaire and comment on it. While numerous suggestions ensued, no major difficulties were noted.

The questionnaire was also pilot tested by asking several practising engineers to complete the questionnaire within a given timeframe. The engineers were found to be able to easily answer the questions in the *Outcomes* section but had difficulty in answering all the questions in the *Contributory* section. Therefore, the number of questions in the *Contributory* section was reduced.

Finally, after several rounds of fine-tuning process, the questions in the *Contributory* section were reduced to 20.

4.5 Data Collection Procedures

Before the surveys were conducted, attempts were made to obtain approval from the Trans College and the partner-universities. Appropriate approval letters were then sent to apply for ethical clearance.

Questionnaires were personally distributed to respondents to establish rapport with respondents, to explain the purposes of the study, and to gain their cooperation.

The surveys of students were carried out in classrooms immediately after the completion of scheduled classes in the third week of April, 2004. A covering letter explaining the purpose of the survey was attached with the questionnaire and students were assured that their answers would be anonymous and that no attempt would be made to identify them.

The collection of student data was followed by collection of staff and employer data in May, and June, 2004. The questionnaire was delivered personally to the 31 staff who had been selected for participation in May, 2004 and was sent to 80 industry-based supervisors or managers by mail in May 2004, along with a set of accompanying instructions and a return address. Responses were slow and follow-up letters were forwarded in May and June, 2004.

From the period between April and June, 2004, a total of 192 completed survey forms were collected from the student survey and 68 survey forms were returned incomplete. Some of the students were not interested in the survey and participated in the survey by just completing Section A of the questionnaire only, while many others answered the first few questions of Section B only. The incomplete survey forms were thus excluded because they were not valid for analysis. Out of the 192 students, 92 Northern University students and 100 Southern University students had answered the survey questionnaire. This represented an effective response rate of 74% for student survey.

All the academic staff participated actively in the survey. Two sets of survey forms were distributed to each staff to survey their perceptions regarding the two transnational engineering programmes. A total of 61 completed survey forms were returned, with 31 completed forms collected from Southern staff, and 30 completed survey forms collected from Northern staff. This represents an effective response rate of 98% for staff survey.

A total of 80 survey forms were mailed or emailed to employers. However, only 20 completed forms were returned. This represents an effective response rate of 25% for employer survey. The following table (Table 4.5) summarizes the response rates of the surveys. An overview of data collection procedures and their relevance to the research questions is summarized in Table 4.6.

Table 4.5
Summary of the Response Rates of the Surveys

Participant	**Number of Survey Forms Distributed**	**Number of Completed Forms Collected**	**Response Rate (%)**
Students	260	192	74
Northern Students	130	92	71
Southern Students	130	100	77
Staff	62	61	98%
Employers	80	20	25

Table 4.6
Overview of the Data Collection Procedures and Their Relevance to Research Questions

Research Question	**Data Collection Instrument**		
	Student Survey (N=260)	Employer Survey (N=80)	Staff Survey (N=31)
What conceptual framework for the delivery of transnational engineering education derives from an analysis of authoritative literature and research in contemporary higher education?	√	√	√
What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?	√		
What are the perceptions of lecturing staff regarding the quality of the transnational engineering programmes conducted at Trans College?			√
What are the perceptions of employers regarding the quality of graduates of the transnational engineering education programmes conducted at Trans College?		√	
What revised conceptual framework for the delivery of highly successful transnational engineering programmes emerges from the study?	√	√	√

4.6 Data Analysis Strategies

Two major categories of data—closed-ended responses and open-ended responses--were generated in this study. Each category of data requires the application of appropriate analytical tools, which for this study, took the following forms.

4.6.1 Descriptive Statistics

Descriptive statistical procedures were used to enable conclusions to be reached regarding the demographic and personal characteristics of respondents and also to enable the perceptual data to be analysed.

Most of the close-ended responses were analysed using the statistical package for the social science (SPSS) software package Version 12 for Windows. AMOS statistical software was used for structural modeling to perform the confirmatory factor analysis (Arbuckle, 1997). Three particular descriptive statistical tools were employed.

T-test analysis

T-test analysis is used to compare the means between two groups to determine whether the two groups are statistically different from each other. To carry out t-test, the frequency distributions of the responses should be analyzed to check if the distribution is mound shaped. Likert scale questions with only five possible answers cannot possibly possess a normal distribution as the range of answers is discrete but not continuous. As long as the frequency distribution gives a mound shape, it is appropriate to use t-test for determining whether there is a significant difference between the means of two groups. With a sample size which is bigger than 30, t-test analysis is applicable. For a sample size which is smaller than 30, Mann-Whitney's U test is appropriate. Independent sample t-test analysis was appropriate for this study to compare the means of one variable for two groups of cases.

In this study, there were 92 student respondents for the Northern group and 100 student respondents for the Southern group. Normality test was first performed to determine the frequency distribution of the data. Having confirmed that the distribution was normally distributed, an independent sample t-test analysis was then carried out to compare the perceptions of both Northern and Southern students.

One-way ANOVA

One-way ANOVA is computed in order to test the differences in means of more than two groups. One-way ANOVA is preferably used to compute the significant mean differences among the three groups instead of using multiple t-test because the greater the number of t-tests done, the less confidence the results. It was used to compare the perceptions of Northern academic staff, students, and employers of Northern transnational engineering graduates on learning outcomes of the programme.

Regression analyses

An equation can be used to express the relationship between two variables and estimate the value of the dependant variable based on a selected value of an independent variable (Lind, Mason, and Marchal, 2000). The technique used for analysis of this relationship is called regression analysis. Regression analysis was used in this study to measure relationships between perceptions and satisfaction levels of students and staff in the two different transnational engineering programmes.

Based on the research questions and related hypotheses that guide this study, the statistical methods that have been discussed are summarized in Table 4.7 and Table 4.8.

Table 4.7
Statistical Analysis for Research Questions

No.	Area of Research	Groups Tested	Statistical Tool
1.	The conceptual framework for the delivery of transnational engineering programmes	All students	Cronbach's coefficient Exploratory factor analysis Confirmatory factor analysis Content analysis
2.	Perceptions of enrolled students regarding the quality of the transnational engineering programmes	All students	Descriptive statistics
3.	Perceptions of staff regarding the quality of the transnational engineering programmes	Staff involved in the two programmes	Descriptive statistics
4.	Perceptions of employers regarding the quality of transnational graduates produced by the transnational engineering programme	Employers for Northern University's graduates	Descriptive statistics
5.	Revised framework for delivery of highly successful transnational engineering programmes	All respondents	All statistical analyses

Table 4.8
Statistical Analysis for Hypotheses Developed for This Study

No.	Hypothesis	Groups Tested	Statistical Tool
1.	*There are no significant differences between the perceptions of Northern and Southern students relating to the quality of transnational engineering education programmes conducted at Trans College.*	Comparison of perceptions --Northern students with Southern students	Independent sample t-test
2.	*There is a significant relationship between the perception of programme quality and the satisfaction levels of students undertaking transnational engineering education programmes at Trans College.*	Northern students and Southern students	Regression analysis
3.	*There are no significant differences between the perceptions of Northern students, Northern staff, and employers regarding the quality of transnational engineering education programmes conducted at Trans College.*	Northern students, staff, and employers	One-way ANOVA

4.6.2 Analysis of the Open-ended Questions

The data relating to the open-ended questions was analyzed by using data reduction and comparisons processes.

The student, staff, and employer open-ended data were studied thoroughly and comparisons were made among them. Data which featured a similar theme were extracted, grouped together, and further revised by using data reduction methods until a clear theme emerged.

Open-ended responses were examined in combination with the descriptive data to reveal issues that pervaded responses to the overall study. These issues were identified for consideration in the final chapter of the thesis.

4.7 Timeframe for the Research

A summary of the timeframe for the study is contained below:

Phase 1: November 2002—December 2003

*Literature search and review
*Identify conceptual framework and research questions
*Design research instruments
*Refine research instruments
*Develop close-ended and open-ended questionnaire for student sample
*Identify samples

Phase 2: January 2004—July 2004

*Conduct survey among students
*Develop questionnaire for conducting surveys among supervisors and managers in manufacturing firms
*Conduct survey among employers
*Conduct survey among the staff
*Perform statistical analyses
*Transcribe and analyse qualitative data
*Update review of literature
*Commence writing dissertation

Phase 3: August 2004- June 2005

***Tsunami interference**
*Write full draft of dissertation
*Complete writing of dissertation
*Refine all chapters
*Submit dissertation

4.8 Chapter Summary

The chapter describes the research design and research methodology that were used to conduct surveys among students, academic staff, and employers. It illustrates in detail how the SERVQUAL-TRANS conceptual framework was developed and then transposed into measurement instruments for measuring the quality of the transnational engineering programmes. It also discusses the goodness of measures in terms of reliability and validity through measuring Cronbach's coefficient (Cronbach, 1951) of each dimension and performing factor analyses for all dimensions.

This chapter examines the data collection methods for different primary source of data. It also covers the procedure for various statistical analyses and tests which were used to examine different hypotheses for answering the research questions. It explains how open-ended questions were analyzed by using data reduction and comparison processes.

CHAPTER 5

DATA ANALYSIS AND PRESENTATION OF FINDINGS

5.1 Introduction

This study sought to develop an authoritative response to the following research problem:

To what extent are the transnational engineering programmes conducted through an alliance of Trans College and partner-universities meeting the perceived needs of students, staff, and employers in Malaysia?

To address this research problem, the delivery of transnational programmes was explored from the perspectives of students, employers, and academic staff at Trans College. Five Research Questions guided the conduct of the research:

Research Question 1: *What conceptual framework for the delivery of transnational engineering education derives from an analysis of literature and research in contemporary higher education?*

Research Question 2: *What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?*

Research Question 3: *What are the perceptions of lecturing staff regarding the quality of the transnational engineering programmes conducted at Trans College?*

Research Question 4: *What are the perceptions of employers regarding the quality of graduates of the transnational engineering education programmes conducted at Trans College?*

Research Question 5: *What revised conceptual framework for the delivery of highly successful transnational engineering programmes emerges from the study?*

This chapter discusses the analyses performed on the data and the findings of the research study.

Section 5.1 provides an introduction to, and an overview of, this chapter.

Section 5.2 contains a summary of the survey responses and of the personal and demographic characteristics of the staff, students, and employers who comprised the research samples.

Section 5.3 focuses on Research Question 1. It establishes the reliability and validity of the preliminary conceptual framework that emerged from the literature analysis and was subsequently transposed into research instruments. Appropriate adjustments are proposed to the theoretical proposal that emerged from the literature review, with concomitant adjustments to the survey instruments that guide the data analysis.

In Section 5.4 of this chapter, Research Questions 2, 3, and 4 are explored through a range of statistical procedures. In essence, the perceptions of students, staff, and employers regarding the quality of the transnational engineering education at Trans College are analysed by calculating means on the *Outcomes* and *Contributory* sections of the survey instruments. T-test analyses were performed to carry out comparisons of the perceptions of the two student cohorts (Northern and Southern Universities) and one-way ANOVA was adopted to compare the perceptions of students, staff, and employers in one of the transnational programmes. Linear regression analysis was then used to investigate the relationship between the perceptions and satisfaction levels of students regarding the qualities of the two different programmes. All statistical analyses were performed using AMOS Version 5 and SPSS Version 12.

In Section 5.5 of this chapter, the results of the analyses of Research Questions 1, 2, 3, and 4 are considered in relation to the preliminary conceptual framework for the study. A refined conceptual framework is proposed in response to Research Question 5.

Section 5.6 provides a summary of the outcomes of Chapter Five.

5.2 Survey Responses and Characteristics of Respondents

An overview of the responses to the surveys of students, staff, and employers is contained in Tables 5.1, 5.2 and 5.3.

A total of 260 students were surveyed. Their response rates and characteristics are summarized in Table 5.1. As can be seen in Table 5.1, response rates were high for both Northern and Southern students and there was a similar distribution of male and female respondents in the transnational engineering degree programmes of the two universities. However, the majority of Northern University's students were part-time students in the age range of 26 to 30 and 31 to 35 years old. Only 50% of the Southern students were exposed to the work environment and 30% had only 3 months, or less, of exposure to professional engineering practice.

The analysis of staff responses indicates 98% response rates (Table 4.5). The analysis also shows that 90% of the staff have post graduate degrees and the majority have 5 years or more of teaching experience (Table 5.2).

The analysis of employer responses indicates that 95% of the employers were experienced managers or supervisors who were holding senior positions at the engineering firms.

Table 5.1
Comparison of Characteristics of Cohorts of Students

Classification		Northern Students		Southern Students		All Students	
		N=92	Percentage	N=100	Percentage	N=192	Percentage
Gender							
(N=192)	Male	79	86	87	87	166	86
	Female	13	14	13	13	26	14
	Incomplete	38		30		68	
Age							
(N=192)	Less than or 21	-	-	36	36	36	19
	22 - 25	34	37	64	64	98	51
	26 - 30	46	50	-	-	46	24
	31 - 35	11	12	-	-	11	6
	More than 35	1	1	-	-	1	-
	Incomplete	38		30		68	
Mode of study							
(N=192)	Full-time	26	28	97	97	123	64
	Part-time	66	72	3	3	69	36
	Incomplete	38		30		68	
Sponsorship							
(N=192)	Self-sponsored	63	68	100	100	163	85
	Company-sponsored	29	32	-	-	29	15
	Incomplete	38		30		68	
Industrial experience							
(N=192)	Working full-time	70	76	14	14	84	44
	Completed industrial training	17	18	29	29	46	24
	Working part-time	5	6	7	7	12	6
	No working experience	-	-	50	50	50	26
	Incomplete	38		30		68	
Years of working experience							
(N=192)	0 month	-	-	50	50	50	26
	≤ 3 months	11	12	30	30	41	21
	≥ 4 months but less than 1 year	10	11	7	7	17	9
	≥ 1 year but less than 2 years	8	9	6	6	14	7
	≥ 2 years but less than 5 years	24	26	7	7	31	16
	More than 5 years	39	42	-	-	39	21
	Incomplete	38		30		68	

Table 5.2
Characteristics of the Staff

Classification		Northern Staff		Southern Staff	
		N=30	Percentage	N=31	Percentage
Gender					
(N=61)	Male	27	90	28	90
	Female	3	10	3	10
Age					
(N=61)	23 - 25	-	-	-	-
	26 - 30	5	17	4	13
	31 - 40	18	60	22	71
	41 - 50	7	23	5	16
	51 - 60	-	-	-	-
Position					
(N=61)	Full-time academic staff	12	40	10	32
	Part-time academic staff	18	60	21	68
Highest qualification of staff					
(N=61)	Ph. D	6	20	7	22
	Master	21	70	21	68
	First degree	3	10	3	10
Years of tertiary teaching experience					
(N=61)	1 – 2 years	7	23.3	4	13
	≥ 2 years but less than 5 year	4	13.3	7	23
	≥ 5 years but less than 10 year	16	53.3	18	58
	More than 10 years	3	10	2	6
University graduated from					
(N=61)	Overseas university	20	66.7	22	71
	Local university	8	26.7	7	23
	Transnational tertiary study	2	6.6	2	6

Table 5.3
Characteristics of Employers

Classification		N	Percentage
Gender			
(n=20)	Male	18	90
	Female	2	10
Age			
(n=20)	27 - 30	3	15
	31 -35	7	35
	36 - 45	6	30
	46 - 55	4	20
Position at the company	Director	2	10
	Manager	9	45
	Senior Engineer/executive	8	40
	Engineer	1	5
Years of working experience	1 – 2 years	2	10
	≥ 2 years but less than 5 year	1	5
	≥ 5 years but less than 10 year	6	30
	More than 10 years	11	55
No. of employees under supervision	Less than or equal to 10	7	35
	11 - 20	5	25
	21 - 30	3	15
	31 - 50	4	20
	51 - 100	1	5
	More than 100	0	0
University graduated from	Overseas university	8	40
	Local university/institution	10	50
	Transnational tertiary study	2	10

5.3 Exploring the Reliability and Validity of the Preliminary Conceptual Framework

Research Question 1 for this study was stated as follows:

What conceptual framework for the delivery of transnational engineering education derives from an analysis of literature and research in contemporary higher education?

Following the analysis of literature and research that was conducted in Chapter Two, a preliminary conceptual framework was developed to guide the empirical aspects of the study. The issue of whether the survey instrument that is derived from this framework, conceptualised as SERVQUAL-TRANS, is characterised by reliability and validity is regarded as being of central importance in proposing a response to Research Question 1.

Figure 3.3 and Table 5.4 indicate that the proposed preliminary SERVQUAL-TRANS conceptual framework consisted of four *Outcomes* dimensions (namely "Technical Competencies", "Generic Competencies", "Communication Social Skills", "Management and Organisation Skills") and seven *Contributory* dimensions (namely "Course Curriculum", "Learning Resources", "Teaching, Learning and Assessment Practices", "Leadership", "Administrative Support", and "Staff and Students' Relationship" and "Professional Exposure") adapted from the existing teaching models in the literature. The four dimensions of the *Outcomes* construct were developed into 28 items for the survey instrument and the seven dimensions of the *Contributory* construct were developed into 50 items for the survey instrument, as shown in Table 5.4 (Details are provided in Chapter Four). Figure 5.1 shows the relationship between the original 11 dimensions and the 78 items that clustered under the 11 dimensions of the proposed SERVQUAL-TRANS conceptual framework before confirmatory and exploratory factor analyses were performed.

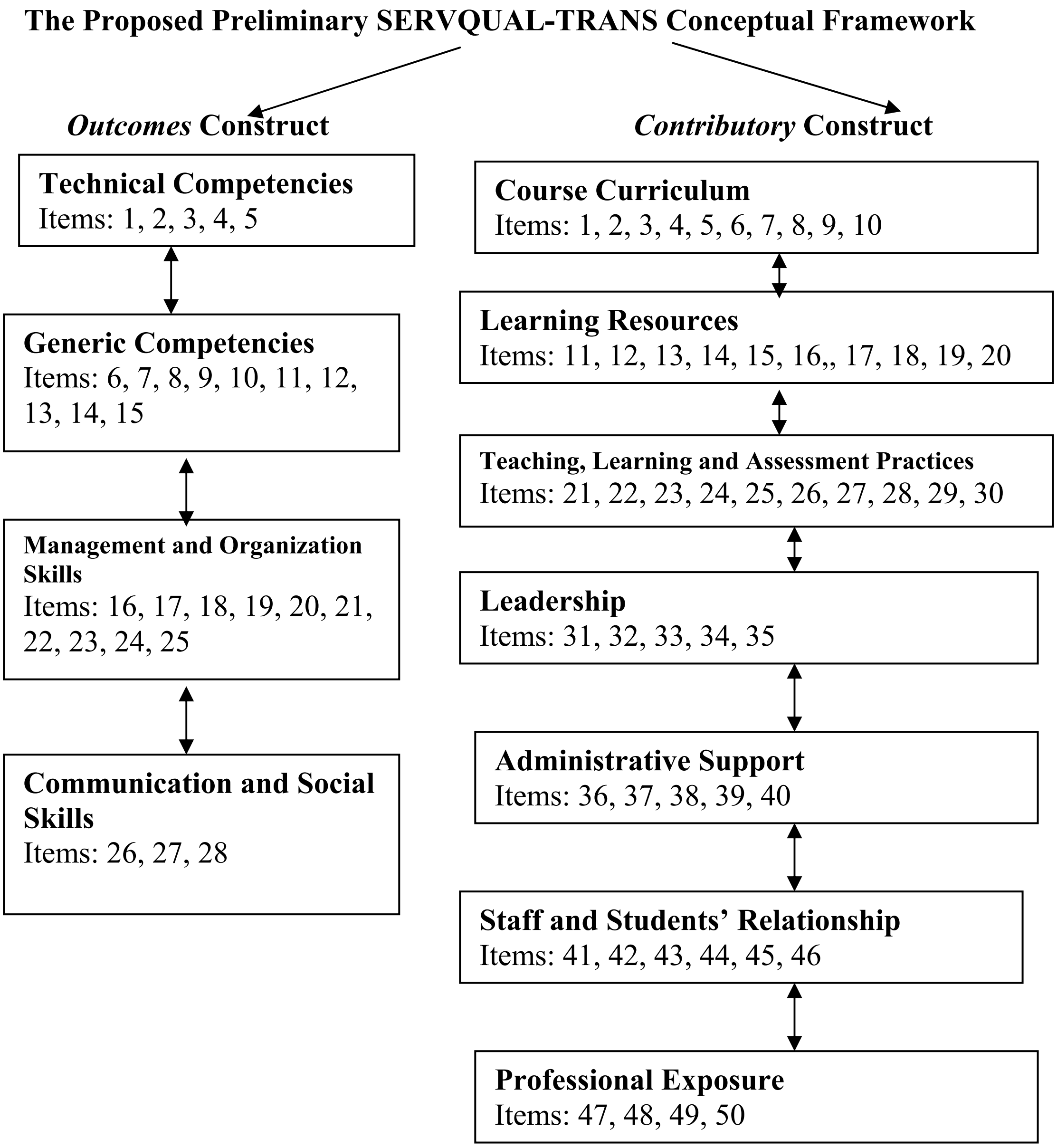


Figure 5.1
Eleven Dimensions and 78 Items in the Proposed Preliminary SERVQUAL-TRANS Conceptual framework

5.3.1 Reliability

To explore the reliability of the instrument that was developed to conduct the surveys, Cronbach alphas for the 4-dimension *Outcomes* construct and 7-dimension *Contributory* construct of the proposed preliminary conceptual framework were calculated using the SPSS version 12 software. The coefficient alpha values for the *Outcomes* dimensions were 0.770 for “Technical Competencies”, 0.859 for “Generic Competencies”, 0.837 for “Management and Organisation Skill” and 0.807 for “Communication and Social skills”. The alpha values for the *Contributory* dimensions were 0.850, 0.872, 0.882, 0.854, 0.810, 0.866, and 0.836 for “Course Curriculum”, “Learning Resources”, “Teaching, Learning and Assessment Practices”, “Leadership”, “Administrative Support”, “Staff and Students’ Relationship” and “Professional Exposure” respectively.

Coefficient alpha values for total *Outcomes* and *Contributory* constructs were 0.915 and 0.96l respectively. All the Cronbach alpha values were higher than 0.70 indicating high reliability of the scale items and stability of 11 dimensions of the conceptual framework. Table 5.4 listed the 11 dimensions with its items and dimension alphas for the student survey.

5.3.2 Validity

In addition to the reliability analyses, it was necessary to examine the validity of the preliminary conceptual framework before confirming that the framework was adequate for research application. The following section examines the validity of the preliminary conceptual framework by using exploratory and confirmatory analyses.

In order to test whether the proposed preliminary conceptual framework was ready for research use, two types of factor analyses, namely exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), were employed. A qualitative analysis was also conducted in this study.

Table 5.4
Reliability Test for 4-Dimension *Outcomes* and 7-Dimension *Contributory* Constructs

***Outcomes* Dimension**	***Outcomes* Items**	**Cronbach Alpha**		
		Southern Students	**Northern Students**	**All Students**
Technical Competencies	1, 2, 3, 4, 5	0.724	0.800	0.770
Generic Competencies	6, 7, 8, 9, 10, 11, 12, 13, 14, 15	0.765	0.903	0.859
Management and Organization Skills	16, 17, 18, 19 , 20, 21,22, 23, 24, 25	0.741	0.893	0.837
Communication and Social Skills	26, 27, 28	0.726	0.881	0.807
***Outcomes* Construct**	Items 1 - 28	0.865	0.941	0.915
***Contributory* Dimension**	***Contributory* Items**			
Course Curriculum	1, 2, 3, 4, 5, 6, 7, 8, 9,10	0.797	0.902	0.850
Learning Resources	11, 12, 13, 14, 15, 16, 17, 18, 19, 20	0.857	0.896	0.872
Teaching, Learning and Assessment Practices	21, 22, 23, 24, 25, 26, 27, 28, 29, 30	0.865	0.901	0.882
Leadership	31, 32, 33, 34, 35	0.821	0.870	0.854
Administrative Support	36, 37, 38, 39, 40	0.762	0.853	0.810
Staff and Students' Relationship	41, 42, 43, 44, 45, 46	0.832	0.904	0.866
Professional Exposure	47, 48, 49, 50	0.734	0.905	0.836
Contributory Construct	Item 1 - 50	0.950	0.971	0.961
All *Outcomes* and *Contributory* Items		0.942	0.972	0.960

Confirmatory factor analysis was first performed to evaluate the validity of the proposed preliminary SERVQUAL-TRANS conceptual framework. If the statistical integrity of the proposed preliminary SERVQUAL-TRANS conceptual framework could not be confirmed, the next step would be to perform an exploratory factor analysis for determining the number and structure of the dimensions that were underpinning the data. After this was done, the resulting dimensions would then be reconfirmed by using confirmatory factor analysis. Figure 5.2 outlined the factor analysis procedure for identification of dimensions and items that measured the quality of the transnational engineering education. The derived dimensions and items were then compared with the findings of the qualitative analysis using open-ended questionnaires to counter-check for validity.

The following sections (Parts a, b, c, d, and e) discuss in detail the confirmatory and exploratory analyses as well as the reliability analysis adopted for investigating the validity and reliability of the proposed SERVQUAL-TRANS conceptual framework.

(a) <u>Confirmatory Factor Analysis (CFA) for the *Outcomes* and *Contributory* Constructs</u>

Confirmatory factor analysis was performed for each construct separately. Figure B.1 in Appendix B showed the path diagram of *the Outcomes* construct. Circles in the path diagram represented dimension, while rectangles or squares represented items. Figure B.1 hypothesized four dimensions (Technical Competencies, Generic Competencies, Management and Organization Skills, and Communication and Social Skills) which were correlated with one another. To test the validity of the *Contributory* construct, confirmatory factor analysis was also performed on the *Contributory* data set using the AMOS software. The initial seven dimensions of the *Contributory* construct as well as the items in each dimension were included in the path diagram. The complete path diagram for the 7-dimension *Contributory* construct of the conceptual framework was shown in Figure B.2 in Appendix B. Figure B.2 hypothesized 7 dimensions of the Contributory construct were correlated with one another. From the confirmatory factor analysis of the initial 4-dimension *Outcomes* and 7-dimension *Contributory* constructs, the results obtained were shown in Table

5.5. The initial conceptual framework was found to be not ideal as the results indicated lack-of-fit of the initial hypothesised *Outcomes* construct. The ratio of chi-square to degrees of freedom was 3.46, which was more than 2, the cut-off value for an acceptable framework (McDonald and March, 1990).

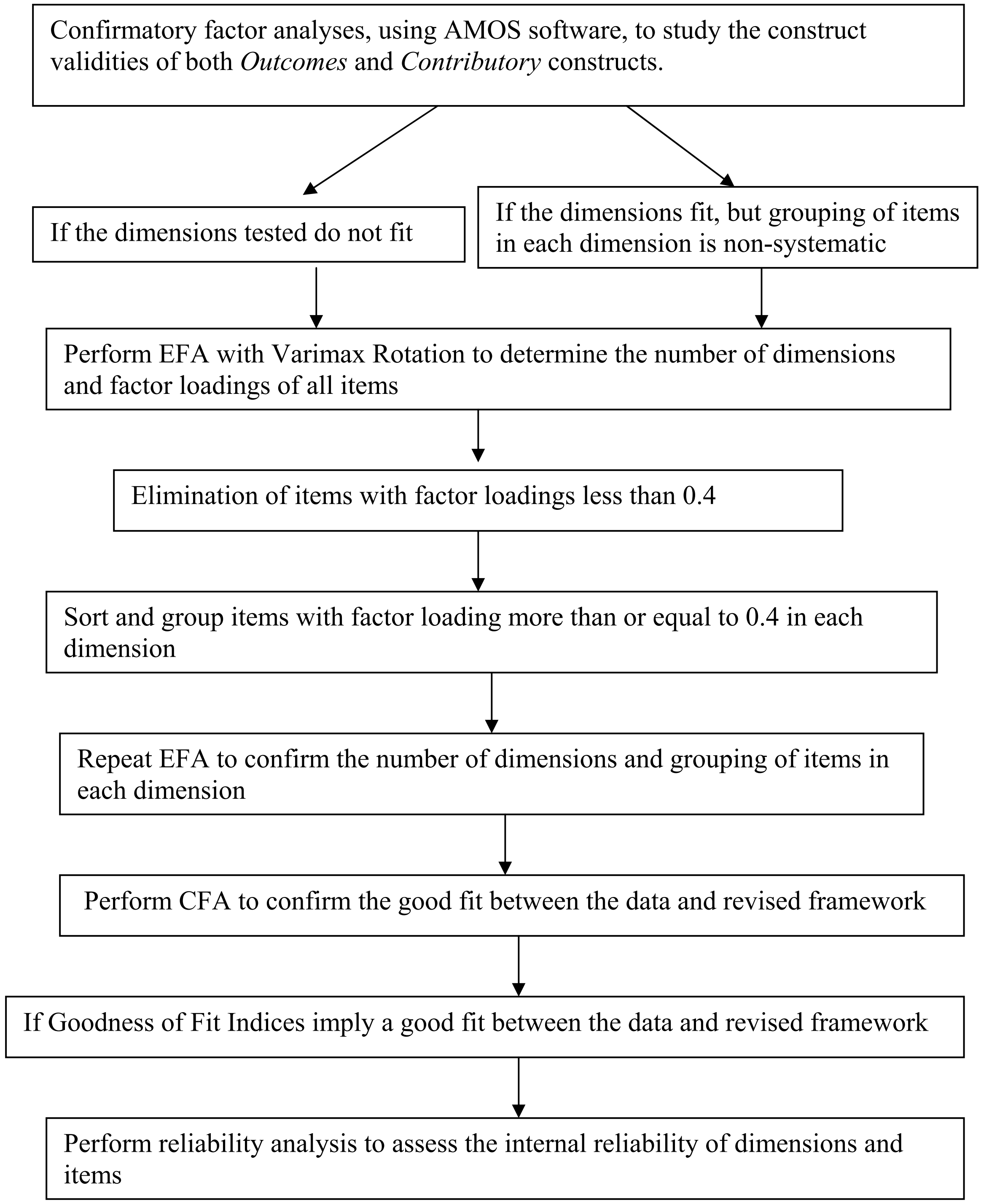


Figure 5.2
Data Analysis Procedure for Assessing the Validity and Reliability of the Proposed Preliminary SERVQUAL-TRANS Conceptual Framework

Similarly, the value of root mean square error of approximation (RMSEA) calculated was 0.102, which was much higher than the cut off value of 0.08 (Hu and Bentler, 1999; Browne and Cudeck, 1993). Other goodness of fit measures, namely CFI (comparative of fit index), TLI (Tucker-Lewis index) and NFI (normed fit index), were not close to 1, which indicated that the initial *Outcomes* construct had to be improved.

Table 5.5
Goodness of Fit Statistics for 4-Dimension *Outcomes* and 7-Dimension *Contributory* Constructs

Goodness of Fit Statistics			
4-Dimension *Outcomes* Construct		**7-Dimension *Contributory* Construct**	
Chi-square	1016.25	Chi-square	1906.62
Degrees of freedom (df)	294	Degrees of freedom (df)	1111
Probability level	0.00	Probability level	0.00
Chi-square/degrees of freedom	3.46	Chi-square/degrees of freedom	1.716
RMSEA	0.102	RMSEA	0.055
Comparative Fit Index (CFI)	0.61	Comparative Fit Index (CFI)	0.85
Tucker-Lewis Index (TLI)	0.53	Tucker-Lewis Index (TLI)	0.82

Table 5.5 also showed the goodness of fit statistics for the *Contributory* construct. From the confirmatory factor analysis, the ratio of Chi-square to degrees of freedom was 1.716 which was well below the cut-off value of 2. The obtained value indicated that the *Contributory* construct was an acceptable construct fit to data (McDonald and March, 1990). The p-value of Chi square probability level was 0 and other goodness of fit measures such as comparative fit Index (CFI) and Tucker-Lewis Index (TLI) were close to 1 which indicated good fit. The root mean square error of approximation (RMSEA) which measured the discrepancy between data and the

framework gave a value of 0.055, which was below 0.08. This meant that the initial proposed 7-dimension *Contributory* construct could be an acceptable construct fit to data (Hu and Bentler, 1999; Browne and Cudeck, 1993). The next step of the analysis was to perform exploratory factor analysis (EFA) on the 4-dimension *Outcomes* construct, as initial analysis had indicated that the original *Outcomes* construct had to be improved.

(b) Exploratory Factor Analysis for the Proposed *Outcomes* Construct

A principal component analysis with Varimax rotation was performed to determine the number of dimensions characterising a set of items. Dimensions with eigenvalues greater than 1 were extracted and a cumulative proportion of variance was calculated. Table B.1 listed out the eigenvalues of all the dimensions for analysis performed on the proposed *Outcomes* construct. The table indicated that eigenvalues of the seven dimensions were greater than 1. According to Kaiser's rule, and looking at the eigenvalues calculated in Table B.1, seven dimensions could be extracted for further analysis. However, according to Cattell's guidelines (1966), the scree plot in Figure B.3 indicated only five or six dimensions could be extracted for further analysis as the Cattell's guidelines retained only dimensions above the elbow and rejected those below the elbow (Cattell, 1966). The results indicated that five to seven dimensions solutions were possible. After the Varimax rotation, items with high factor loading (factor loading above 0.4) were considered to describe the factor well. On the other hand, if a factor loading was below 0.4, the item could be ignored as the variable did not correlate well with the factor. Items with low communalities (below 0.1) also would be removed from the analysis as low communalities indicated that the items had little in common with other items in the dataset. Since all the items in Table B.2 had communalities higher than 0.1, they could be used for further analysis. (Garson, 2004).

Table B.3 illustrated the rotated factor pattern. Items with significant factor loading i.e. factor loading of greater than 0.4, were grouped according to their factor loadings. "Q1—Application of maths and science", was loaded in dimensions 4 and 5, with higher loading factor (factor loading of 0.566) in dimension 5. However, it was grouped under dimension 4 because of its content relevance to the rest of items in dimension 4. Similarly, due to the close content relevance of Q10 to other items in dimension 1, "Q10—Can undertake problem identification and solution" was grouped under dimension 1 even though the item had higher loading under dimension 5. Items Q6 and Q25 were deleted as these items were under dimensions with fewer than three items and the contents of these two items had been included in Q7. "Q18—Cope with uncertainty and stress" was also deleted as this item had been taken into account by Q23 and Q16.

After deleting Q6, Q18, and Q25, exploratory factor analysis was performed again to determine the number of dimensions that could be used to represent relationships among the interrelated items. The results calculated by the exploratory factor analysis, after the deletion of Q6, Q18, and Q25, were shown in Table B.4 and Table B.5. After the Varimax rotation, results calculated in Table B.4 indicated that eigenvalues of the five items were greater than 1. Based on Kaiser's rule, and from the eigenvalues calculated in Table B.4, five dimensions could be extracted for further analysis. The items were sorted out and grouped according to their loadings for each dimension as shown in Table B.5. For items which had loading on more than one dimension, only the item with a higher or the highest loading factor would be selected. Q 1, Q2, Q3, Q4, and Q5 were grouped under "Technical Competencies"; Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, and Q15 were grouped under "Generic Competencies"; Q16, Q17, Q22, Q23, and Q24 were grouped under "Management and Organisation Skills", Q19, Q26, Q27, and Q28 were grouped under "Communication and Social Skills", Q20 and Q21 were grouped under "Teamwork", which was a new dimension added to the existing dimensions. The new item grouping was tabulated in Table 5.6.

Table 5.6
***Outcomes* Construct of the Revised SERVQUAL-TRANS Framework**

A. Technical Competencies
Q1. I am able to apply mathematics, science and engineering knowledge in analyzing engineering problems.
Q2. I am able to use software simulation tools to analyze engineering problems and develop solutions to the problems.
Q3. I am able to use test and measurement equipment to design, conduct experiments and analyze experimental data.
Q4. I am able to use given specifications for designing a prescribed engineering system.
Q5. I am able to design alternative systems based on technical and non-technical criteria.
B. Generic Competencies
Q7. I have learnt about professional engineering ethics.
Q8. I can integrate and apply technical advice provided by the academic staff in solving technical problems.
Q9. I understand the impact of engineering on business and economics in both local and global environment.
Q10. I am able to undertake problem identification, formulation and develop solution to problem.
Q11. I understand the needs of the engineering industry and community as a whole.
Q12. I am able to demonstrate quality-assurance criteria in relation to engineering practice.
Q13. I demonstrate continuous learning to overcome the obsolescence of changing technologies.
Q14. I have developed lifelong learning skills.
Q15. I am aware of the impact of global environmental changes on the development of engineering.
C. Management and Organization Skills
Q16. I am able to plan and organize tasks efficiently and effectively.
Q17. I am able to work under minimal supervision.
Q22. I am able to brainstorm ideas in groups.
Q23. I have the capacity to work within deadlines fixed by the linking university.
Q24. I have developed study skills in preparing for examination papers set and marked by the linking university.
D. Teamwork
Q20. I have learned to work in teams through the college's extra-curricular activities.
Q21. I am able to contribute multidisciplinary viewpoints in problem solving.
E. Communication and Social Skills
Q19. I take initiative to explore opportunities and develop new ideas.
Q26. I have acquired good oral communication skills through individual and group presentation of assignments in class.
Q27. I am able to speak and write good English after a period of study in the degree program.
Q28. I have acquired good report writing skill.

(c) <u>Exploratory Factor Analysis for the Proposed *Contributory* Construct</u>

Even though the 7-dimension *Contributory* construct of the conceptual framework was confirmed to be valid by the confirmatory factor analysis, it was still necessary to perform exploratory factor analysis (EFA) to ensure a consistent categorisation of items under each dimension of the *Contributory* construct. After the Varimax rotation, the scree plot in Figure B.4 revealed that eight or nine dimensions could be extracted for further analysis. However, Table B.6 showed that the eigenvalues of 12 dimensions were greater than 1, which meant that 12 dimensions could be extracted for further analysis (Cattell, 1966). By examining the scree plot and eigenvalues obtained, the results indicated that 8 to 12-dimension solutions were the possible underlying structure for the set of 50 items.

Table B.7 illustrated the grouping of items under each dimension. All the items were sorted out and grouped according to their loadings ranking by choosing the item with the highest loading grouped under each dimension. It was revealed that "Q10 —The number of Wajib subjects prescribed is appropriate" was grouped with Q11, Q12, Q47, Q48, and Q49. Since Q10 had no relationship with the rest of the items in the group, exploratory factor analysis was performed again for the 8-dimension data set. Results in Table B.8 again revealed that Q10 was grouped with Q11 and Q12; while Q47, Q48, Q49, and Q50 were grouped under another dimension (Table A.8). This meant that Q10 had to be deleted as it was a stand-alone item having no correlation with any other items in the data set. With the deletion of Q10, items were grouped under each dimension as shown in Table B.9. The items were then grouped accordingly to the dimensions as shown in Table B.10. Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, and Q9 were grouped under "Course Curriculum"; Q28, Q29, Q30, Q33, Q34, and Q35 under "Leadership"; Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, and Q25 under "Learning Resources"; Q11 and Q12 under "Tangibles"; Q41, Q42, Q43, Q44, Q45, and Q46 under "Staff and Students' Relationship"; Q47, Q48, Q49, and Q50 under "Professional Exposure"; Q27, Q36, Q37, Q38, Q39, and Q40 under "Administrative Support"; Q21, Q22, Q23, Q24, and Q26 under "Teaching, Learning and Assessment Practices".

(d) Confirmatory Factor Analysis for the Revised SERVQUAL-TRANS Framework

After examining the findings from the CFA and EFA of the original *Outcomes* construct and findings from the EFA of the revised *Outcomes* construct, the 5-dimension *Outcomes* construct with deletion of three items (Q6, Q18, and Q25) from the list of items was run with AMOS software to confirm the validity of the 5-dimension *Outcomes* construct. The path diagram was constructed to represent the relationship between the items and dimensions of the 5-dimension *Outcomes* construct. Figure B.5 showed the path diagram of the confirmatory factor analysis of the 5-dimension *Outcomes* construct. It also hypothesized that the 5 dimensions of the *Outcomes* construct (Technical Competencies, Generic Competencies, Management and Organization Skills, Teamwork, Communication and Social Skills) were correlated with one another.

Results in Table 5.7 showed the goodness of fit statistics for the 5-dimension *Outcomes* construct. From the results calculated, the ratio of chi-square to degrees of freedom of the *Outcomes* construct was 1.92, which was less than 2, the cut-off value for an acceptable model (McDonald and March, 1990). The value of root mean square error of approximation (RMSEA) calculated was 0.06, which was lower than the cut off value of 0.08 (Hu and Bentler, 1999; Browne and Cudeck, 1993). Other goodness of fit measures, namely CFI (goodness of fit index) and TLI (Tucker-Lewis index), were close to 1, which indicated an acceptable fit for the 5-dimension *Outcomes* construct. This evidence also suggested that the items formed a coherent set which could measure the distinct *Outcomes* construct. The confirmatory factor analysis thus provided empirical evidence which supported the construct validity of the *Outcomes* construct.

Table 5.7
Goodness of Fit Statistics for 5-Dimension *Outcomes* and 8-Dimension *Contributory* Constructs

Goodness of Fit Statistics			
5-Dimension *Outcomes* Construct		**8-Dimension *Contributory* Construct**	
Chi-square	460.60	Chi-square	1874.50
Degrees of freedom (df)	240	Degrees of freedom (df)	1061
Probability level	0.00	Probability level	0.00
Chi-square/degrees of freedom	1.92	Chi-square/degrees of freedom	1.77
RMSEA	0.06	RMSEA	0.06
Comparative Fit Index (CFI)	0.88	Comparative Fit Index (CFI)	0.84
Tucker-Lewis Index (TLI)	0.84	Tucker-Lewis Index (TLI)	0.82

The output from the EFA of the 7-dimension *Contributory* construct was unsatisfactory because it indicated that there was a non-systematic grouping of items even though the calculated results by CFA showed goodness of fit. Due to the non-consistency of outputs between CFA and EFA, and after performing several EFAs on 7-dimension and 8-dimension *Contributory* constructs with all items included and with deletion of an item, an 8-dimension *Contributory* construct with the deletion of Q10 was selected for further confirmatory factor analysis. Figure B.6 showed the path diagram of the 8-dimension *Contributory* construct with deletion of Q10. It also hypothesized that the 8 dimensions of the *Contributory* construct (Course Curriculum, Leadership, Teaching, Learning & Assessment Practices, Administrative Support, Staff and Students' Relationship, Learning Resources, Tangibles, and Professional Exposure) were correlated with one another.

It could be seen from Table 5.7 that all goodness of fit measures, namely TLI and CFI, were close to 1. The RMSEA value was 0.06, which was less than the cut-off value of 0.08. Similarly, the chi-square-to-degrees-of-freedom ratio was 1.77 which was less than the cut-off value of 2.0. These evidences together with the output from EFA suggested that the items formed a coherent set for measuring the *Contributory* construct. The Confirmatory Factor Analysis supported the construct validity of the *Contributory* construct.

5.3.3 Reliability Analysis for the Revised Conceptual Framework

To ensure that the revised framework was reliable, reliability analyses on the 5-dimension *Outcomes* construct and 8-dimension *Contributory* construct were performed. From Table 5.8, Cronbach alphas for the *Outcomes* dimensions ranged from 0.668 to 0.862. The corresponding Cronbach alpha value was 0.770 for "Technical Competencies", 0.862 for "Generic Competencies", 0.785 for "Management and Organisation Skill" and 0.784 for "Communication and Social skills". Cronbach alpha for the *Outcomes* construct was 0.909. All the Cronbach alpha values, with the exception of "Teamwork", were higher than 0.70, indicating high reliability of the scale items of the 5-dimension *Outcomes* construct. Since "Teamwork" dimension had only two items and the items were extracted from the original 10-item "Management and Organisation Skills" dimension, the relationship of reliability to length of test could be calculated by the following equation (Suhr, 1999):

$R_{teamwork} =$ KRo/(1+ (K -1) Ro

Where $R_{teamwork}$ is the reliability of the Team Work,

Ro is the reliability of the original test, and

K is the factor by which the length of the test is changed.

Since the "Management and Organisation Skills" dimension originally had an alpha value of 0.837, by substituting all the figures into the above equation gave 0.507.

$R_{teamwork} = (0.2)\ (0.837)/((\ 1 + (0.2 - 1)\ (0.837)) = \ 0.507$

To be accepted as a reliable dimension, the reliability for the 2-item "Teamwork" dimension must be greater than 0.507. When compared to the above calculated value of 0.507, the generated Cronbach alpha value of 0.668 for the "Teamwork" dimension showed high reliability of this dimension. Table 5.8 listed the Cronbach alphas for the five dimensions *Outcomes* construct.

Cronbach alpha (Cronbach, 1951) for each dimension in the *Contributory* construct was also computed using all the students' perception data. The Cronbach alphas for the eight dimensions of the *Contributory* construct were shown in Table 5.8. The Cronbach alphas clearly revealed that the eight dimensions of the *Contributory* construct were valid and stable as all the dimensions had alpha values of 0.70 or more (Nunnally, 1978). The total alpha value of 0.961 indicated that all the dimensions of the *Outcomes* and *Contributory* constructs were internally reliable.

From the above analyses, we could conclude that the proposed preliminary 11-dimension SERVQUAL-TRANS conceptual framework for measuring educational quality of the transnational education was found to be not optimum statistically. The integrity of the proposed preliminary conceptual framework that was developed from the current theory and research could be further improved. By using factor analyses, the dimensions and items of the proposed preliminary conceptual framework were fine-tuned. The net effect can be seen in Table 5.8 and Figure 5.3 - the revised SERVQUAL-TRANS framework had 13 dimensions consisting of the 5-dimension *Outcomes* construct with 25 items and the 8-dimension *Contributory* construct with 49 items.

Table 5.8
The Revised 13-Dimension SERVQUAL-TRANS Framework
(after factor analyses)

***Outcomes* Dimension**	***Outcomes* Items**	**Cronbach Alpha**
Technical Competencies	1, 2, 3, 4, 5	**0.770**
Generic Competencies	7, 8, 9, 10, 11, 12, 13, 14, 15	**0.862**
Management & Organization Skills	16, 17, 22, 23, 24	**0.785**
Communication & Social Skills	19, 26, 27, 28	**0.784**
Teamwork	20, 21	**0.668**
***Outcomes* Construct**	**With deletion of Q6, Q18, Q25**	**0.909**
***Contributory* Dimension**	***Contributory* Items**	
Course Curriculum	1, 2, 3, 4, 5, 6, 7, 8, 9	**0.854**
Leadership	28, 29, 30, 31, 32, 33, 34, 35	**0.875**
Teaching, Learning & Assessment Practices	21, 22, 23, 24, 26	**0.857**
Administrative Support	27, 36, 37, 38, 39, 40	**0.807**
Staff and Students' Relationship	41, 42, 43, 44, 45, 46	**0.866**
Learning Resources	13, 14, 15, 16, 17, 18, 19, 20, 25	**0.876**
Tangibles	11, 12	**0.791**
Professional Exposure	47, 48, 49, 50	**0.836**
***Contributory* construct**	**With deletion of Q10**	**0.961**

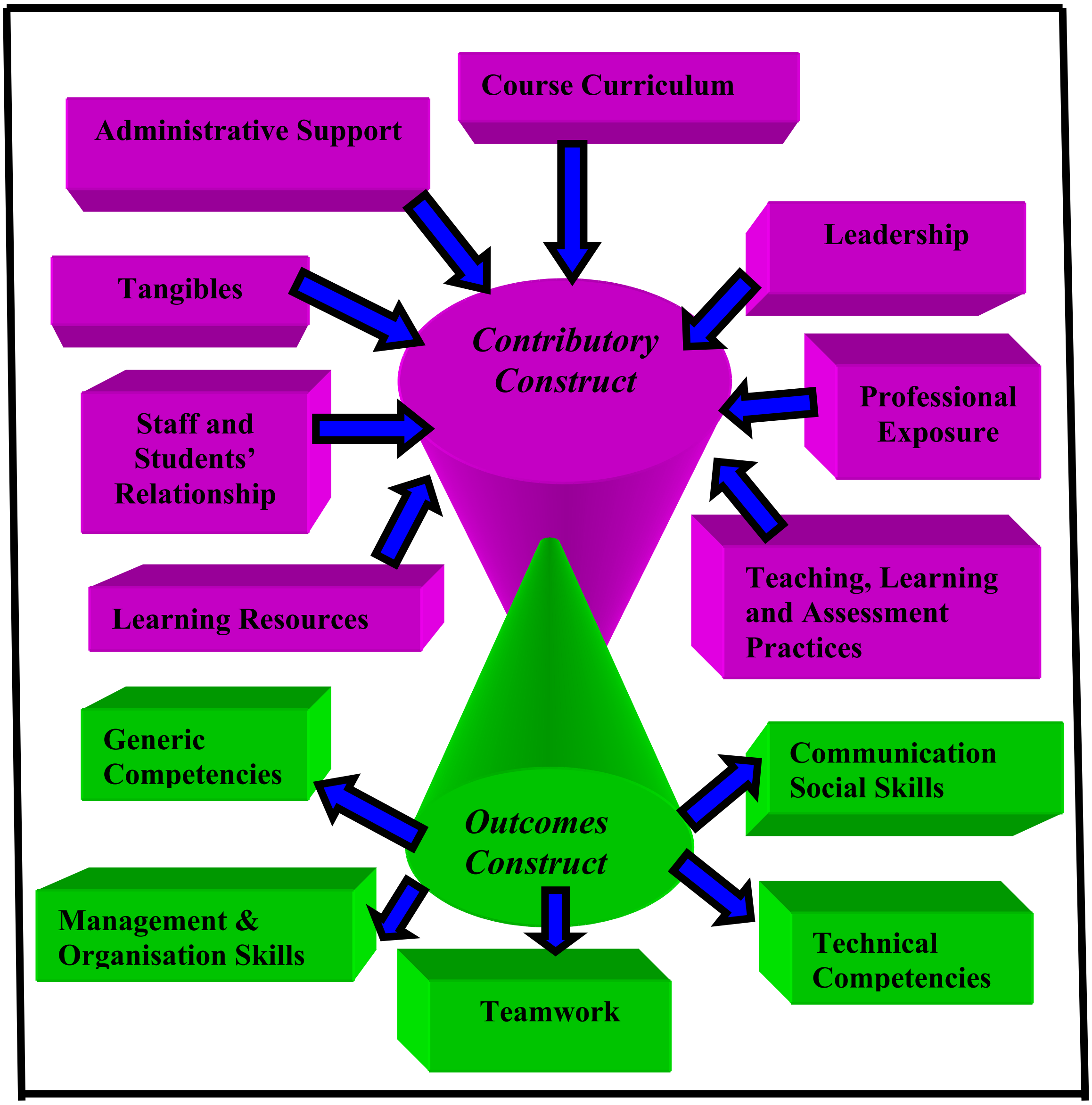


Figure 5.3
The Revised SERVQUAL-TRANS Framework for the Transnational Engineering Education

5.4 Outcomes of the Student, Staff, and Employer Survey Analyses

This section of the study reports the statistical data pertaining to Research Questions 2, 3, and 4. Research Question 2 focuses on students' perceptions of the quality of the Trans College engineering programs while Research Question 3 focuses on staff's perceptions and Research Question 4 focuses on employers' perceptions.

5.4.1 *Research Question 2: What are the perceptions of enrolled students regarding the quality of the transnational engineering programmes conducted at Trans College?*

The perceptions of the students regarding the quality of their transnational engineering programmes are contained in Tables 5.10 *(Outcomes* items) and 5.12 (*Contributory* items). Detailed analyses of these tables are followed by consideration of the respective responses of Northern and Southern students and analysis of the relationship between students' perceptions of programme quality and their satisfaction levels.

5.4.1.1 Perceptions of students regarding the quality of learning outcomes of their programmes

Statistical analysis of students' perceptions of the five broad dimensions of the outcomes of their engineering studies (Table 5.9) showed that the statistical means on all five dimensions were less than 3, meaning that majority of students were generally satisfied with the quality of the outcomes of the five broad aspects of their programmes.

Students perceived the development of their communication and social skills to be the most impressive development (mean score = 2.67) among all the learning outcome dimensions. This was followed by the "Management and Organisation Skills" dimension which was rated by students with a mean score of 2.70. The "Teamwork" dimension was rated by students to be 2.82. Development in "Technical

Competencies" was rated to be 2.98 and "Generic Competencies" dimension was rated to be the second last in the list (mean score = 2.90).

Table 5.9
Mean Scores of *Outcomes* Dimensions

***Outcomes* Dimension**	**N**	**Lowest Mean**	**Highest Mean**	**Dimension Mean**
Technical Competencies	192	2.89	3.06	2.98
Generic Competencies	192	2.82	2.96	2.90
Management and Organisation Skills	192	2.60	2.80	2.70
Communication and Social Skills	192	2.56	2.78	2.67
Teamwork	192	2.81	2.83	2.82

Next, the results of every item for each dimension were examined. The results in Table 5.10 indicated that students had positive perceptions on the development of their technical competencies. Item 1 had the lowest item mean of 2.89 which indicated that students had gained some confidence in application of mathematics, science and engineering knowledge in modeling and analysing engineering problems (Item 1, mean = 2.89). However, when responding about the use of software simulation tools for analysing engineering problems and developing solutions to the problems, students perceived their skills to be less competent (Item 2, mean = 3.07). Item 2 was the item with the highest mean. Students also lacked confidence in designing alternative systems based on technical and non-technical criteria (Item 5, mean = 3.06).

Students in both programmes generally indicated that they had gained generic skill competencies during the course of their studies (mean of "Generic Competencies" dimension = 2.90). All the means of the items in the "Generic Competencies" dimension were in the range of 2.82 to 2.96 indicating that there was no large variation among all the items. Item 14 was the item with the lowest mean in this dimension.

Table 5.10
Students' Perceptions of Learning Outcomes of the Programmes

ITEMS OF THE *OUTCOMES* DIMENSIONS	N	Mean	Std. Deviation
Technical Competencies			
1. Application of maths and science	192	2.89	.684
2. Use software simulation tools	192	3.07	.857
3. Use test and measurement equipment	192	2.93	.738
4. Use given specification for design	192	2.98	.709
5. Design alternative systems	192	3.06	.753
Generic Competencies			
7. Learned professional engineering ethics	192	2.86	.735
8. Integrate and apply technical advice provided	192	2.96	.646
9. Understand impact of engineering on business	192	2.89	.764
10. Can undertake problem identification & solution	192	2.93	.724
11. Understand the needs of engineering industry	192	2.87	.805
12. Demonstrate quality-assurance criteria in engineering practice	192	2.96	.758
13. Demonstrate continuous learning to overcome obsolescence in technology	192	2.90	.716
14. Develop lifelong learning skill	192	2.82	.726
15. Aware of the impact of global changes in engineering	192	2.89	.750
Management and Organisation Skills			
16. Plan & organize tasks efficiently	192	2.69	.748
17. Work under minimal supervision	192	2.60	.857
22. Brainstorm ideas in groups	192	2.71	.756
23. Can work within university deadlines	192	2.68	.891
24. Develop study skill in preparing for exam	192	2.80	.835
Communication and Social Skills			
19. Initiative in exploring opportunity	192	2.71	.758
26. Good communication skills	192	2.65	.730
27. Able to speak and write good English	192	2.56	.756
28. Acquire good report writing skill	192	2.78	.829
Teamwork			
20. Work in team through college's extra curricular activities	192	2.81	.915
21. Contribute multidisciplinary viewpoints in solving points	192	2.83	.775

Students perceived that they had become independent learners who could work under minimal supervision as the mean of item 17 was 2.60, which was the item with the lowest mean in the "Management and Organisation Skills" dimension. Item 24 (developing study skill in preparing for examination) was the item with the highest mean of 2.80. All the mean scores were below 3 indicating that majority of the students agreed that their management and organisation skills had improved.

Students strongly agreed that using English as a medium of instruction had helped them effectively in both oral and written communication (Item 27, mean = 2.56). Item 27 turned out to be the item with the lowest mean. This outcome of learning was in compliance with Hrabinska's study (2000) that students had the chance to improve their knowledge of English language. All the mean scores of the "Communication and Social Skills" items were below 3 indicating that the majority of the students agreed that their communication and social skills had improved.

Students also believed that they had learnt to work in teams through the extra-curricular activities organised in the college (Item 20, mean = 2.81). They could also apply multidisciplinary viewpoints in problem solving (Item 21, mean = 2.83). There was no apparent difference in the mean scores of these two items. The two mean scores were below 3 indicating that majority of the students agreed that they had cultivated a spirit of teamwork in them.

5.4.1.2 Perceptions of students regarding contributory factors leading to superior learning experiences

In general, the fairly satisfactory results of the *Contributory* dimensions and items appeared to complement the results of the *Outcomes* dimensions. Table 5.11 showed that students acknowledged the good quality of the course curriculum (mean = 2.50) as the mean for the course curriculum was below 3 and it was the lowest mean among the eight *Contributory* dimensions.

The "Leadership" and "Administrative Support" dimensions were rated with dimension mean scores of 2.62 and 2.66 respectively. Students proclaimed that they could work with staff at both the linking universities and at the college ("Staff and Students' Relationship", mean = 2.79). They also responded positively to the provision of professional exposure (mean = 2.81) and learning resources in the transnational education (mean = 2.82). They admitted that the teaching, learning and assessment practices adopted in the programmes were of acceptable quality (mean = 2.86). The overall mean for the "Tangibles" dimension was rated to be more than 3 (mean = 3.12), which indicated that an ambitious goal must be set to improve the score to a lower figure. This dimension had the highest mean.

Table 5.11
Mean Scores of the *Contributory* Dimensions

***Contributory* Dimension**	**N**	**Lowest Item Mean**	**Highest Item Mean**	**Dimension Mean**
Course Curriculum	192	1.85	2.80	2.50
Teaching Learning and Assessment Practices	192	2.72	2.99	2.86
Administrative Support	192	2.43	2.80	2.66
Staff and Students' Relationship	192	2.70	2.85	2.79
Learning Resources	192	2.66	3.02	2.82
Tangibles	192	3.02	3.22	3.12
Professional Exposure	192	2.67	2.90	2.81
Leadership	192	2.50	2.78	2.62

a. Students' perceptions of Course Curriculum

Next, the items of each dimension were examined. The results of the item mean scores shown in Table 5.12 indicated that all the items under "Course Curriculum" were rated below 3, indicating that students were happy with the quality of the "Course Curriculum". Students valued highly the usage of English as the medium of instruction in the degree programmes (Item 4, mean = 1.85). This item was the item with the lowest mean score.

One of the main concerns associated with the transnational education is the quality of course curriculum. Howe and Martin (1998) criticised the linking university for being unable to contextualise the course content based on local needs. However, the responses from these group of students proved that their concerns were unfounded because it was noted positively in Table 5.12 that the curriculum was updated systematically to reflect the needs of local employers (Item 1, mean = 2.51). Repeatedly, students acknowledged highly the relevance of course content to the technical needs of the local job market by according a mean score of 2.52 to “course content was related to technical needs of the job market”.

Results in Table 5.12 also showed that students acknowledged that they were assessed at the same standard as students at the linking university (Item 7, mean = 2.51) and the courses offered were of similar quality to those of the linking universities (Item 3, mean = 2.58). They even stressed that they had to follow the same format of the final year project as adopted in the linking universities (Item 8, mean = 2.40). The finding was in contradictory to the report by Ekhaguere (2000) which recorded that the transnational courses offered were sometimes the inferior versions of analogous courses offered to their home students (Ekhaguere, 2000).

b. Students’ perceptions of Learning Resources

The results in Table 5.12 showed that students rated all the items under “Learning Resources” with mean values below 3, with the exception of item 14 (mean = 3.02), whereby students indicated that course materials provided by the local tutors were not as comprehensive. However, the course materials provided by the linking university were more comprehensive (Item 15, mean = 2.66). Item 15 was the item with the lowest mean score in this dimension. Apart from the course materials, students could also access the library of the linking university electronically (Item 19, mean = 2.81) and extract the online course materials for reference (Item 20, mean = 2.70). The results were again contradictory to Saffu and Mamman’s (1999) findings which reported that resources provided for strategic alliances at the implementation stage were inadequate.

Table 5.12
Students' Perceptions of *Contributory* Factors that Lead to Superior Learning Experiences

ITEMS OF THE *CONTRIBUTORY* DIMENSIONS	N	Mean	Std. Deviation
Course Curriculum			
1. Curriculum is updated systematically	192	2.51	.927
2. Curriculum mirrors linking university's curriculum	192	2.80	.922
3. Course offered is of the same quality	192	2.58	.962
4. Degree program is delivered and assessed in English	192	1.85	.971
5. Course content is related to technical needs of the job market	192	2.52	.992
6. Coursework problems are real-life work related problems	192	2.74	1.021
7. Linking university assess students at the same standard	192	2.51	1.058
8. Students have to follow the same final year project's format	192	2.40	1.078
9. College lecturers provide input to the development of course curriculum	192	2.64	1.065
Teaching, Learning, and Assessment Practices			
21. College teaching staff implement good pedagogical practices effectively	192	2.86	1.021
22. College tutors make lecture very interesting and simulating	192	2.99	1.121
23. College lecturers have strong theoretical and practical knowledge	192	2.72	1.065
24. College teaching staff give helpful feedback to students' works	192	2.84	1.067
26. College lecturers are able to facilitate discussion in class	192	2.88	1.117
Administrative Support			
27. Day and night lectures and practical classes are available	192	2.43	1.036
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately	192	2.76	.973
37. Administrative and records management system maintain student records effectively	192	2.67	.989
38. Adequate student services are provided by the college	192	2.78	.957
39.Administrative and technical services are provided promptly and efficiently	192	2.80	1.005
40. Transcripts and degree certificates are issued promptly by linking university.	192	2.53	.954
Staff's and Students' Relationship			
41. Linking university staff meet with students privately to gather their views and address their concerns	192	2.77	1.048
42. College tutors play active roles in addressing students' requests	192	2.77	.992
43. University lecturers give prompt responses to students' requests	192	2.70	.955

Table 5.12 (cont'd)

44. Students receive prompt, individualized attention from college tutors	192	2.85	1.053
45. College course tutors give students' confidence and motivate students to achieve at a high level	192	2.81	1.174
46. There is open and honest communication among college staff, university staff and students	192	2.81	1.111
Learning Resources			
13. Sufficient qualified local teaching staff members are available	192	2.90	1.228
14. Course materials provided by college tutor are comprehensive	192	3.02	1.144
15. Course materials provided by linking university are comprehensive	192	2.66	1.115
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff	192	2.83	1.040
17. Sufficient college teaching staff with extensive industry experiences are available	192	2.71	1.091
18. Linking university staff visit the college often enough to advice on daily questions	192	2.89	1.037
19. Adequate electronic access to linking university's library	192	2.81	1.116
20. Course materials are posted effectively on linking university's webpage	192	2.70	1.162
25. Marked assignments are returned with proper feedback and comments	192	2.84	1.086
Tangibles			
11. Library facilities, teaching aids, computing & engineering lab provision are up-to-date	192	3.02	1.158
12. Sufficient computers and engineering equipment are available	192	3.22	1.183
Professional Exposure			
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university	192	2.86	.995
48. Students understand professional engineering practice through professional exposure activities organized by the school	192	2.80	.999
49. Adequate student exchange systems are in place to facilitate professional development	192	2.90	1.053
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession	192	2.67	1.093
Leadership			
28. College teaching staff provide input to the development of assignments and examination papers	192	2.78	.974
29. Input by linking university staff ensure consistency in assignments and examination papers	192	2.70	1.040
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate	192	2.71	.974
31. College leaders make clear to all the vision and goals for the degree program	192	2.62	.968
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision	192	2.60	.965
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries	192	2.53	.943
34. Strong collaboration link between linking university and college	192	2.50	.992
35. The excellence of engineering degree education is promoted to students and community	192	2.52	.981

Results in Table 5.12 also indicated that sufficient qualified local teaching staff were available to teach the courses (Item 13, mean = 2.90). Among the staff, many of them brought with them extensive industry experience (Item 17, mean = 2.71) which had added value to engineering education. The linking university provided support to the local staff by sending sufficient university teaching staff to provide academic guidance to teaching staff (Item 16, mean = 2.83) and provide advice on daily questions (Item 18, mean = 2.89) to students. The results again contradicted Lee's report (1997a) on shortage of teaching staff in the transnational programmes.

c. Students' perception of Tangibles, such as physical facilities

An advantage of this framework was that it enabled the college to identify weaknesses in the programmes. For example, the results in Table 5.12 showed that students commented on the need to improve further the provision of physical facilities at the college by highlighting that insufficient computers and engineering equipment were available for students' needs (Item 12, mean = 3.22) and improvements were needed in the library facilities, as well as multimedia teaching aids (Item 14, mean = 3.02). It was evident from the following illustrative comments that students were expecting to have better delivery of lectures through provisions of good physical facilities and learning resources:

"Better laboratory facilities for students and more laboratory-based course work."

"The facilities basically have to be the same as facilities at the linking university"

The findings were in line with the reports recorded in the literature which echoed that there were insufficient good computers to cater to a large number of students recruited (Lee, 1997a; Howe and Martin, 1998).

d. Students' perceptions of Teaching, Learning & Assessment Practices

Another concern for the transnational programmes was the quality of the staff. From the positive viewpoints of students gathered in their responses (Table 5.12), students indicated that academic staff possessed good theoretical and practical knowledge of their subjects (Item 23, mean = 2.72), and were able to implement the pedagogical practices franchised from the linking university (Item 21, mean = 2.86). Item 23 was the item with the lowest mean score.

Students also commented that the staff had put in effort to make lectures more interesting and stimulating (Item 22, mean = 2.99), and were able to facilitate discussion and group interaction in class (Item 26, mean = 2.88). Staff also provided helpful comments and feedback to students on their progress (Item 24, mean = 2.84). Students were hoping that the academic staff's delivery of material could be improved as item 22 was accorded the highest mean score among all.

e. Students' perceptions of Leadership

It was evident from the results in Table 5.12 that item 34 was the item with the lowest mean score in this dimension. The strong collaboration between the linking university and the college (Item 34, mean = 2.50) had enabled the transnational engineering degree programmes to be linked to the growth of both local and global engineering industries (Item 33, mean = 2.53). The leaders had been able to establish the goals and visions of the programmes (Item 31, mean = 2.62) and the excellence of the degree programmes was promoted to students and the community (Item 35, mean = 2.52).

The feature of the programmes was characterised by the active participation of staff from both the college and linking universities. College staff willingly provided input into the development of assignments and examination papers (Item 28, mean = 2.78), and university staff maintained and ensured consistency in the standard of the programmes (Item 29, mean = 2.70). Likewise, staff from both institutions also contributed and shared responsibility for marking and moderation of students' scripts.

This was evident by a mean score of 2.71 accorded by students to item 30. Among all the items, item 28 was the item with the highest mean score.

f. Students' perceptions of Administrative Support

Students generally perceived that services provided by the linking universities and the college had contributed to satisfactory learning experiences. Students commented that the flexibility of the degree structure with the timetabling of day and night classes had provided working adults with the opportunity to further their studies (Item 27, mean = 2.43). This item was graded with the lowest mean score. On the other hand, the highest mean score was accorded to item 39, even though students commented that they were satisfied with easy access to prompt and efficient administrative and technical services (Item 39, mean = 2.80).

Students were of the opinion that all the administrative and records management systems had maintained student records effectively (Item 37, mean = 2.67). The administrative arrangement set up by both the linking universities and college to secure and respond to students' feedback (Item 36, mean = 2.76) was appropriate. In terms of administrative services, students highly and positively evaluated item 40, "transcripts and degree certificates are issued promptly by linking university", to be a good service offered in the programmes (Item 40, mean = 2.53).

g. Students' perceptions of Staff and Student Relationships

The survey results indicated that students seemed to rate their relationship with staff at the linking universities better than their relationship with local staff. Students claimed that they received prompt responses to their requests from the staff at the linking universities (Item 43, mean = 2.70). Item 43 was the item with the lowest mean score in this dimension.

Students also stressed that linking university staff met with them to listen to their opinions and address their concerns (Item 41, mean = 2.77). When discussing their rapports with local staff, students highlighted that they received individualised attention from the college's academic staff (Item 44, mean = 2.85) even though this item was accorded with the highest mean in this dimension.

h. Students' Perceptions of Provision of Professional Exposure

Students agreed that exposure to engineering practice was integrated throughout the curriculum (Table 5.12). Some of the activities included were industry visits (Item 48, mean = 2.80), as well as formal and informal guest lectures to provide opportunities for professional exposure (Item 47, mean = 2.86). Visiting lecturers from the linking universities had also assisted to enhance students' understanding of professional practice by providing sound advice (Item 50, mean = 2.67). Students also indicated that student exchange systems were in place to facilitate professional development (Item 49, mean = 2.90). Item 50 had the lowest mean score, while item 49 had the highest mean score.

Based on the study on the perceptions of students, it was found that the mean scores of almost all perception items, with a few exceptions, were generally below 3. It would be appropriate at this stage to determine if the same group of students was also satisfied with the programmes. The following section presented the satisfaction results of students with the quality of the transnational engineering education.

5.4.1.3 Hypothesis 1: *There are no significant differences between the perceptions of Northern and Southern students relating to the quality of transnational engineering education programmes conducted at Trans College.*

This hypothesis could not be totally accepted as t-test results from Table B.11 showed that some of the calculated p-values were less than 0.05 at the 95% significant level. The differences in perceptions were highlighted below:

a. Difference in perceptions of students on learning outcomes

Northern University students rated themselves better than Southern University students in all the dimensions of the learning outcomes. The results in Table 5.13 showed that p-values for “Generic Competencies” and “Communication and Social Skills” dimensions were less than 0.05 at 95% significance level. This meant that there were significant differences in perceptions between Northern and Southern Universities’ students in these two dimensions. Northern University students accorded a dimension mean score of 2.79 to their development in “Generic Competencies” (Table 5.14) while Southern students accorded a dimension mean score of 2.99 to this dimension. Northern University students further claimed that they had better “Communication and Social skills” than Southern University students. This was reflected in the dimension mean score accorded to “Communication and Social Skills” dimension (mean = 2.55), compared to the same dimension mean score of Southern students (mean = 2.78).

Table 5.13
Independent Samples T-test for Comparison of Students’ Perceptions on *Outcomes* and *Contributory* Dimensions

		Levene's Test for Equality of Variances				
Dimension		**F**	**Sig.**	**t**	**df**	**Sig. (2-tailed)**
Generic Competencies	Equal variances assumed	7.391	.007	-2.721	190	.007
	Equal variances not assumed			-2.687	165.913	.008
Communication and Social Skills	Equal variances assumed	3.787	.053	-2.678	190	.008
	Equal variances not assumed			-2.669	184.708	.008
Tangibles	Equal variances assumed	.284	.595	-3.456	190	.001
	Equal variances not assumed			-3.447	186.334	.001

Table 5.14
Mean Scores of *Outcomes* Dimensions as Evaluated by the Students in the Programmes

DIMENSION	Students	N	Mean	Std. Deviation
Technical Competencies	Northern Students	92	2.93	.603
	Southern Students	100	3.03	.476
Generic Competencies	Northern Students	92	2.79	.574
	Southern Students	100	2.99	.421
Management and Organisation Skills	Northern Students	92	2.63	.594
	Southern Students	100	2.75	.604
Communication and Social Skills	Northern Students	92	2.55	.616
	Southern Students	100	2.78	.565
Teamwork	Northern Students	92	2.79	.708
	Southern Students	100	2.85	.761

Table 5.15
Mean Scores of *Outcomes* Items which have Significant Differences

Item	Differences in Mean Scores between Student Groups	Mean (Southern Students)	Mean (Northern Students)	Mean Difference
12	Demonstrate quality-assurance criteria in engineering practice	3.10	2.80	-.30
17	Work under minimal supervision	2.81	2.37	-.44
28	Acquire good report writing skill	2.94	2.60	-.34

When examining in detail the items in the learning outcome dimensions, it was found that Northern University students rated most of the items under "Generic Competencies" better than Southern University students (Table B.12). The results indicated that under the "Generic Competencies" dimension, the items which had significant differences between Northern and Southern Universities' students were items 12, 17, and 28 (Table 5.15). Northern University students claimed that they could demonstrate quality-assurance criteria more effectively in engineering practice (Item 12, mean = 2.80) than Southern University students (Item 12, mean = 3.10). Northern students regarded themselves as better students in terms of report writing skills (Item 28). They also perceived that they could work more independently than Southern University students (Item 17).

(b) Differences in Perceptions of Students in *Contributory* Dimensions and Items

When comparing students' perceptions of the *Contributory* dimensions, only one dimension out of the eight was found to have significant difference in mean score. Results in Table 5.13 clearly showed that the p value of the "Tangibles" dimension was less than 0.05 at 95% significance level. Table 5.16 showed that Northern students accorded a dimension mean of 2.85 to "Tangibles" dimension, while Southern students accorded a dimension mean of 3.37 to the "Tangibles" dimension.

The perception data in Table B.12 reflected that Northern University students consistently gave better ratings to almost all the items under the *Contributory* construct. Differences in perceptions of students in *Contributory* items were found in six out of forty-nine items in the *Contributory* dimensions and they were as shown in Table 5.17.

Table 5.16
Mean Scores of *Contributory* Dimensions as Evaluated by the Students in the Programmes

DIMENSION	Students	N	Mean	Std. Deviation
Course Curriculum	Northern Students	92	2.54	.703
	Southern Students	100	2.47	.659
Teaching, Learning, and Assessment Practices	Northern Students	92	2.75	.846
	Southern Students	100	2.96	.865
Administrative Support	Northern Students	92	2.71	.748
	Southern Students	100	2.62	.661
Staff and Student Relationships	Northern Students	92	2.76	.815
	Southern Students	100	2.81	.825
Learning Resources	Northern Students	92	2.85	.804
	Southern Students	100	2.79	.780
Tangibles	Northern Students	92	2.85	1.065
	Southern Students	100	3.37	1.007
Professional Exposure	Northern Students	92	2.82	.970
	Southern Students	100	2.80	.723
Leadership	Northern Students	92	2.72	.779
	Southern Students	100	2.53	.636

Table 5.17
Mean Scores of *Contributory* Items which have Significant Differences

Item	Differences in Contributory Mean Scores between Student Groups	Mean (Southern Students)	Mean (Northern Students)	Mean Difference
11.	Library facilities, teaching aids, computing and engineering laboratory provision are up-to-date	3.22	2.80	-.42
12.	Sufficient computers and engineering equipment are available	3.52	2.90	-.62
13.	Sufficient qualified local teaching staff members are available	3.10	2.67	-.43
20.	Course materials are posted effectively on linking university's webpage	2.44	2.99	.55
22.	College tutors make lecture very interesting and simulating	3.18	2.78	-.40
34.	Strong collaboration link between linking university and college	2.31	2.71	.40

From Table 5.17, Northern and Southern students generally exhibited significant differences in perceptions in items 11, 12, 13, 20, 22, and 34. Five items (Items 11, 12, 13, 20, 22) were related to physical facilities and learning resources, while item 34 was linked to the collaboration link between the two institutions. Northern students rated item 11 with a mean score of 2.80 and Southern students accorded a mean score of 3.22 to item 11. It was very clear that Southern students felt negatively about the provisions of library facilities, computer facilities, teaching and engineering facilities for conducting the program. They also perceived that more qualified local teaching staff members, who could conduct interesting and simulating lectures, should be recruited. Nevertheless, Southern students agreed that the linking university had posted the course materials on the Southern University's webpage effectively and the collaboration link between Trans College and Southern University was stronger in comparison to the collaboration link between Trans College and Northern University.

In general, Northern University students had more positive opinions of both the learning outcomes and their learning experiences. Since perception was related to student satisfaction, the following section focused on studying the relationship between perception and satisfaction of students.

5.4.1.4 *Hypothesis 2: There is a significant relationship between the perception of programme quality and the satisfaction levels of students undertaking transnational engineering education programmes at Trans College.*

The above hypothesis examined the relationship between perception and satisfaction data of the transnational engineering students. The relationship between perception and satisfaction of students were examined in order to investigate the potential of using SERVQUAL-TRANS to evaluate the satisfaction levels of students. Linear Regression analysis was conducted to identify whether there existed statistically, positive relationship between perception and satisfaction data.

a. <u>Relationship between *Outcomes* and satisfaction levels of students</u>

Table 5.18a and Table 5.18b summarised the analysed results for studying the relationship between satisfaction data and *Outcomes* data of both Northern and Southern students. The *Outcomes* data of Northern Students accounted for 19.3% (R Square) of the total explained variance of the dependant variable (Table 5.18a) with F-statistic value of 4.102 and significance level of less than 0.05 (Table 5.18b). However, the low R Square value of 19.3% meant that the *Outcomes* dimensions could only explain 19.3% of the satisfaction level of students with the programme. Moreover, a closer look at Table 5.19 revealed the estimated coefficients of all individual dimensions of *Outcomes* construct were also not significant at 95% significance level. This showed that there was no significant relationship between the *Outcomes* and satisfaction data of Northern students.

Table 5.18a
Linear Regression Summary for Outcomes Dimensions with Overall Satisfaction

Model	**R**	**R Square**	**Adjusted R Square**	**Change Statistics**				
				R Square Change	F Change	df1	df2	Sig. F Change
Northern Students	.439	.193	.146	.193	4.102	5	86	.002
Southern Students	.276	.076	.027	.076	1.555	5	94	.181

Predictors: (Constant), Team Work Mean Score, Generic Competencies Mean Score, Communication and Social Skills Mean, Technical Competencies Mean Score, Management and Organisation Skills Mean

Dependent Variable: Overall Northern Student Quality Satisfaction Mean

Table 5.18b
Linear Regression ANOVA for *Outcomes* Dimensions with Overall Satisfaction

Student		Sum of Squares	df	Mean Square	F	Sig.
Northern Students	Regression	17.196	5	3.439	4.102	.002
	Residual	72.108	86	.838		
	Total	89.304	91			
Southern Students	Regression	8.176	5	1.635	1.555	.181
	Residual	98.864	94	1.052		
	Total	107.040	99			

Predictors: (Constant), Team Work Mean Score, Generic Competencies Mean Score, Communication and Social Skills Mean, Technical Competencies Mean Score, Management and Organisation Skills Mean

Dependent Variable: Overall Northern Student Quality Satisfaction Mean; Overall Southern Students Quality Satisfaction Mean

Table 5.19
Linear Regression Analysis for Coefficients of *Outcomes* Dimensions
(for Northern Students only)

Student		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
Northern Students	(Constant)	.565	.556	1.016	.312
	Technical Competencies Mean Score	.263	.227	1.163	.248
	Generic Competencies Mean Score	.019	.256	.075	.940
	Management and Organization Skills Mean	.233	.269	.866	.389
	Communication and Social Skills Mean	.098	.225	.436	.664
	Team Work Mean Score	.235	.196	1.197	.235

Dependent Variable: Overall Northern Student Quality Satisfaction Mean

Table 5.18a and Table 5.18b also showed the relationship between *Outcomes* and satisfaction data of Southern students. The *Outcomes* data of Southern Students accounted for 7.6% (R Square) of the total explained variance of the dependant variable (Table 5.18a) with F-statistic value of 1.555 and significance level of more than 0.05 (Table 5.18b). This concluded that there was no significant relationship between the *Outcomes* and satisfaction data of Southern students.

From the above analysed results, it could be concluded that there was no significant relationship between the *Outcomes* and satisfaction data of students and the *Outcomes* construct of the SERVQUAL-TRANS could not be used for assessing the satisfaction level of students.

b. Relationship between *Contributory* and satisfaction data of students

Table 5.20a and Table 5.20b summarised the results for studying the relationship between satisfaction and the *Contributory* data of both Northern and Southern students. The *Contributory* data of Northern Students accounted for 46.9% (R Square) of the total explained variance of the dependant variable (Table 5.19a) with F-statistic value of 9.147 and significance level of less than 0.05 (Table 5.20b). This showed goodness of fit and that there was a significant positive relationship between the *Contributory* and satisfaction data of Northern students. The study also discerned that three *Contributory* dimensions (namely “Course Curriculum”, “Leadership”, and “Tangibles”) showed statistically significant, positive relationship with the satisfaction of students with the programme. This was evident from the p values of the “Course Curriculum”, “Leadership”, and “Tangibles” dimensions which were less than 0.1 at 90% significance level (table 5.20c). The other five *Contributory* dimensions did not yield statistically significant relationships with the satisfaction levels of students.

Table 5.20a and 5.20b also showed a positive relationship between the *Contributory* and satisfaction data of Southern students. The *Contributory* data of Southern Students accounted for 20.4% of the total explained variance of the dependant variable (Table 5.20a) with F-statistic value of 2.916 and significance level less that

0.05 (Table 5.20b) at 95% significance level. This showed goodness of fit and that there was a significant positive relationship between the *Contributory* and satisfaction data of Southern students.

Similarly, the study also disclosed that two *Contributory* dimensions, namely "Course Curriculum" and "Tangibles", showed statistically significant, positive relationships with the satisfaction of students with the course. From Table 5.20c, the p values of "Course Curriculum" and "Tangibles" dimensions were less than 0.05 at the 95% significance level. The other six *Contributory* dimensions did not yield statistically significant relationships with the satisfaction levels of students.

Table 5.20a
Linear Regression Summary for *Contributory* Dimensions with Overall Satisfaction

Model	R	R Square	Adjusted R Square	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
Northern Students	.685	.469	.417	.469	9.147	8	83	.000
Southern Students	.452	.204	.134	.204	2.916	8	91	.006

Notes: Predictors: (Constant), Professional Exposure Mean Score, Course Curriculum Mean Score, Tangibles Mean Score, Staff and Students' Relationship Mean Score, Learning Resources Mean Score, Leadership Mean Score, Services Support Mean Score, Teaching, Learning and Assessment Practices Mean Score

Dependent Variable: Overall Northern Student Quality Satisfaction Mean; Overall Southern Student Quality Satisfaction Mean

Table 5.20b
Linear Regression ANOVA for *Contributory* Dimensions with Overall Satisfaction

Student		Sum of Squares	df	Mean Square	F	Sig.
Northern Students	Regression	41.843	8	5.230	9.147	.000
	Residual	47.461	83	.572		
	Total	89.304	91			
Southern Students	Regression	21.841	8	2.730	2.916	.006
	Residual	85.199	91	.936		
	Total	107.040	99			

Notes: Predictors: (Constant), Professional Exposure Mean Score , Course Curriculum Mean Score, Tangibles Mean Score, Staff and Students' Relationship Mean Score, Learning Resources Mean Score, Leadership Mean Score, Services Support Mean Score, Teaching, Learning and Assessment Practices Mean Score. Dependent Variable: Overall Northern Student Quality Satisfaction Mean; Overall Southern Student Quality Satisfaction Mean

Table 5.20c
Linear Regression Analysis for Coefficients of *Contributory* Dimensions (for both Southern and Northern Students)

Student		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
Northern Students	(Constant)	.442	.356	1.243	.217
	Course Curriculum Mean Score	.420	.160	2.633	.010
	Leadership Mean Score	.369	.183	2.020	.047
	Teaching, Learning and Assessment Practices Mean Score	.139	.170	.819	.415
	Services Support Mean Score	.083	.181	.460	.647
	Staff and Students' Relationship Mean Score	-.075	.166	-.454	.651
	Learning Resources Mean Score	-.241	.158	-1.526	.131
	Tangibles Mean Score	.187	.110	1.700	.093
	Professional Exposure Mean Score	.053	.130	.410	.683
Southern Students	(Constant)	1.628	.519	3.136	.002
	Course Curriculum Mean Score	.572	.205	2.797	.006
	Leadership Mean Score	-.054	.266	-.205	.838
	Teaching, Learning and Assessment Practices Mean Score	-.132	.178	-.743	.459
	Services Support Mean Score	.105	.212	.496	.621
	Staff and Students' Relationship Mean Score	-.204	.173	-1.181	.241
	Learning Resources Mean Score	.192	.190	1.006	.317
	Tangibles Mean Score	-.291	.110	-2.649	.010
	Professional Exposure Mean Score	.212	.191	1.114	.268

Dependent Variable: Student Quality Satisfaction Mean

From the linear regression analyses, it could be concluded that the more positively students regarded the *Contributory* aspect of the programmes, the greater the satisfaction of students with the programmes. This meant that students' satisfaction with the programme could be evaluated by using only the *Contributory* construct of the SERVQUAL-TRANS framework. The *Contributory* construct, but not the *Outcomes* construct, of the SERVQUAL-TRANS framework was thus able to measure students' satisfaction with the transnational engineering education.

After studying the relationship between perceptions and satisfactions of students, it was necessary to examine the perceptions of staff who were involved in the transnational engineering in order to study the quality of the transnational engineering education from staff perspective. The following section presented the perceptions of staff on the transnational engineering education.

5.4.2 Research Question 3: What are the perceptions of staff regarding the quality of the transnational engineering programmes conducted at Trans College?

The perceptions of staff regarding the quality of the transnational engineering preparation programmes in which they taught are contained in Tables 5.22 *(Outcomes* items) and 5.24 (*Contributory* items).

5.4.2.1 Perceptions of staff regarding the learning outcomes of the programmes

The results in Table 5.21 showed that academic staff regarded the "Teamwork" dimension to be the best attribute among the five dimensions that had been developed in students (mean = 2.33). They also indicated that students had built up good "Management and Organisation skills" (mean = 2.44). When comparing the "Technical Competencies" dimension with the "Generic Competencies" dimension, academic staff indicated in Table 5.21 that students had developed better "Technical Competencies" (mean = 2.82) than "Generic Competencies" (mean = 2.92) which was the dimension with the highest mean score. They believed that the "Communication and Social skills" of students had developed to a higher level after a period of study in the programmes (mean = 2.73).

Table 5.21
Mean Scores of the *Outcomes* Dimensions as Evaluated by the Staff

***Outcomes* Dimension**	**N**	**Mean**	**Std. Deviation**
Technical Competencies	61	2.82	.55869
Generic Competencies	61	2.92	.58103
Management and Organisation Skills	61	2.44	.61980
Communication and Social Skills	61	2.73	.76631
Teamwork	61	2.33	.65119

Staff rated the development of skills of students better than students rated themselves in every item of the "Technical Competencies". Mean scores of the responses from staff (Table 5.22) ranged from 2.61 (Item 4) to 2.97 (Item 5) with every item being rated better than those given by students. Staff, as a whole, agreed that students needed more improvement in the development and assessment of system designs based on technical and non-technical criteria (Item 5).

When each item of the "Generic Competencies" dimension was studied in detail, the study revealed that even though item 8 had the lowest mean score and staff agreed that students had the ability to integrate and apply engineering knowledge for problem solving (Item 8, mean = 2.52), they had identified three areas which needed immediate attention (Table 5.22). Staff agreed that students must acquire skills to permit continuous learning in order to keep up with changing technology (Item 13, mean = 3.02). According to staff, students must acquire a broader range of knowledge and skills or else they might have difficulty in demonstrating quality-assurance criteria in engineering practice (Item 12, mean = 3.00). Item 15 was the item with the highest mean score in this dimension (mean = 3.33), which indicated that staff thought that students had low awareness of the impact of global changes in engineering.

Academic staff rated positively students' "Management and Organisation Skills". They rated almost every item more highly than the students except for Item 17 (Table 5.22, Item 17, mean = 2.75) "Working under minimal supervision", which was the item with the highest mean score. Staff were hoping that students could be more independent learners and problem solvers in a wider range of circumstances. The results showed that all the items were allocated mean scores below 3, indicating staff were happy with the development of "Management and Organisation Skills" in students and that students were able to communicate fluently and effectively in English (Item 27, mean = 2.77).

Staff believed that students had acquired reasonable oral communication (Item 26, mean = 2.75) and report writing skills during their course of studies in the programmes (Item 28, mean = 2.85). Item19 was the item with the lowest mean score, while item 28 was the item with the highest mean score. All the items had mean scores below 3 indicating that staff were happy with the development of communication and social skills of students. The results in Table 5.22 showed that staff praised highly on the development of teamwork spirit in students (Item 20, mean = 2.07). They also stressed that students were able to contribute ideas and suggestions during team discussions (Item 21, mean = 2.59).

5.4.2.2 Perceptions of staff regarding *Contributory* factors that lead to superior learning experience

The perceptions of academic staff regarding the *Contributory* dimensions that offered superior student learning experience were summarised in Table 5.23. Staff allocated positive scores to most of the contributory dimensions. The best dimension mean score was given to the "Teaching, Learning, and Assessment Practices" dimension (mean = 1.90) and the worst dimension mean score to "Professional Exposure" provided to students (mean = 2.89). They agreed strongly that facilities were excellent, as the mean of the "Tangibles" dimension was 1.92. This answer was in direct contrast to the response by students.

Table 5.22
Staff's Perceptions of Learning Outcomes of the Programmes

ITEMS OF THE *OUTCOMES* DIMENSIONS	N	Mean	Std. Deviation
Technical Competencies			
1. Application of maths and science	61	2.92	.737
2. Use software simulation tools	61	2.82	.646
3. Use test and measurement equipment	61	2.80	.771
4. Use given specification for design	61	2.61	.665
5. Design alternative systems	61	2.97	.730
Generic Competencies			
7. Learned professional engineering ethics	61	2.98	.785
8. Integrate and apply technical advice provided	61	2.52	.788
9. Understand impact of engineering on business	61	2.92	.918
10. Can undertake problem identification & solution	61	2.74	.854
11. Understand the needs of engineering industry	61	2.85	.703
12. Demonstrate quality-assurance criteria in engineering practice	61	3.00	.775
13. Demonstrate continuous learning to overcome obsolescence in technology	61	3.02	.826
14. Develop lifelong learning skill	61	2.93	.873
15. Aware of the impact of global changes in engineering	61	3.33	.978
Management & Organisation Skills			
16. Plan and organise tasks efficiently	61	2.46	.848
17. Work under minimal supervision	61	2.75	.809
22. Brainstorm ideas in groups	61	2.33	.769
23. Can work within university deadlines	61	2.33	1.060
24. Develop study skill in preparing for exam	61	2.34	.704
Communication & Social Skills			
19. Initiative in exploring opportunity	61	2.56	.940
26. Good communication skills	61	2.75	.994
27. Able to speak and write good English	61	2.77	.920
28. Acquire good report writing skill	61	2.85	.910
Teamwork			
20. Work in team through college's extra curricular activities	61	2.07	.772
21. Contribute multidisciplinary viewpoints in solving points	61	2.59	1.006

Table 5.23
Mean Scores of *Contributory* Dimensions as Evaluated by the Staff

***Contributory* Dimension**	**N**	**Mean**	**Std. Deviation**
Course Curriculum	61	2.09	.68
Teaching, Learning, and, Assessment Practices	61	1.90	.44
Administrative Support	61	2.07	.59
Staff and Students Relationship	61	2.13	.52
Learning Resources	61	2.13	.62
Tangibles	61	1.92	.81
Professional Exposure	61	2.89	.75
Leadership	61	2.09	.61

a. Staff perceptions of Course Curriculum

The results in Table 5.24 indicated that academic staff in general accorded better scores to all items under "Course Curriculum" in comparison with the scores accorded by students. Items 3, 4, and 5 were rated to be below 2 which indicated that courses offered in the engineering degree programmes were of the same quality as of the courses offered at the linking university (Item 3, mean = 1.74). Item 3 was the item with the lowest mean score and item 9 was the item with the highest mean score. Staff indicated that the course content was closely related to the requirements of technical jobs in the local market (Item 5, mean = 1.92). This again had contradicted the findings by Ekhaguere (2000) and Howe and Martin (1998), for the former had recorded that the standard of transnational education was of inferior value, while the latter claimed that linking university was unable to contextualise the course content based on local needs.

b. Staff perceptions of Tangibles such as physical facilities

Academic staff were impressed with the provision of physical facilities in the programmes (Table 5.24). Sufficient up-to-date computers and engineering equipment were available to cater to students' needs (Item 12, mean = 1.85). All the library facilities and multimedia teaching aids were at the cutting edge (Item 11, mean = 1.98).

c. Staff perceptions of Learning Resources

Staff perceived that there were sufficient qualified local teaching staff available at the college to provide academic guidance to students (Item 13, mean = 1.77). Some of the academic staff teaching in the programmes possessed extensive industry experiences (Item 17, mean = 1.77) as they were employed in senior positions in local industry. Local teaching staff always worked in consultation with staff from the linking university and the linking university staff were always available to provide academic guidance to local teaching staff (Item 16, mean = 2.51).

The linking university had established a good website which held comprehensive course materials (Item 20, mean 2.39). Students could gain access easily to the university's library (Item 19, mean = 2.16). However, staff were expecting more linking university staff to be available at the college to provide academic guidance and advice to both staff and students.

d. Staff perceptions of Teaching, Learning & Assessment Practices

Staff regarded their academic delivery highly. They accorded mean scores of below 2 to items 22, 23, 24, and 26 in Table 5.24 with item 22 having the lowest mean score of 1.52. It was very clear that staff tended to believe that they were well equipped in their areas (Item 23, mean = 1.67) and their good delivery skills were able to arouse and sustain the interest of students (Item 22, mean = 1.52). They believed that they could encourage students to participate in group discussion (Item 26, mean = 1.77). They also believed that they excelled at promoting student development through providing students with adequate feedback on their works (Item 24, mean = 1.62).

e. Staff perceptions of Leadership

Staff, in general, gave a high regard for items in the "Leadership" dimension. The mean scores accorded by staff to every item under this dimension ranged from 1.87 for item 30 to 2.34 for item 28 (Table 5.24). Staff generally agreed that both the college and the linking university played active roles in contributing to the successful conduct of the programmes by maintaining strong collaboration between both institutions (Item 34, mean = 2.23), ensuring that the engineering education was clearly linked to the growth of both local and global engineering industries (Item 33, mean = 1.89) and promoting the excellence of transnational engineering education to both students and the community (Item 35, mean = 2.15).

f. Staff perceptions of Administrative Support

The ratings accorded by staff to items under "Administrative Support" ranged from 1.36 for item 27 to 2.52 for item 40 (Table 5.24). Academic staff were particularly impressed with the day and night lectures and practical classes which were scheduled for the convenience of both full-time and part-time students (Item 27, mean = 1.36). All the items in this dimension were accorded with mean scores below 3, indicating that staff were happy with the "Administrative Support" offered in the programmes.

g. Staff perceptions of Staff and Student Relationships

Results in Table 5.24 showed that staff had provided prompt and individualised attention to students (Item 44, mean = 1.72). They always motivated students until students gained sufficient confidence and finally achieved more successes in their studies (Item 45, mean = 1.70). Item 45 was the item with the lowest mean score in this dimension.

Staff also indicated that linking university staff played an active role by meeting with students privately to gather their views and address their concerns promptly (Item 41, mean = 2.41) and all the academic staff always worked with one another to address students' requests (Item 42, mean = 2.52). Students were encouraged to communicate freely and openly with the college and university staff (Item 46, mean = 1.92).

h. Staff perceptions of Professional Exposure

Staff rated the "Professional Exposure" dimension with a mean score of 2.89 (Table 5.24). They responded favourably to all items under the "Professional Exposure" dimension, except for item 49, which received the highest mean score of 3.18. Academic staff commented that staff exchange systems were not officially put in place to facilitate professional development (Item 49, mean = 3.18). Students, however, were provided with opportunities to understand professional engineering practice through professional exposure activities organised by the school (Item 48, mean = 2.98). They agreed that linking university staff also conducted formal and informal guest lectures to students to help them to have better understanding of professional engineering practice (Item 47, mean = 2.72), and provided invaluable advice to the college's teaching staff (Item 50, mean = 2.69). Item 50 was the item with the lowest mean score in this dimension.

The above analysed results indicate that the perception scores of staff on the quality of the transnational engineering education were below 3.00 except the mean score of item 49. This meant that in general staff were satisfied with the quality of the transnational engineering education.

Table 5.24
Staff's Perception of Contributory Factors that Lead to Superior Learning Experiences

Contributory Items	N	Mean	Std. Deviation
Course Curriculum			
1. Curriculum is updated systematically	61	2.11	.896
2. Curriculum mirrors linking university's curriculum	61	2.02	.826
3. Course offered is of the same quality	61	1.74	.947
4. Degree program is delivered and assessed in English	61	1.92	.988
5. Course content is related to technical needs of the job market	61	1.92	.971
6. Coursework problems are real-life work related problems	61	2.38	1.157
7. Linking university assess students at the same standard	61	2.11	1.066
8. Students have to follow the same final year project's format	61	2.18	.904
9. College lecturers provide input to the development of course curriculum	61	2.43	1.284
Teaching, Learning, and Assessment Practices			
21. College teaching staff implement good pedagogical practices effectively	61	2.56	.940
22. College tutors make lecture very interesting and simulating	61	1.52	.504
23. College lecturers have strong theoretical and practical knowledge	61	1.67	.598
24. College teaching staff give helpful feedback to students' works	61	1.62	.522
26. College lecturers are able to facilitate discussion in class	61	1.77	.761
Administrative Support			
27. Day and night lectures and practical classes are available	61	1.36	.484
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately	61	2.15	.891
37. Administrative and records management system maintain student records effectively	61	2.08	.690
38. Adequate student services are provided by the college	61	2.21	.933
39. Administrative and technical services are provided promptly and efficiently	61	2.10	.907
40. Transcripts and degree certificates are issued promptly by linking university.	61	2.52	.906
Staff's and Students' Relationship			
41. Linking university staff meet with students privately to gather their views and address their concerns	61	2.41	1.131
42. College tutors play active roles in addressing students' requests	61	2.52	.924
43. University lecturers give prompt responses to students' requests	61	2.51	.977
44. Students receive prompt, individualized attention from college tutors	61	1.72	.521
45. College course tutors give students' confidence and motivate students to achieve at a high level	61	1.70	.527
46. There is open and honest communication among college staff, university staff and students	61	1.92	.614
Learning Resources			
13. Sufficient qualified local teaching staff members are available	61	1.77	.716
14. Course materials provided by college tutor are comprehensive	61	1.66	.574
15. Course materials provided by linking university are comprehensive	61	2.13	1.008
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff	61	2.51	1.059

Table 5.24 (Cont' d)

17. Sufficient college teaching staff with extensive industry experiences are available	61	1.77	.804
18. Linking university staff provide students with advice on daily questions	61	2.69	1.088
19. Adequate electronic access to linking university's library	61	2.16	1.098
20. Course materials are posted effectively on linking university's webpage	61	2.39	1.201
25. Marked assignments are returned with proper feedback and comments	61	2.11	.933
Tangibles			
11. Library facilities, teaching aids, computing and engineering lab provision are up-to-date	61	1.98	.885
12. Sufficient computers and engineering equipment are available	61	1.85	.813
Professional Exposure			
47. Students understand professional engineering practice through formal and informal guest lectures are conducted by the linking university	61	2.72	.897
48. Students understand professional engineering practice through professional exposure activities organized by the school	61	2.98	1.041
49. Adequate staff exchange systems are in place to facilitate professional development	61	3.18	.958
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession	61	2.69	.941
Leadership			
28. College teaching staff provide input to the development of assignments and examination papers	61	2.34	1.047
29. Input by linking university staff ensure consistency in assignments and examination papers	61	2.23	1.086
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate	61	1.87	.645
31. College leaders make clear to all the vision and goals for the degree program	61	1.98	.846
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision	61	2.05	.845
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries	61	1.89	.915
34. Strong collaboration link between linking university and college	61	2.23	.783
35. The excellence of engineering degree education is promoted to students and community	61	2.15	.833

5.4.3 Research Question 4: *What are the perceptions of employers regarding the quality of the transnational engineering programmes conducted at Trans College?*

The perceptions of employers regarding the quality of the transnational engineering preparation programmes at Trans College were contained in Tables 5.25 and 5.26 (*Outcomes dimensions and items*) and 5.27 (*Contributory* items). Detailed analyses of these tables were followed by consideration of the respective responses of students, staff, and employers regarding the overall programme quality.

Only employers of Northern University's graduates were surveyed as Southern University's students had not yet graduated.

5.4.3.1 Perceptions of employers regarding the learning outcomes of the programmes

The results in Table 5.25 indicated that the dimension mean scores accorded by employers for the learning outcome dimensions were below 3, suggesting that employers were happy with the learning outcomes of the Northern University's transnational engineering programme. Employers also rated "Teamwork", "Management and Organisation Skills" and "Communication and Social Skills" in the same order as academic staff. The dimension mean scores for these three dimensions were 2.40, 2.49, and 2.63 respectively. Like students, Table 5.25 clearly showed that employers rated development of "Generic Competencies" (mean = 2.67) better than the development of "Technical Competencies" (mean = 2.71) in transnational engineering graduates.

Table 5.25
Mean Scores of *Outcomes* Dimensions as Evaluated by the Employers

***Outcomes* Dimension**	**N**	**Mean**	**Std. Deviation**
1. Technical Competencies	20	2.71	.74119
2. Generic Competencies	20	2.67	.63573
3. Management and Organisation Skills	20	2.49	.49620
4. Communication and Social Skills	20	2.63	.57640
5. Teamwork	20	2.40	.59824

The weakness in "designing alternative systems" as disclosed by both students and staff was validated by the employers' survey. Employers indicated that graduates' innovative capabilities for coping with rapidly changing technology seemed to be lacking (Table 5.26, Item 5, mean = 3.20). The findings from the students', staff's, and employers' surveys suggested that authentic teaching and learning experience must be included actively in the curriculum. Students must not only be exposed to applications of engineering concepts through practical laboratory work, but must also develop the ability to design a new, generic system based on their own integration of multidisciplinary knowledge in mathematics, science and technology.

The results also revealed that graduates must develop a greater awareness of the "impact of engineering on business and economics in both local and global environments" (Item 9, mean = 3.05), and the "impact of global changes in engineering" (Item 15, mean = 3.05). This might be achievable in a longer term since the results in Table 5.26 showed that graduates had somewhat "developed the life-long learning skills" (Item 14, mean = 2.65) and "demonstrated continuous learning to overcome obsolescence in technology" (Item 13, mean = 2.45). Having acquired life-long learning and continuous learning skills, they would be able to expand their knowledge horizon to familiarise themselves with the environmental changes, codes of practice, politics, social and commercial context of the engineer's work, and its impact on both local and global business environments.

Employers declared that graduates were able to work independently (Item 17, mean = 2.10). Graduates possessed the abilities to plan and organise their tasks efficiently (Item 16, mean = 2.45). They also had the ability to accomplish their tasks within deadlines (Item 23, mean = 2.70). When evaluating graduates' "Teamwork" attribute, employers responded very positively to item 20 under this dimension (Table 5.26). They accorded a mean score of 2.00 to item 20 which depicted clearly that graduates were able to work harmoniously in teams, either as team leader or a team member in the project teams or cross-functional work groups (Item 20, mean = 2.00). However, they were expecting graduates to be more active in contributing multidisciplinary viewpoints towards problem solving (Item 21, mean = 2.80).

As a whole, employers were optimistic about the transnational engineering education and the increased roles played by the transnational providers. However, they still emphasised the need for further improvement in terms of the learning outcomes of the transnational engineering education.

Table 5.26
Employers' Perceptions of Learning Outcomes of the Programme

Outcomes Items	Participant	N	Mean Perception
Technical Competencies			
1. Application of maths and science	Employers	20	2.40
2. Use software simulation tools	Employers	20	2.55
3. Use test and measurement equipment	Employers	20	2.55
4. Use given specification for design	Employers	20	2.85
5. Design alternative systems	Employers	20	3.20
Generic Competencies			
7. Learned professional engineering ethics	Employers	20	2.30
8. Integrate & apply technical advice provided	Employers	20	2.60
9. Understand impact of engineering on business	Employers	20	3.05
10. Can undertake problem identification & solution	Employers	20	2.35
11. Understand the needs of engineering industry	Employers	20	2.90
12. Demonstrate quality-assurance criteria in engineering practice	Employers	20	2.65
13. Demonstrate continuous learning to overcome obsolescence in technology	Employers	20	2.45
14. Develop lifelong learning skill	Employers	20	2.65
15. Aware of the impact of global changes in engineering	Employers	20	3.05
Management & Organisation Skills			
16. Plan & organize tasks efficiently	Employers	20	2.45
17. Work under minimal supervision	Employers	20	2.10
22. Brainstorm ideas in groups	Employers	20	2.50
23. Can work within deadlines	Employers	20	2.70
24. Develop study skill in preparing for exam	Employers	20	2.70
Communication & Social Skills			
19. Initiative in exploring opportunity	Employers	20	2.55
26. Good communication skills	Employers	20	2.75
27. Able to speak and write good English	Employers	20	2.60
28. Acquire good report writing skill	Employers	20	2.60
Teamwork			
20. Able to work in team	Employers	20	2.00
21. Contribute multidisciplinary viewpoints in solving problems	Employers	20	2.80

5.4.3.2 Perceptions of employers regarding the contributory factors that lead to superior learning experience

When considering the relevance of the course curriculum to the job requirements, employers granted a mean score of 2.84 to item 1 in Table 5.27 to indicate the closeness of the degree curriculum to job requirements. They agreed that students had exposure to real-life work related problem (Item 4, mean = 2.63). However, they accorded a mean score of 2.95 to item 5 which indicated that graduates were only moderately familiar with the latest engineering equipment and software. This meant that employers might have some doubts regarding the familiarity of the latest engineering equipment and software by the graduates.

From the results in Table 5.37, it was very obvious that employers' perceptions of course delivery in the transnational engineering education were very similar to those of students. Employers attributed the average achievement of graduates in the workplace to the quality of instruction by the academic staff in the programmes (Item 7, mean = 2.84). As indicated by employers**,** graduates had acquired the skill of facilitating group discussion from the lecturers after attending the programmes (Item 10, mean =2.37). The helpful lecturers (Item 17, mean= 2.58) had also trained up graduates who were able to provide comments and constructive feedback for work improvement (Item 8, mean = 2.68). Generally, graduates from the Northern University's transnational engineering program were able to fit in at their workplaces and performed reasonably well.

The results in Table 5.27 showed that employers, to a certain extent, understood the vision and goals of the programmes (Item 11, mean = 2.74). However, most of the employers still felt that the transnational engineering program must be promoted actively in order to raise its profile within the community (Item 12, mean = 3.05). They indicated that the excellence of transnational engineering programmes had to be promoted to all engineering firms.

Employers welcomed the idea of conducting day and night classes for both full-time and part-time students (Item 9, mean = 1.95). They agreed that their employees were able to enroll in this programme as night lectures and practical classes were conducted for working adults (Item 9, mean = 1.95). When asked about administrative and technical services provided in the Northern programmes, employers claimed that they had no difficulty in obtaining reliable and detailed information of the Northern graduates from the college (Item 13, mean = 2.58). They indicated that Northern graduates were able to present their certificates and transcripts during the job interviews even though they had recently graduated from the programmes. This could be linked to the prompt issuance of transcripts and certificates by the linking universities (Item 16, mean = 2.53). Employers concluded that more adequate services had to be provided in the programmes in terms of hostel accommodation, laboratory support course, and career services (Item 14, mean = 2.74).

Employers praised highly the free flow of communication in the programmes (Item18, mean = 2.47). They stressed that their employees did not hesitate to seek help from the academic staff even during their working career (Item 17, mean = 2.58). This showed clearly that their employees had built up a very close relationship with their former lecturers and tutors while they were studying in the programmes.

Employers, who always participated actively in conducting formal and informal guest lectures at the college, viewed professional exposure to have been of substantial value in boosting students' understanding of professional and ethical responsibilities (Item 19, mean = 2.58). Employers indicated that both the linking university and the college had provided students with the opportunity to undergo industrial training in the manufacturing firms, while the industrial placement opportunity arranged by the school for students was also a good practice that would enhance students' professional exposure (Item 20, mean = 1.84).

Employers' ratings of the attributes of Northern graduates were higher than those given by staff and the students themselves. To examine the differences in perceptions, one-way ANOVA was performed on students', staff's, and employers' data.

Table 5.27
Employers' Perceptions of *Contributory* Factors that Lead to Superior Learning Experience

***Contributory* Items**	**Mean**	**Std. Deviation**
1. Degree curriculum closely related to job requirements	2.84	.958
2. Standard of the graduates is the same as those graduated from other universities of similar ranking	2.95	.911
3. English linguistic skills	2.74	.872
4. Exposure to real-life work related problem	2.63	.955
5. Familiarity with latest engineering equipment and software due to good provision of learning resources	2.95	1.129
6. Due to quality and experienced lecturers, graduates can fix into workplace and perform well	2.74	.933
7. Due to excellent quality of instruction, graduates have the ability to perform	2.84	.898
8. Helpful feedback provided by lecturers have trained students to be able to provide comments	2.68	.885
9. Day and night classes are conducted.	1.95	.848
10. Employees learnt the skills of facilitating group discussion.	2.37	.831
11. Employers know the vision and goals of the transnational degree program	2.74	.872
12. The excellence of the program is promoted to all	3.05	.848
13. Linking university and college are able to provide reliable details about graduates	2.58	.607
14. Adequate student services are provided	2.74	.653
15. Provision of prompt and efficient administrative and technical services by the college	2.53	.697
16. No difficulty in presenting their certificates and transcripts during job interviews	2.53	.697
17. Employees always seek help from university lecturers and college tutors even after graduation	2.58	.769
18. Staff and students communicate openly and honestly	2.47	1.020
19. Opportunity to attend both formal and informal guest lectures	2.58	.838
20. Opportunity to undergo industrial training in manufacturing firms	1.84	.688

5.4.3.3 <u>Hypothesis 3</u>: *There are no significant differences between the perceptions of Northern students, Northern staff, and employers regarding the quality of transnational engineering education programmes conducted at Trans College.*

The results of one-way ANOVA in Table B.13 indicated that there were significant differences in perceptions of students, staff, and employers. Nine out of 25 learning outcome items shown in Table B.13 had significant differences in perceptions. From Table 5.28, the items which had significant difference were items 1, 2, 7, 13, 14, 15, 17, 20, and 26. Hence, the above hypothesis, Hypothesis 3, was rejected.

Glancing through the results shown in Table 5.28, employers' views were in contrast with students' perceptions of their abilities in the application of mathematics and science. Employers indicated that graduates had the knowledge of mathematics and science and they were able to use mathematics and science in analysis and synthesis (Item 1, mean = 2.40). Students apparently were lacking in confidence in their abilities and accorded a mean score of 2.93 to this item.

When asked about graduates' ability in using computer simulation software for analysis and synthesis, employers also responded positively to this question. They revealed that Northern graduates were able to use computer simulation tools effectively for the solving of engineering problems (Item 2, mean = 2.55). Again, students' perception was worse than the employers' view as they felt that they were not competent in software simulation (mean = 3.08). This could be because graduates had been exposed to a wide range of software simulation packages during their undergraduate studies and were able to identify their weakness in using certain software simulation tools or students could become more cautious when evaluating themselves.

Employers were of the opinion that Northern University's transnational graduates possessed the ability to apply engineering ethics to work (Item 7, mean = 2.30). However, their point of view was very different from staff's perception of students' understanding of professional and ethical responsibilities as staff accorded a mean

Table 5.28
Significant Differences in Perceptions among Employers, Staff, and Students

LEARNING OUTCOMES ITEMS	Mean (Students)	Mean (Staff)	Mean (Employers)
Technical Competencies			
1. Application of maths and science	2.83*	2.93	2.40*
2. Use software simulation tools	3.08*	2.87	2.55*
Generic Competencies			
7. Display of professional engineering ethics	2.72*	3.30*	2.30*
13. Demonstrate continuous learning to overcome obsolescence in technology	2.85	3.13*	2.45*
14. Develop lifelong learning skill	2.76*	3.20*	2.65*
15. Aware of the impact of global changes in engineering	2.80*	3.40*	3.05
Management and Organization Skills			
17. Work under minimal supervision	2.37*	2.90*	2.10*
Communication & Social Skills			
26. Good communication skills	2.51*	2.93*	2.75*
Teamwork			
20. Work in team	2.83*	2.30*	2.00*

*Data which has significant difference.

score of above 3 to this item (Item 7, mean = 3.30). This could be due to the fact that the majority of Northern students were part-time students whose first priority was work commitments and showed less commitment to their study responsibilities during the course of their undergraduate studies.

Employers also responded positively towards graduates' abilities to continue learning new technology to overcome rapid changes in technology (Table 5.38, Item 13, mean = 2.45). This was in contrast to staff's perception that Northern students did not possess the capacity for lifelong learning (Item14, mean = 3.20), and expressed that students faced difficulty in overcoming obsolescence in technology (Item 13, mean = 3.13), and might not be able to embrace new technologies relevant to the development of engineering.

Graduates showed a lot of dedication toward their work. Their commitment toward work was clearly reflected in employers' perceptions of items 17 and 20 in Table 5.28. Insofar as work was concerned, graduates earned the trust and confidence of employers as they could work under minimal supervision (Table 5.28, Item 17, mean = 2.10) and in team (Item 20, mean = 2.00). On the other hand, they showed lesser commitment toward their studies. Academic staff indicated critically that Northern students had not developed successful independent learning skills and were not able to work efficiently under minimal supervision (Item 17, mean = 2.90).

Another area about which staff and employers were equally concerned was students and graduates' communication skill. Generally, students perceived their communication skill had improved to a certain extent after attending the transnational engineering degree programme (Item 26, mean = 2.51). Nevertheless, both staff and employers had higher expectations of students' and graduates' abilities in communicating effectively with an engineering team and others. Staff accorded a mean score of 2.93 to students' communication skill while employers rated graduates with a mean score of 2.75. They were expecting students and graduates to use English more effectively as a means for oral and written presentations.

5.5 The Revised Conceptual Framework

Research Question 5, the final research question for this study, focused on using the outcomes of the data analysis to assess the integrity of the preliminary conceptual framework for the delivery of transnational engineering education programmes. Research Question 5 was stated as follows:

What revised conceptual framework for the delivery of highly successful transnational engineering programmes emerges from the study?

Three sets of research data are considered in addressing this question. These are:

- The results of the reliability and validity analyses that were discussed in Research Question 1 (5.5.1);
- The qualitative data that were obtained from the surveys of student, staff, and employers (5.5.2);
- The results of the analyses of Research Questions 2, 3, and 4 (5.5.3).

5.5.1 Findings of the Reliability and Validity Studies

The revised SERVQUAL-TRANS framework that emerged from the analyses conducted in relation to Research Question 1 led to the addition of some dimensions to the *Outcomes and Contributory* constructs and the relocations of items in each of the *Outcomes* and *Contributory* dimensions.

A noticeable addition was the addition of the "Teamwork" dimension to the *Outcomes* construct, which was consistent with the emphasis by Hong, Nahm, and Doll (2004) and Clark and Fujimoto (1991). Hong et al. (2004) recognised the importance of cross-functional teamwork in product development, especially in the fast-paced, globally competitive engineering work environment; while Clark and Fujimoto (1991) stressed that the need for cross-functional teamwork increased when the level of difficulty and complexity of the overall new product development increased. Clearly, the inclusion of the "Teamwork" dimension was consistent with the product development literature which emphasised the importance of teamwork in the engineering profession.

Another addition was the appearance of the “Tangibles” dimension in the *Contributory* construct. This addition was in contrast to Parasuraman et al.’s (1988) definition of “Tangibles” in their SERVQUAL framework developed for service industry, as they defined “Tangibles” as physical facilities, equipment and appearance of personnel. The “Tangibles” dimension of the revised SERVQUAL-TRANS framework focused on assessing the quality of physical facilities solely without evaluating the quality of human resources. Based on the importance placed by the professional bodies on both facilities and teaching staff (Table 2.3 of Chapter 2), and the clear differentiation of the facilities aspect from the teaching staff aspect, the addition of the “Tangibles” dimension to the *Contributory* construct proved to be worth noting.

The most obvious relocation of items which contributed significant value to the framework was the inclusion of Q28, Q29, and Q30 in the “Leadership” dimension of the *Contributory* construct. The inclusion of these items in the “Leadership” dimension was consistent with the notion of multiple role leadership by Limerick, Cunnington, and Crowther (1998). The important relationship between teacher leaders and administrator leaders in sustaining and growing the knowledge-generating capacity of the school was recognised through the inclusion of these items in the “Leadership” dimension.

The outcomes of the reliability and validity studies considered in Research Question 1 and discussed here, are of importance in developing a finalised version of the conceptual framework. The quantitative analysis has resulted in the addition of one dimension to the *Outcomes* construct, one dimension to the *Contributory* construct and relocation of items within the *Outcomes* and *Contributory* dimensions.

5.5.2 Findings of the Qualitative Data Analyses

The qualitative findings (Appendix C) from the open-ended questionnaire demonstrated that conclusions were consistent in general with the quantitative data resulting from the student, staff, and employer questionnaires. A summary of the qualitative analysis is presented in Table 5.29.

It was evident from the illustrative comments that students were expecting to have better delivery of lectures through provision of more suitable physical facilities and learning resources. They were also expecting to have better professional exposure to engineering practice through undergoing industrial training at engineering workplaces.

Students expressed in the open-ended questionnaire the importance of having adequate provision of teaching resources at the college, such as having qualified and experienced teaching staff, better library resources, and laboratory facilities. Students were hoping that staff from the linking university could conduct lectures more frequently at the college. They were also hoping that facilities provided at the college would be the same as those at the linking university. The comments from the students had been included in the "Learning Resources" and "Tangibles" dimensions of the *Contributory* construct.

Students also expressed the importance of having regular monitoring of class delivery by the linking university and appreciated the opportunity to have good exposure to professional practice. They expected the university and college to introduce industrial training as a compulsory requirement of the programme.

Staff largely emphasised the need for improvement in course delivery and expected a greater delivery of electronic technology lectures by the linking university to supplement face-to-face delivery. They also desired a formalised quality process mechanism for the smooth provision of transnational engineering education.

Academic staff expressed in the open-ended questionnaire the need to formalise the quality assurance mechanism in the transnational education. They preferred the marking of assignments and examination scripts to be done by the linking university to ensure consistency in the standard of the programme. They expected a higher utilisation of electronic delivery mechanisms to enhance face-to-face course delivery and frequent real-time interaction among staff of the linking university, college staff, and students. Again, these comments had been included in the "Teaching, Learning, and Assessment Practice", "Leadership", "Professional Exposure", and "Staff and Students' Relationship" dimensions of the *Contributory* construct.

Apart from the above, college staff also emphasised the importance of up-dating the course curriculum for coping with the rapid changes in industry needs and technological advancement. The remarks of academic staff had been included in the "Course Curriculum" dimension of the *Contributory* construct.

Employers discussed more the relevance of course content to industry needs. They also stressed the importance of producing graduates with acceptable technical and communication skills. The inputs from employers were included in the "Course Curriculum" dimension of the *Contributory* construct, and "Technical Competencies" as well as "Generic Competencies" of the *Outcomes* construct.

The qualitative findings revealed that employers supported the five dimensions that comprised the revised *Outcomes* construct (namely "Technical Competencies", "Generic Competencies", "Management and Organisation Skills", "Communication and Social Skills" and "Teamwork"). In particular, employers commented that graduates should possess creative technical and problem solving skills. They also stressed that it was of paramount importance for graduates to possess excellent communication and leadership skills. Employers emphasised the importance of having a close working relationship with the industry to create professional exposure opportunities for students. They added that students must be guided at the workplace by undertaking industrial placement within the engineering environment. Employers also welcomed the use of technological means for promoting interaction and brainstorming of ideas between staff and students.

Table 5.29
Summary of the Analysis of the Qualitative Data

Students' Comments	Staff Comments	Employers' Comments
Academic staff from the linking university must conduct lectures more frequently at the college	Localize the course content to suit the local engineering development	Must have close working relationship with the industry
Facilities at the college must be the same as those at the linking university	Must have higher levels of utilization of electronic delivery mechanism	Must use technology delivery mode as a means to promote interaction and brainstorming of ideas
University must conduct regular monitoring of class delivery at the college	Must formalize a quality assurance mechanism	Graduates must possess problem solving skills, communication and leadership skills
Students must be provided with professional exposure through industrial training	Assignments and examination papers should be marked by staff at linking university	Must have adequate industrial exposure in actual work environment
Must have better laboratory facilities and library resources	Student exchange programme must be implemented	Must encourage proper English usage

The conclusions that emerge from Table 5.29 of qualitative analysis indicate that no additional dimensions need to be added to the revised 13-dimension framework derived from the quantitative analysis. The qualitative analysis confirms and supports the adequacy of the framework derived from the earlier quantitative analysis.

5.5.3 Extrapolations from Research Questions 2, 3, and 4

This study discloses that the perception and satisfaction levels of students, academic staff and employers with the transnational engineering programmes on the whole were positive. Judging from the overall perception and satisfaction levels of students, staff, and employers, there is no doubt that transnational engineering education is an appropriate education system for delivering engineering education.

This research survey also reveals that students and academic staff, in general, had different perceptions regarding the quality of the transnational engineering education even though they were provided with the same infrastructures, learning resources, and services at the college. Northern students generally rated the development of both technical and non-technical attributes in themselves better than Southern students who had no provision of engineering-related work exposure. This could be attributed to the fact that majority of Northern students had significant industry experiences, and their working environments had provided them with good exposure to engineering practice and complex industrial problems which enhanced the development of skill competencies and confidence in Northern students. The differences in perceptions could lead to a conclusion that prior experiences of students had affected students' perceptions regarding the learning outcomes of the programmes.

There were mixed reactions with regards to the quality of physical facilities. Students, especially Southern students, expected the college to have sufficient cutting-edge library facilities, computing and engineering laboratories. Academic staff, on the other hand, were of the opinion that the facilities available were sufficient for conducting the course. The students' perceptions of quality of facilities appeared to be affected by their prior experience or their current exposure to engineering practice. Due to having exposure to linking university's facilities during their compulsory 2 weeks stay at Southern University campus and sharing among Southern students about their exposure, Southern University's students tended to set higher expectation for physical facilities. The analyzed results corresponded closely with the finding of Joseph and Joseph (1997) which reported that students became more discriminating and critical of the service delivery once they had basis knowledge and experience with tertiary education. From the Research Questions 2 and 3, it is clear that the structuring of the conceptual framework based on the perception theory, instead of perception-expectation theory of SERVQUAL model, was adequate to assess the quality of the transnational engineering education programmes.

Results from Research Questions 1, 2, and 3 present the emphasis placed by students, staff, and employers regarding the quality of the transnational engineering programmes. Students expected the college, university, and engineering industry to share the same vision and collaboratively improve the quality of transnational engineering programmes by actively putting collaborative, joint effort in bringing improvements to the areas which still need further improvement. Similarly, staff also expected more involvement of the linking university in course delivery through higher level utilization of electronic delivery mechanism such as using video technologies or holding frequent real time interaction for students and college staff to gain invaluable insights and knowledge from lectures or discussion facilitated by the linking university. Employers, having the same opinions as students and staff, expected more frequent course delivery through electronic technology and a closer working relationship between the linking university, college, and engineering industry. Because of the emphasis by all the stakeholders towards the importance of having the same 'vision' and more collaborative roles from all parties in developing the quality of transnational engineering education, the revised SERVQUAL-TRANS conceptual framework in Figure 5.3 can be further modified.

The study also reveals that only the *Outcomes* construct of students was not significantly related to the satisfaction data of students. This is not surprising as most of the students always measure satisfaction from the perspective of the contributory aspects such as standard of the curriculum, facilities for study, capability and experience of lecturers instead of looking at the overall perspective such as the outcome attributes that have been developed in students after going through the course.

5.5.4 The Final Revised Conceptual Framework for Assessing the Quality of Transnational Engineering Programmes

From the analyses of results, a conclusion was reached that the finalised SERVQUAL-TRANS framework should consist of five *Outcomes* dimensions (namely "Technical Competencies', "Generic Competencies", "Management and Organisation Skills", "Communication and Social Skills" and "Teamwork") and eight *Contributory* dimensions (namely "Course Curriculum", "Learning Resources", "Tangibles", "Teaching, Learning, and Assessment Practices", "Administrative Support", "Staff and Students' Relationship", "Leadership" and "Professional Exposure"). The final version of the SERVQUAL-TRANS framework (Figure 5.4) shows a dynamic interchange between the *Outcomes* and *Contributory* constructs. It is a comprehensive framework which illustrates a range of distinctive characteristics as shown in the Research-Based Framework for Enhancing School Outcomes (RBF) developed by University of Southern Queensland's Leadership Research Institute and Education Queensland and Kaplan and Norton's Balanced Scorecard in which "integration is sought across teaching and learning outcomes, relationships with stakeholders and professional learning and development" (Crowther et al., 2002). It is also conceptually similar to the Design Template for a Whole-school Approach to Improving Student Learning Outcomes produced by Hill and Crevola (as cited in Hill and Jane, 2000).

Similar to these three frameworks, the SERVQUAL-TRANS framework emphasizes the firm establishment of the strategic foundation of the college and linking university. It distinguishes itself from other frameworks by illustrating the importance of strategic roles played by leaders in the network instead of a single organisation. It displays clearly the contributions of the university and college towards the development of course curriculum, good teaching, learning and assessment practices, and how academic staff shared responsibilities within the network to achieve good learning outcomes and to resolve conflict. It also shows clearly how the practices exercised by the linking university affect the teaching and learning activities at the college, and how the autonomous units work as a cohesive community in support of the transnational education activities.

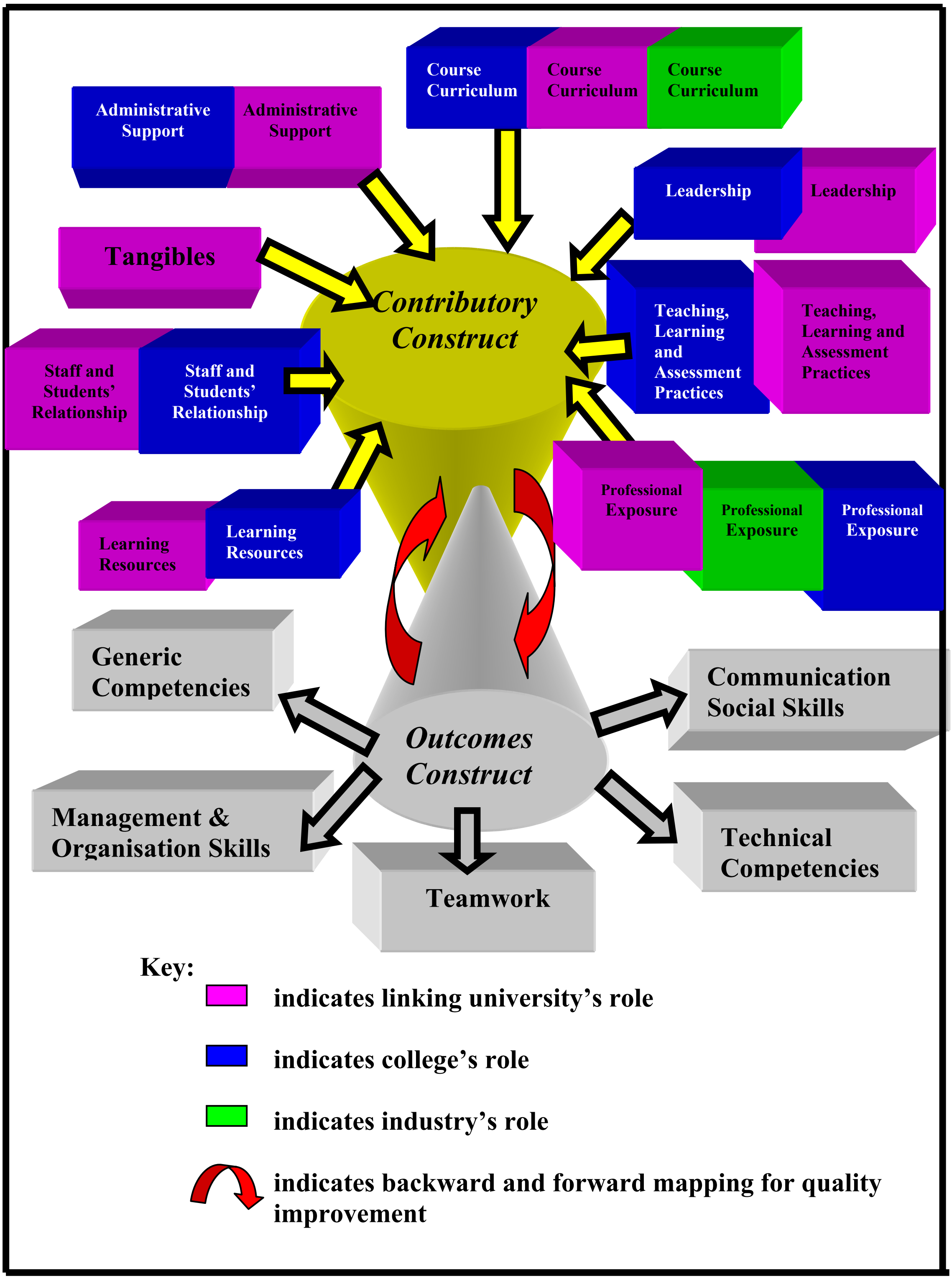


Figure 5.4
The Final Revised SERVQUAL-TRANS Framework

The *Outcomes* element of the RBF comprises school outcomes which focus on student learning; the creation of new knowledge, skill and dispositions within the professional learning community; school-community relations; and the alignment of *Contributory* elements (Crowther et al., 2002). The SERVQUAL-TRANS framework relates explicitly the *Outcomes* construct to a range of competencies demanded by industry, and assesses the development of attributes in students and graduates through evaluating the perceptions of students, staff, and employers. The framework allows the stakeholders to perform backward and forward mapping to sustain growth and development in the transnational engineering education.

Most of the developed frameworks in the education and organisational management literature imply that participants should interact with key players in each of the dimensions of the frameworks. The SERVQUAL-TRANS accepts and extends this feature by promoting open communication among internal and external participants ranging from students, staff, and employers.

The newly developed SERVQUAL-TRANS framework may be used to measure the perceptions of students, staff, and employers in a wide range of professional preparation programmes.

5.6 Summary of Chapter Five

It was clear from the study that the quality of transnational engineering education depended on many aspects and the results showed that the transnational approach to delivery was able to produce graduates who were accepted by employers as having capability to perform engineering practice at an acceptable level of professionalism. The study revealed that transnational engineering education had successfully developed students in both technical and non-technical skills. However, ways and means must be sought to encourage innovative and authentic teaching, learning and assessment practices, to further develop creativity and problem-solving skills in students. Academic staff should use various approaches to enhance the teaching of engineering courses so that creative and critical thinking skills could be developed in students, thereby encouraging higher achievement in the development of their technical competencies, particularly in the area of applications of technology to using software and hardware for designing alternative engineering systems.

The main contribution of SERVQUAL-TRANS framework, when used for measuring the quality of the transnational engineering education, is that it is able to detect the differences in the perceptions of staff, students, and employers. It provides a way to improve the perceptions and satisfactions of the staff, students, and employers to ensure that the standard of the programmes could be maintained or even raised to a higher level.

The overall study reveals a welcome finding as the results indicated that the transnational engineering graduates would continue to be sought after by employers. Hence, a quality operation mechanism for delivery of the transnational engineering programme must be developed and implemented by the transnational engineering providers.

CHAPTER 6

TOWARDS A NEW FRAMEWORK FOR TRANSNATIONAL ENGINEERING EDUCATION

6.1 Introduction

Over the last ten years, many universities have been responding to the forces of globalization by becoming more international in focus. The concept of *transnational education* has become prominent in many developed and developing countries during that time. Various forms of transnational education with different delivery modes have brought significant benefits to developing nations which are in need of higher education opportunities, but these benefits have also been associated with growing concerns about the quality of transnational educational services.

In this final chapter of the thesis, the development of a conceptual outcomes-based framework for evaluating the quality of transnational engineering education is undertaken. Implications for further research are also explored. To conclude the thesis and the chapter, personal reflections upon the doctoral journey are presented.

6.2 A Conceptual Framework for Transnational Engineering Education

Currently, transnational engineering education is under-researched. The delivery mode of transnational undergraduate programmes varies from one programme to another. There are no generally accepted formal operational guidelines or published quality assurance mechanisms for guiding transnational providers towards the provision of quality operations.

Based on the studies of the transnational engineering degree programmes offered by Southern University and Northern University in conjunction with Trans College, a new conceptual framework has been developed to evaluate the quality of transnational engineering education, and valuable insights into the complexity of the transnational engineering educational process have been discovered. It is clear from the outcomes of this study that the quality of transnational engineering education depends on creation of successful network structures between the host university, college, and the engineering industry, with each institution acting as an autonomous unit possessing distinctive competencies and performing collaborative functions. This networked relationship is captured in Figure 6.1. The framework makes clear that engineering educational institutions have to become action-learning organisations to respond to ongoing advancements in engineering and technology as well as the challenges of globalization for engineering education.

The usefulness of the framework lies particularly in the interrelated nature of the *Contributory* and *Outcomes* dimensions that comprise it. This feature enables framework such as SERVQUAL-TRANS to be devised to measure the dynamic interrelationship between the functional characteristics of an organisation and the achievements of that organisation as perceived by a range of stakeholders.

Another useful quality of the framework is that of its application in influencing policy implementation. For example, the framework might be used to help administrators and academic staff to identify organisational strengths and weaknesses, to address weaknesses, and to develop policies that will enhance the level of "alignment" within their organisation. More specifically, the framework challenges transnational providers to improve their systems of educational planning and implementation so as to produce skilled manpower and knowledge workers for the workforce of today and the future.

In summary, the valid and reliable conceptual SERVQUAL-TRANS framework that has been derived from this study can be transposed into instruments for measuring the perceptions of students, staff, and employers, thereby enhancing the quality of educational programmes that are likely to assume increasing importance in the decade ahead.

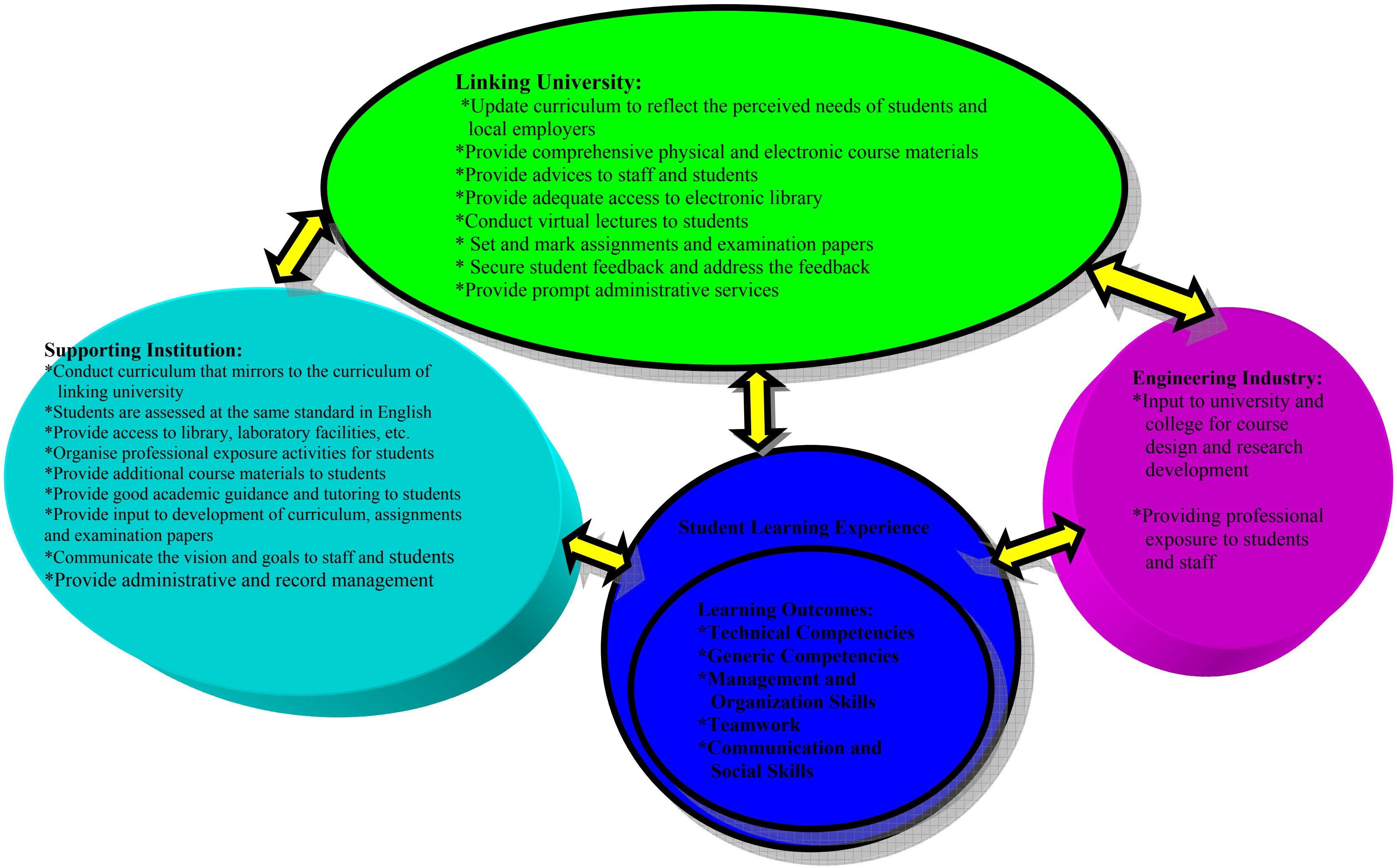


Figure 6.1
The Proposed Networked-systemic Learning Organisation of Transnational Engineering Education

6.3 Implications of the Research Findings for the Quality of Transnational Programmes at Trans College

This study has provided a conceptual framework to guide the ongoing development of transnational engineering education at Trans College. It is recommended that Trans College should make use of the framework, and the outcomes of this study, in refining its approach to transnational education.

The study has also disclosed that the perception levels of students and academic staff in the transnational engineering education were generally positive. Students and staff were basically satisfied that the delivery of transnational engineering education had provided students, especially part-time students, with positive opportunities for furthering their studies in engineering. The transnational education providers were also perceived as providing highly supportive learning environment for students in their respective courses.

The data revealed that there were a range of positive and negative features which emerged from the practices of the transnational engineering programmes. The strengths of the transnational engineering programmes were summarised as follows:

(a) Employers perceived that transnational engineering graduates had achieved satisfactory work performance in their workplaces. Academic staff agreed that students had achieved acceptable levels of learning outcomes and students generally asserted positive perceptions of their learning experiences.

(b) Students, staff, and employers indicated that the strong collaboration between the linking universities and the college had enabled the transnational engineering degree programmes to be linked to the growth of both local and global engineering industries. They were also pleased with the scheduling of classes during day time and after office hours. Because of the convenient timetables, some multinational companies have been able to sponsor employees for further studies and to use transnational engineering education as a means to upgrade their human resource skills and to equip their employees with high-level professional training.

(c) Within the daily internal operation transactions, both university's and college's academic and administrative staff participated and contributed actively in the transnational engineering programmes. Open and free flow of communications was perceived to exist among academic staff and administrative staff of the linking university with students and staff at the college.

(d) Both students and staff indicated that they had adequate electronic access to course materials and to the linking university's library. Academic staff were very impressed with the posting of comprehensive course materials on Southern University's webpage and adequate provision of electronic access to Southern University's library. Southern University students also acknowledged the effective posting of course materials on the website.

Despite all the above positive features of the transnational engineering education programmes, there were several aspects of the programmes which were criticized and were regarded as needing further improvements. The weaknesses of the transnational engineering programmes were summarized as follows:

(a) Even though students reported that their skill competencies had improved during the course of their studies, they recognised the need to develop further some technical and generic competencies. Employers agreed that graduates were slightly deficient in problem solving and creative thinking skills.

(b) There was a need for equipping the laboratories with more up-to-date and cutting-edge computers and engineering equipment.

(c) Students indicated that they preferred to have some lectures conducted by linking universities' academic staff either through physical or virtual delivery of lectures. They appeared to hope that communication technologies such as video conferencing with academic staff and fellow students at the linking university could be initiated.

(d) Students had the option of choosing either to undertake or not to undertake industrial training during their course of studies. As such, full-time students' exposure to professional practice has been limited, hence the development of both technical and non-technical competencies of students has been limited.

(e) Staff indicated that they expected to have better professional development and they expected the linking university to coordinate staff development sessions for them to ensure that they knew clearly their responsibilities in teaching and for improving the standards in assessment and delivery.

It is a major recommendation of this study that the positive aspects of the transnational engineering education that have been identified be regarded as Best Practices and be emphasised in future developments at Trans College. It is recommended that the negative aspects of programmes that have been identified be addressed by Trans College and its partner Universities.

6.4 Towards a More Effective Delivery System for Transnational Engineering Education

The urgency of reforming engineering education is clearly reflected in the words of Kerns (2004, p.1):

> *It's clear that many engineering jobs related to the production of products are now being performed in China, and in other countries, where cost of production is dramatically lower. I've heard some say that countries now becoming world leaders in product production still rely on the USA and other western countries for creative design of products. Is there any reason to believe that if this is true, that it will last forever?* (Kerns, 2004, p.1)

Due to the migration of manufacturing industries to the East Asian countries, and the emergence of these countries as world leaders in manufacturing, there is a need to reform engineering education. As part of this process, it is expected that transnational engineering education will play a very important role in training professional engineers to meet the skilled manpower needs of the engineering industry in developing countries. Based on the perceptions and satisfaction levels of students, staff, and employers in this study, a new system of organisation is proposed for effective implementation of transnational engineering education. Its features may be discussed in relation to either **networked organization concepts** or **operational and mechanistic concepts.**

(a) Networked Organisation Concepts

Increasingly, there is a need for engineering education to respond to the needs of manufacturing development in developing countries. As most engineering careers require involvement in international activities, many employers prefer employees with more internationally- focused engineering education.

To ensure the effective delivery of internationalized engineering education and to promote the participation and support of developed countries in engineering programmes, the formation of networked educational structure by a transnational university, a local educational institution, and the engineering industry is important (see Figure 6.1). As pointed out by Karl Martersteck, a retired industry executive:

> *Industry must establish the "requirements" for the quality and education of the engineers they hire. Unless, and until, major industrial leaders whose views are generally respected speak out and say that they will not hire engineers unless the engineers have the broader "new paradigm" education, academics will continue to pursue their present course."*(Splitt, F. G., 2003, p.8).

The basis for implementation of this framework should be 'shared vision' among all the autonomous units and collaborative engagement of the three organisations in developing strategic integration, tactical integration, operational integration, interpersonal integration, and cultural integration. The new educational organisation should recognise the need to mould itself to be a 'networked-systemic learning organization' (Limerick et al., 1998**),** capable of coping with fast changing technologies, and creating new knowledge through integrated learning activities.

(b) Operational and Mechanical Concepts

Analysis of organisational effectiveness literature of the type that was reviewed in Chapter Two suggests that the formation of a highly successful networked-systemic learning educational organization would involve creation of a shared strategic vision, internal structures with vision and operational mechanisms that facilitate the delivery of programmes. The following ideas are suggested as means for improvement of the conduct of future transnational engineering education within emerging networked transnational education networks:

***Design of course curriculum**

The new networked learning education model, involving formal collaboration between a university and a local higher institution, and informal collaboration between the university, local higher institution and manufacturing firms will provide the basis for collaborative improvements in the design of course curriculum.

In the system that is proposed, the university will have the capacity to design courses in flexible structures which are able to respond, adapt, and meet the local and global needs of engineering firms. The tri-party collaboration will open doors to cross-fertilization of ideas in curriculum development. The programmes will be able to carry a blend of internationalized academic and industry-based courses.

Effort will need to be made to invite input from local industry to ensure that the curriculum is updated systematically according to the needs of local industry. Greater industry involvement in the transnational engineering system will encourage the provision of increased industrial placements to students. Students will then be provided with technological and engineering competence and an understanding of international perspectives. Finally, employers will be able to recruit staff who are able to deal with inter-organisational development, different markets, and customers.

*** Physical facilities and learning resources**

From the student perceptions component of the research survey, it is apparent that a well established website for course delivery should be a mandatory requirement for transnational engineering education. Real-time lecturing can then be conducted by academic staff at the linking university through the use of communication technologies. Academic staff at the supporting institution will play a key role as facilitators of learning processes. Through constructive cooperation between the linking university and the college, websites equipped with good audio and visual presentations by academic staff at the linking university will promote the effective delivery of transnational engineering concepts.

To introduce the outcomes-based orientation of transnational engineering education into the programmes, it is important to fully equip the engineering laboratories with a large variety of advanced engineering equipment to reinforce learning, develop students' practical skills, skills in engineering practice, and team working. The web-based laboratory experiment can also be used as a powerful and useful tool for carrying out engineering experiments.

To ensure smooth implementation of this delivery process, the linking university should at the initial stage of the collaboration inspect the physical facilities and learning resources to ensure the adequate setting up of a fully equipped library and engineering laboratory at the local institution.

***Staff development**

As part of the effort to ensure a superior student learning experience, the university and the supporting institution should jointly identify staff development activities that will equip staff with the rapidly developing subject expertise to update their knowledge on engineering developments. The linking university should ensure that staff understand fully the academic systems, operational mechanisms, and quality assurance processes that will be implemented in the transnational engineering education.

***Teaching, learning and assessment strategies**

As teaching and learning in engineering studies involve investigating, designing, building, testing, evaluating, and re-testing, as well as intense practical work, successful engineering instruction is basically realizable only through close interaction between students and lecturers, and with direct access to various types of engineering equipment and simulation software.

To ensure the effective delivery of engineering education, and to increase enthusiasm among full-time and adult students, tutors at a local institution can make their teaching and learning more interesting and stimulating by clarifying the complex theory that is taught by linking university staff through virtual lecturing or vice-versa. Since teaching and learning activities are organized in the classroom environment at the college following a scheduled timetable, students who study under the guidance of local academic staff will then have extensive access to extensive laboratory facilities and computer-based simulations. This exposure will strengthen students' experiential learning and hence help to fulfill the outcome-driven requirements of professional engineering bodies. Similarly, by participating in electronic audio and visual presentations through the internet, part-time students will be provided with the opportunity to access cutting-edge engineering facilities at the local institution.

To address issues related to a perceived lack of technical competencies, there is a need to increase the practical and experiential focus of course delivery by introducing more problem-based learning, project-based learning, collaborative learning, inquiry-based learning, or enquiry-and-action learning into the transnational engineering education. More laboratory-focused classes must be initiated and the practical classes must emphasize unique engineering educational objectives such as trouble-shooting and innovation. More industry-related projects must be sought in order to enhance students' engagement in independent study projects. Industry mentors must be invited to participate actively in a full range of projects or designs involving the design and projects.

Finally, to ensure better quality control, all students should be assessed at the standard set by the linking university. All assignments and examination papers should be set and marked by academic staff at the linking university. To avoid delays in the mailing of physical scripts, an established website should be maintained for convenient electronic submission of students' assignments. All assignments should be marked and detailed with comments before returning to students through electronic transmission.

***Student feedback**

To further improve the services provided to students, students should be encouraged to fill in survey forms electronically so that feedback and suggestions for program implementation and delivery can be forwarded to the linking university. The feedback and suggestions can then be used more effectively by the linking university for review process. Staff-student consultative forums can also be organized and linked electronically to the linking university to encourage interaction of students and staff at the linking university.

In summary, transnational engineering education has the potential to provide quality engineering education with standards comparable to international engineering degree standards if more rigorous and quality operation mechanisms are put in place. The networked transnational engineering education arrangements that are proposed as a result of this study are intended to help improve the operation mechanism of current and future programmes.

Alternatively, transnational education providers can use the proposed model and strategies to enable them to operate better in strategic alliances with other leading international institutions throughout the world. It is possible to envision a day when they can become a hub of tertiary education with educational networks spanning the globe.

6.5 Limitations and Implications for Further Research

This research demonstrates the relative ease of evaluating the quality of transnational professional education programmes by transposing the SERVQUAL-TRANS framework into a measuring instrument. However, there are several limitations we should consider prior to using the framework and generalizing the findings. One of the limitations of this study is that the framework is tested in a single context only, that is in an educational institution in Malaysia. Further more, the sample used is only small sample and may not be representative of the whole population of stakeholders of transnational engineering programmes. Hence, it is of utmost importance that the conceptual framework that has emerged from this study be subjected to further intense critique and investigation.

It is equally apparent that further research is needed to confirm the suitability of the SERVQUAL-TRANS framework as a strategy for measuring the quality of transnational programmes such as engineering. The following specific issues appear to warrant further research regarding the SERVQUAL-TRANS framework that has been used in this study:

- The framework should be tested to determine its usefulness for measuring the quality of other transnational programmes, such as computing and business.

- A larger scale longitudinal survey should be conducted to assess the perceptions of students, staff, and employers in a transnational institution over a few years, to assess whether the SERVQUAL-TRANS framework can be used to initiate and sustain continuous improvement in a programme.

- Transnational programmes in a number of other institutions in Malaysia and South East Asian countries should be explored to ascertain whether the findings of this research are replicable . This is particularly important in light of the relatively small sample sizes of the current study.

It is apparent from the results of this study that there are important aspects and areas of students' experiences that are in need of further research. Since it was revealed in this study that there were perceived deficiencies in the technical and generic competencies of students and graduates, research activities should be carried out to investigate ways and means which can redress these deficiencies. It is particularly important to carry out research to develop better assessment practice for transnational engineering education.

The development of a networked-systemic learning organization of the type that underpins successful transnational education requires management configurations which are very different from the professional bureaucracy configurations of traditional educational institutions. If transnational education is to achieve its potential, there is an obvious need to search for a new style of management for managing the networked-systemic learning organisation.

Further research is needed to examine the relationship between the perceptions and satisfaction levels of stakeholders of transnational engineering education programmes. Based on this research the following specific questions appear to warrant further study regarding the perceptions and satisfaction levels of engineering students:

- Which aspects of the perceptions and satisfaction levels of students are affected primarily by the services provided by the linking university, and which are affected primarily by the services of the supporting institution?

- Do staff and student satisfaction levels increase as they become more familiar with the delivery and quality assurance mechanisms adopted by the linking university?

6.6 Personal Reflections on the Doctoral Journey

My pursuit of the Doctorate in Education has been one of the most challenging and exciting experiences of my life.

In 2001, I enrolled in two doctorate programmes. The institution at which I worked offered to sponsor me in the Doctorate in Engineering Management at the University of Warwick, U.K., but I chose, and self-financed, the Doctorate of Education at the University of Southern Queensland. My main reasons for this choice were the flexibility of the University of Southern Queensland programme, combined with what I perceived to be its integration of coursework and research components and the allowance that it made for close affinity to my professional practice.

In the U.S.Q. Doctorate in Education, coursework is a compulsory component of the programme. I found that the coursework provided an important and smooth introduction to educational studies that suited me as a non-educator (I am a professional engineer, as well as head of an engineering unit at a Penang college). It also provided doctoral level research methods and skills, particularly in the qualitative paradigm, that were new to me as a doctoral student who had no basic background in education studies.

Moreover, the coursework was presented in a highly professional approach through various technology-based platforms. The academic understandings and insights that I gained through this process went far beyond the mere transmittal of knowledge. I truly appreciate the high quality communication and international sharing of ideas that I experienced, as well as the personal socialization with lecturers, staff, and other doctoral students.

One of the important determinants of my positive experience during my doctoral programme was the support mechanisms provided by the USQ to enable students to progress with confidence from one stage of the programme to another stage. I truly treasured the teleconferencing sessions that were organised to introduce students to new modules of study and the international "survival meetings" that were held to promote group discussion, to facilitate interaction and to heighten and sustain motivation among students. I was pleased to learn that the university attempted to involve all students actively in developing educational processes, structures, and strategies and encouraged all students to send on-going feedback, ideas and suggestions to the doctoral team.

Despite the great enthusiasm I had for my doctoral study, I was also immersed in my professional occupation. This created major challenges of personal organization when my doctoral research project came on board. At times, I had so much difficulty balancing between career, family life, and study that I became exhausted and had to find ways of containing my stress levels. However, through frequent communication with my two supervisors, who provided me with a dynamic and intellectually stimulating environment, I was able to continue to progress through the various stages of the research process towards the completion of my study. Their enthusiastic participation as supervisors of my project has also stirred my interest in research and has helped me to see the importance of diversifying my professional work beyond administration and teaching to include ongoing research in engineering education.

As a whole, I feel that my doctoral study has moved my view of the world from that of an engineering paradigm to include aspects of an education paradigm. It was a difficult but very meaningful process to engage in personal transformation from a predominantly mechanical university administrator to a more organic administrator who comprehended some of the complexity of teaching and learning processes. But I feel that I have done that. I have also acquired new leadership skills and have found them to be very useful in proposing strategies and directions for my workplace. My study has also enhanced my personal confidence and has helped me to see workplace problems from new educational viewpoints.

Finally, through the four years of my engagement in doctoral study, I came to realize how important it is for engineers to understand the place of education in their profession and to be able to integrate sound educational practices in the delivery of engineering education. Relatedly, I began to comprehend the contributions that education schools could offer to engineering schools in universities.

In view of the knowledge and experience that I have gained from my doctorate study, I would like to call for more engineering educators to further their postgraduate study in education and to take up other professional programmes in education.

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APPENDIX A.1

Student Survey Questionnaire

Transnational Engineering Degree: What it means and how it works.

Trans Students' Perceptions

This questionnaire was developed to evaluate the quality of a locally-completed foreign engineering degree program (Trans College's transnational program) and the quality of the learning experiences of students who are studying in the program.

The questionnaire consists of four sections:

Section A seeks information about relevant personal details.

Section B asks for your perceptions of the extent to which you have developed specific professional competencies after a period of study in the Trans College's transnational engineering program.

Section C asks for your perceptions of the quality of learning experience in the locally-completed foreign engineering degree program at Trans College.

Section D asks you to assess your overall perception of the quality, satisfaction, and standard of the programme.

Section E provides space for you to make more comments.

Please complete the attached questionnaire as comprehensively as you can. Your feedback will be used to develop a proposal to improve the distance delivery of overseas engineering undergraduate program conducted at Trans College.

Thank you in advance for your kind cooperation and support. Please return the completed questionnaire as soon as possible. If you have any questions regarding the questionnaire, please contact the undersigned.

Yours sincerely

Transnational Engineering Degree: What it means and how it works.

SECTION A – PERSONAL DETAIL

PLEASE INDICATE YOUR PERSONAL DETAILS BY WRITING CLEARLY IN THE SPACES PROVIDED OR TICKING THE BOX THAT BEST DESCRIBES YOU.

1. Age (years):

☐ Less than or 21 ☐ 31 -- 35

☐ 22 – 25 ☐ More than 35

☐ 26 -- 30

2. Gender: ☐ M ☐ F

3. Course Studied:

Northern's Bachelor of Electronic & Electrical Engineering ☐

Southern's Bachelor of Engineering ☐

4. Years of Study:_______________________________

5. Mode of Study:

Full-time ☐ Part-time ☐

6. Sponsorship:

Self-sponsored ☐ Company-sponsored ☐

7. Industrial Experience:

Working full-time ☐ Working part-time ☐

Completed industrial training ☐ No working experience ☐

8. Year of working experience:

☐ ≤ 3 months ☐ ≥ 2 years but less than 5 years

☐ ≥ 4 months but less than 1 year ☐ More than 5 years

☐ ≥ 1 year but less than 2 years

SECTON B: THE TRANS COLLEGE'S TRANSNATIONAL ENGINEERING DEGREE- LEARNING EXPERIENCE

Please reflect upon your learning experiences while studying in the locally completed foreign degree engineering programs conducted jointly by the linking university and Trans College.

In each column, circle one response to each of the items that are listed. In the left-hand column your responses will indicate your views regarding the importance of particular engineering competencies and skills that are taught in the program. In the right-hand column, your responses will indicate your perceptions *of your personal development of those particular engineering competencies.*

HOW IMPORTANT IS THIS ATTRIBUTE TO YOU?	ATTRIBUTES OF STUDENTS	TO WHAT EXTENT HAVE YOU DEVELOPED THIS ATTRIBUTE?
Very Important / Moderatel y Important / Not Important	**A. TECHNICAL COMPETENCIES**	Outstanding / Moderate / Poor
1 2 3 4 5	1. I am able to apply mathematics, science and engineering knowledge in modelling and analysing engineering problems.	1 2 3 4 5
1 2 3 4 5	2. I am able to use software simulation tools to analyse engineering problems and develop solutions to the problems.	1 2 3 4 5
1 2 3 4 5	3. I am able to use test and measurement equipment to design, conduct experiments and analyse experimental data.	1 2 3 4 5
1 2 3 4 5	4. I am able to use given specifications for designing a prescribed engineering system.	1 2 3 4 5
1 2 3 4 5	5. I am able to design alternative systems based on technical and non-technical criteria.	1 2 3 4 5

Very Important Moderately Important Not Important	**B. GENERIC COMPETENCIES**	Outstanding Moderate Poor
1 2 3 4 5	6. I know how to apply ethical and moral principles in professional activities.	1 2 3 4 5
1 2 3 4 5	7. I have learned about professional engineering ethics .	1 2 3 4 5
1 2 3 4 5	8. I can integrate and apply technical advice provided by the academic staff in solving technical problems.	1 2 3 4 5
1 2 3 4 5	9. I understand the impact of engineering on business and economics in both local and global environments.	1 2 3 4 5
1 2 3 4 5	10. I am able to undertake problem identification, formulation and develop solution to problem.	1 2 3 4 5
1 2 3 4 5	11. I understand the needs of the engineering industry and community as a whole.	1 2 3 4 5
1 2 3 4 5	12. I am able to demonstrate quality-assurance criteria in relation to engineering practice.	1 2 3 4 5
1 2 3 4 5	13. I demonstrate continuous learning to overcome the obsolescence of changing technologies.	1 2 3 4 5
1 2 3 4 5	14. I have developed lifelong learning skills.	1 2 3 4 5
1 2 3 4 5	15. I am aware of the impact of global environmental changes on the development of engineering.	1 2 3 4 5

Very Important Moderatel y Important Not Important	**C. MANAGEMENT AND ORGANIZATION SKILLS**	Outstanding Moderate Poor
1 2 3 4 5	16. I am able to plan and organize tasks efficiently and effectively.	1 2 3 4 5
1 2 3 4 5	17. I am able to work under minimal supervision.	1 2 3 4 5
1 2 3 4 5	18. I am able to cope with uncertainties, stress, and pressure.	1 2 3 4 5
1 2 3 4 5	19. I take initiative to explore opportunities and develop new ideas.	1 2 3 4 5
1 2 3 4 5	20. I have learned to work in teams through the College's extra-curricular activities.	1 2 3 4 5
1 2 3 4 5	21. I am able to contribute multidisciplinary viewpoints in problem solving.	1 2 3 4 5
1 2 3 4 5	22. I am able to brainstorm ideas in groups.	1 2 3 4 5
1 2 3 4 5	23. I have the capacity to work within deadlines fixed by the linking university.	1 2 3 4 5
1 2 3 4 5	24. I have developed study skills in preparing for examination papers set and marked by the linking university.	1 2 3 4 5
1 2 3 4 5	25. I have concern for personal actions and consequences after studying Moral Studies.	1 2 3 4 5

Very Important		Moderately Important		Not Important	D. COMMUNICATION AND SOCIAL SKILLS	Outstanding		Moderate		Poor
1	2	3	4	5	26. I have acquired good oral communication skills through individual and group presentation of assignments in class.	1	2	3	4	5
1	2	3	4	5	27. I am able to speak and write good English after a period of study in the degree program.	1	2	3	4	5
1	2	3	4	5	28. I have acquired good report writing skill.	1	2	3	4	5

SECTION C – CONTRIBUTORY ELEMENTS

What factors contribute to superior learning experiences (or otherwise) in the locally-completed foreign degree engineering program at Trans College?

Please indicate your views of the importance of each of the items that are identified in this section of the questionnaire**.**

FACTORS THAT CONTRIBUTE TO SUPERIOR LEARNING EXPERIENCES	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
A. COURSE CURRICULUM	Strongly Agree		Not Sure		Strongly Disagree
1. The prescribed degree curriculum is updated systematically to reflect the perceived needs of students and local employers.	1	2	3	4	5
2. The curriculum conducted at Trans College mirrors the linking university's curriculum in its own country.	1	2	3	4	5
3. Courses offered in the degree program at Trans College are of the same quality as of the courses offered at the linking university.	1	2	3	4	5
4. The degree program is delivered and assessed in the English language	1	2	3	4	5
5. The course content is related to technical jobs in the local market.	1	2	3	4	5
6. Coursework problems to be solved by students are real-life work related problems.	1	2	3	4	5
7. Students are being assessed at the same standard as students at the linking university.	1	2	3	4	5
8. The format of the final year project is the same as that at the linking university.	1	2	3	4	5
9. College lecturers are given opportunity to provide input to the development of course curriculum.	1	2	3	4	5
10. The number of Wajib subjects prescribed by the local authority for the program is appropriate.	1	2	3	4	5

FACTORS THAT CONTRIBUTE TO THE SUPERIOR LEARNING EXPERIENCE	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
B. LEARNING RESOURCES	Strongly Agree		Not Sure		Strongly Disagree
11. Library facilities, multimedia teaching aids, computing and engineering laboratory provision are up-to-date.	1	2	3	4	5
12. Sufficient computers and engineering equipment are available to cater to students' needs.	1	2	3	4	5
13. Sufficient qualified local teaching staff members are hired for teaching the courses.	1	2	3	4	5
14. The course materials provided by the college tutors are comprehensive.	1	2	3	4	5
15. The course materials provided by the linking university are comprehensive.	1	2	3	4	5
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff.	1	2	3	4	5
17. Sufficient college teaching staff with extensive industry experiences are available to teach students.	1	2	3	4	5
18. Linking university staff visit the college often enough to provide students with advice on daily questions.	1	2	3	4	5
19. The linking university provides students with adequate electronic access to its library.	1	2	3	4	5
20. Course materials are posted effectively on the webpage of the linking university.	1	2	3	4	5

FACTORS THAT CONTRIBUTE TO THE SUPERIOR LEARNING EXPERIENCE	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
C. TEACHING, LEARNING, AND ASSESSMENT PRACTICES	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
21. College teaching staff are able to effectively implement good pedagogical practices.	1	2	3	4	5
22. College tutors work hard to make lectures very interesting and stimulating.	1	2	3	4	5
23. College lecturers have strong theoretical and practical knowledge of their subjects.	1	2	3	4	5
24. College teaching staff give helpful comment and feedback to students on their work.	1	2	3	4	5
25. Marked assignments with proper feedback and comments are returned promptly to students.	1	2	3	4	5
26. College lecturers are able to facilitate discussion and group interaction in class.	1	2	3	4	5
27. Day and night lectures and practical classes are conducted to allow both full-time and part-time students to attend classes conveniently.	1	2	3	4	5
28. Input into the development of assignments and examination papers by the college teaching staff is adequate.	1	2	3	4	5
29. Input into assignments and examination question papers by the linking university staff ensures consistency in standards.	1	2	3	4	5
30. The responsibility for marking and moderation of students' scripts by the college tutors and linking university staff and external examiners is appropriate.	1	2	3	4	5

FACTORS THAT CONTRIBUTE TO THE SUPERIOR LEARNING EXPERIENCE	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENTIN THE LEFTHAND COLUMN?				
D. LEADERSHIP	Strongly Agree		Not Sure		Strongly Disagree
31. College leaders make clear to staff and students their vision and goals for the degree program.	1	2	3	4	5
32. Academic and management staff demonstrate a shared responsibility for ensuring the provision of quality engineering education to students.	1	2	3	4	5
33. The engineering degree education is clearly linked to the growth of engineering industries locally and globally.	1	2	3	4	5
34. There is strong collaboration link between the linking university and the college.	1	2	3	4	5
35. The excellence of the engineering degree education is promoted to students and the community.	1	2	3	4	5
E. ADMINISTRATIVE SUPPORT	Strongly Agree		Not Sure		Strongly Disagree
36. There are appropriate administrative arrangements to secure student feedback and to respond to students' feedback immediately.	1	2	3	4	5
37. The administrative and records management system maintains student records effectively.	1	2	3	4	5
38. Adequate student services such as hostel accommodation, laboratory support, course and career advice are provided by the college.	1	2	3	4	5
39. Administrative and technical services are provided promptly and efficiently.	1	2	3	4	5
40. Transcripts and degree certificates are issued promptly by the linking university to graduating students.	1	2	3	4	5

FACTORS THAT CONTRIBUTE TO THE SUPERIOR LEARNING EXPERIENCE	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENTIN THE LEFTHAND COLUMN?				
F. STAFF AND STUDENTS' RELATIONSHIP	Strongly Agree		Not Sure		Strongly Disagree
41. Linking university staff meet with students privately to gather their views and address their concerns.	1	2	3	4	5
42. College tutors play active roles in addressing students' requests with the help of university teaching staff.	1	2	3	4	5
43. University lecturers give prompt responses to students' requests.	1	2	3	4	5
44. Students receive prompt, individualized attention from the college tutors.	1	2	3	4	5
45. The college course tutors give students' confidence and motivate students to achieve at a high level.	1	2	3	4	5
46. Open and honest communication among college staff, university staff, and students is a feature of the transnational program.	1	2	3	4	5
G. PROFESSIONAL EXPOSURE	Strongly Agree		Not Sure		Strongly Disagree
47. Students understand professional and ethical responsibilities through formal and informal guest lectures conducted by the linking university.	1	2	3	4	5
48. Students understand professional engineering practice through professional exposure activities such as industry visits organized by the school.	1	2	3	4	5
49. Adequate student exchange systems are in place to facilitate professional development.	1	2	3	4	5
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession..	1	2	3	4	5

SECTION D: RATING QUALITY, SATISFACTION AND STANDARD OF THE COURSE

In education, the quality of the programme can be measured through your satisfaction with the programme and your opinion on the standard on the programme. Please circle the name of your university and one number below to indicate your overall perception of quality, satisfaction, and standard of the programme.

1. How satisfied are you with the Trans College-Northern University's engineering degree programme in terms of **overall academic course delivery services** provided by the Trans College and the linking university?

   Very Satisfied **Very Dissatisfied**

   1 2 3 4 5

2. How satisfied are you with the Trans College-Northern University's engineering degree programme in terms of **overall administrative services** provided by the Trans College and the linking university?

   Very Satisfied **Very Dissatisfied**

   1 2 3 4 5

3. How would you rate the **overall standard** of the course curriculum of your degree program?

   Extremely Good **Extremely Poor**

   1 2 3 4 5

4. Overall, how satisfied are you with the **quality** of your degree programme?

   Very Satisfied **Very Dissatisfied**

   1 2 3 4 5

SECTION E:

IN RETROSPECT

A) What do you regard as the three (3) most distinctive, successful features of your degree programme? Briefly describe these distinctive successful features here.

1.

2.

3.

B) Which aspects of your degree programme would you change in order to enhance its effectiveness?

1.

2.

3.

C) Are there any aspects of your degree programme that are hindering your study? If so, please describe them.

1.

2.

3.

D) What is the best way for an overseas university to conduct engineering courses with students in Malaysia? On the basis of your learning experience in your degree programme, please describe briefly your recommendation.

I AM VERY GRATEFUL FOR YOUR ASSISTANCE WITH THIS SURVEY. THANK YOU!

B.K. CHONG.

APPENDIX A.2

Staff Survey Questionnaire

Transnational Engineering Degree: What it means and how it works.

Trans Lecturers' Perceptions

This questionnaire was developed to evaluate the quality of a locally-completed foreign engineering degree program (transnational engineering program) and the quality of the experiences of students who are studying in the program.

The questionnaire consists of four sections:

Section A seeks information about relevant personal and professional details.

Section B asks for your perceptions of the success (or otherwise) of the transnational engineering program in preparing students to cope with the changing world of engineering.

Section C investigates your perceptions of the characteristics of the transnational engineering program and seeks your professional opinions regarding the characteristics of a high quality transnational program.

Section D investigates your overall perception of quality, satisfaction, and standard of the programme.

Section E provides space for you to make more comments.

Please complete the attached questionnaire as comprehensively as you can. Your feedback will be used to develop a proposal to improve the distance delivery of overseas engineering undergraduate program conducted at Trans College.

Thank you in advance for your kind cooperation and support. Please return the completed questionnaire as soon as possible. If you have any questions regarding the questionnaire, please contact the undersigned.

Yours sincerely

SECTION A – PERSONAL AND PROFESSIONAL DETAIL

PLEASE INDICATE YOUR PERSONAL AND PROFESSIONAL DETAILS BY WRITING CLEARLY IN THE SPACES PROVIDED OR TICKING THE BOX THAT BEST DESCRIBES YOU.

1. Age (years):

☐ 23 - 25	☐ 41 -- 50
☐ 26 – 30	☐ 51 -- 60
☐ 31 - 40	

2. Gender: ☐ M ☐ F

3. University graduated from (for both undergraduate and postgraduate study):

Undergraduate:______________________ Date of graduation:________________

Postgraduate:_______________________ Date of graduation:________________

4. Highest qualification obtained:_____________________________

5. Position held in the College:________________________________

6. Years of teaching experience in engineering degree programs:_________________

7. Years of teaching in the transnational degree programs:______________________

8. Names of the degree programs taught:

____

9. Subjects taught in the degree programs:

____

SECTON B: THE TRANSNATIONAL ENGINEERING DEGREE- *GOALS AND ACHIEVEMENTS*

Lecturers' perceptions of transnational degree program goals and outcomes
Please reflect upon your educational experiences while teaching the locally completed foreign engineering degree programs conducted jointly by the linking university and Trans College.

In each column, circle one response to each of the items that are listed. In the left-hand column your responses will indicate your views regarding the importance of the key goals of the Trans programs. In the right-hand column, your responses will indicate your perceptions of students' performance in relation to that goal of the transnational degree programs.

YOUR VIEW OF THE IMPORTANCE OF GOALS	SPECIFIC TRANSNATIONAL PROGRAM'S GOALS	YOUR VIEW OF STUDENTS' SUCCESS WITH GOALS
Very Important / Moderately Important / Not Important	**A. TECHNICAL COMPETENCIES**	Outstanding / Moderate / Poor
1 2 3 4 5	1. Application of mathematics, science and engineering knowledge in modelling and analysing engineering problems.	1 2 3 4 5
1 2 3 4 5	2. Use of computer simulation tools to analyse engineering problems and to develop solutions to practical problems.	1 2 3 4 5
1 2 3 4 5	3. Use of relevant test and measurement equipment to design, conduct experiments and analyse experimental data.	1 2 3 4 5
1 2 3 4 5	4. Following of given specifications to design a prescribed engineering system.	1 2 3 4 5
1 2 3 4 5	5. Development and assessment of alternative system designs based on technical and non-technical criteria.	1 2 3 4 5

YOUR VIEW OF THE IMPORTANCE OF GOALS	SPECIFIC TRANSNATIONAL PROGRAM'S GOALS	YOUR VIEW OF STUDENTS' SUCCESS WITH GOALS
Very Important Moderatel y Important Not important	**B. GENERIC COMPETENCIES**	Outstanding Moderate Poor
1 2 3 4 5	6. The ability to articulate ethical and moral principles in professional activities.	1 2 3 4 5
1 2 3 4 5	7. Development of professional engineering ethics in students through professional exposure provided by the college and linking university. .	1 2 3 4 5
1 2 3 4 5	8. The ability to integrate and apply technical advice provided by academic staff in solving technical problems.	1 2 3 4 5
1 2 3 4 5	9. Understanding of the impact of engineering on business and economics in both local and global environments.	1 2 3 4 5
1 2 3 4 5	10. The ability to undertake problem identification, formulation and solution.	1 2 3 4 5
1 2 3 4 5	11. Understanding of the needs of the engineering industry and community as a whole.	1 2 3 4 5
1 2 3 4 5	12. The capacity to demonstrate quality-assurance criteria in relation to engineering practice.	1 2 3 4 5
1 2 3 4 5	13. The ability to *demonstrate* continuous learning to overcome the obsolescence of changing technologies.	1 2 3 4 5
1 2 3 4 5	14. The capacity for lifelong learning skills and processes.	1 2 3 4 5
1 2 3 4 5	15. Awareness of the impact of global environmental changes on the development of engineering.	1 2 3 4 5

YOUR VIEW OF THE IMPORTANCE OF GOALS	SPECIFIC TRANSNATIONAL PROGRAM'S GOALS	YOUR VIEW OF STUDENTS' SUCCESS WITH GOALS
Very Important Moderatel y Important Not important	**C. MANAGEMENT AND ORGANIZATION SKILLS**	Outstanding Moderate Poor
1 2 3 4 5	16. The ability to plan and organize tasks efficiently and effectively.	1 2 3 4 5
1 2 3 4 5	17. The ability to work under minimal supervision.	1 2 3 4 5
1 2 3 4 5	18. The ability to cope with uncertainties, stress, and pressure.	1 2 3 4 5
1 2 3 4 5	19. Demonstration of initiative to explore opportunities and developing new ideas.	1 2 3 4 5
1 2 3 4 5	20. Development of teamwork through the College's extra-curricular activities.	1 2 3 4 5
1 2 3 4 5	21. The ability to contribute multidisciplinary viewpoints in problem solving.	1 2 3 4 5
1 2 3 4 5	22. The ability to brainstorm ideas in groups.	1 2 3 4 5
1 2 3 4 5	23. Capacity to work within deadlines fixed by the linking university.	1 2 3 4 5
1 2 3 4 5	24. Development of study skills in preparing for examination papers set and marked by the linking university.	1 2 3 4 5
1 2 3 4 5	25. Development of concern for personal actions and consequences through the teaching of Moral Studies.	1 2 3 4 5

YOUR VIEW OF THE IMPORTANCE OF GOALS	SPECIFIC TRANSNATIONAL PROGRAM'S GOALS	YOUR VIEW OF STUDENTS' SUCCESS WITH GOALS
Very Important Moderately Important Not mportant	**D. COMMUNICATION AND SOCIAL SKILLS**	Outstanding Moderate Poor
1 2 3 4 5	26. The acquisition of good oral communication skills through individual and group presentation of assignments in class.	1 2 3 4 5
1 2 3 4 5	27. The ability to speak and write English after a period of study in the transnational degree program.	1 2 3 4 5
1 2 3 4 5	28. The acquisition of good report writing skill.	1 2 3 4 5

SECTION C – CONTRIBUTORY ELEMENTS

What factors contribute to the success or otherwise of the transnational engineering program at Trans College?

Please indicate your views of the importance of each of the items that are identified in this section of the questionnaire**.**

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	**TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?**				
A. COURSE CURRICULUM	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
1. The prescribed degree curriculum is updated systematically to reflect the perceived needs of students and local employers.	**1**	**2**	**3**	**4**	**5**
2. The curriculum conducted at Trans College mirrors the linking university's curriculum at its own country.	**1**	**2**	**3**	**4**	**5**
3. Courses offered in the degree program of Trans College are of the same quality as of the courses offered at the linking university.	**1**	**2**	**3**	**4**	**5**
4. The degree program is delivered and assessed through appropriate levels of English usage.	**1**	**2**	**3**	**4**	**5**
5. The course content is related to technical jobs in the local market.	**1**	**2**	**3**	**4**	**5**
6. Coursework problems to be solved by students are real-life work related problems.	**1**	**2**	**3**	**4**	**5**
7. Degree students are being assessed at the same standard as students at linking university.	**1**	**2**	**3**	**4**	**5**
8. The format of the final year project is the same as that at the linking university.	**1**	**2**	**3**	**4**	**5**
9. Local staff are given adequate encouragement to provide input to the development of course curriculum.	**1**	**2**	**3**	**4**	**5**
10. The number of compulsory subjects prescribed by the local authority for the program is appropriate.	**1**	**2**	**3**	**4**	**5**

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
B. LEARNING RESOURCES	Strongly Agree		Not Sure		Strongly Disagree
11. Library facilities, multimedia teaching aids, computing and engineering laboratory provision are up-to-date.	1	2	3	4	5
12. Sufficient computers and engineering equipment are available to cater to students' needs.	1	2	3	4	5
13. Sufficient qualified local teaching staff members are hired for teaching the courses.	1	2	3	4	5
14. The course materials provided by the college tutors are comprehensive.	1	2	3	4	5
15. The course materials provided by the linking university are comprehensive.	1	2	3	4	5
16. Sufficient university teaching staff members are available to provide academic guidance to local teaching staff.	1	2	3	4	5
17. Staff with vast industry experiences are recruited by the college to teach students with up-to-date technical knowledge and skills.	1	2	3	4	5
18. Linking university staff visit the college often enough to provide advices on the day-to-day operation of the college.	1	2	3	4	5
19. The linking university provides students with adequate electronic access to its library.	1	2	3	4	5
20. Course materials are posted effectively on the webpage of the linking university.	1	2	3	4	5

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
C. TEACHING, LEARNING AND ASSESSMENT PRACTICES	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
21. Adequate monitoring by the linking university ensures effective implementation of good pedagogical practices by college teaching staff.	1	2	3	4	5
22. College tutors work hard to make lectures very interesting and stimulating.	1	2	3	4	5
23. College lecturers have strong theoretical and practical knowledge of their subjects.	1	2	3	4	5
24. College teaching staff give helpful comments and feedback to students on their work.	1	2	3	4	5
25. Marked assignments with proper feedback and comments are returned promptly to students.	1	2	3	4	5
26. College lecturers are able to facilitate discussion and group interaction in class.	1	2	3	4	5
27. Day and night lectures and practical classes are conducted to allow both full-time and part-time students to attend classes conveniently.	1	2	3	4	5
28. Input into the development of assignments and examination papers by the college teaching staff is adequate.	1	2	3	4	5
29. Input into assignments and examination question papers by the linking university staff ensures consistency in standards	1	2	3	4	5
30. The responsibility for marking and moderation of students' scripts by the college tutors and linking university staff and external examiners is appropriate.	1	2	3	4	5

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
D. LEADERSHIP	Strongly Agree		Not Sure		Strongly Disagree
31. College leaders make clear to staff and students their vision and goals for the transnational program.	1	2	3	4	5
32. Academic and management staff demonstrate a shared responsibility for ensuring the provision of quality engineering education to students.	1	2	3	4	5
33. Both the linking university and the school ensure that the engineering degree education is clearly linked to the growth of engineering industries locally and globally.	1	2	3	4	5
34. Differences of viewpoint between college staff and linking university's staff are mediated to promote strong collaborative links.	1	2	3	4	5
35. The excellence of the transnational engineering degree education is promoted to all staff and the community.	1	2	3	4	5
E. ADMINISTRATIVE SUPPORT	Strongly Agree		Not Sure		Strongly Disagree
36. The linking university and college make appropriate administrative arrangement to secure student feedback and to respond to students' feedback immediately.	1	2	3	4	5
37. The linking university and college work collaboratively to provide a reliable administrative and records management systems to properly maintain student records.	1	2	3	4	5
38. Adequate student services such as hostel accommodation, laboratory support, course and career advice are provided by the college.	1	2	3	4	5
39. Administrative and technical services are provided promptly and efficiently.	1	2	3	4	5
40. Transcripts and degree certificates are issued promptly by the linking university to graduating students.	1	2	3	4	5

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFTHAND COLUMN?				
F. STAFF AND STUDENTS' RELATIONSHIP	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
41. Linking university staff meets with students privately to gather their views and address their concerns.	1	2	3	4	5
42. College tutors play active roles in addressing students' requests with the help of university teaching staff.	1	2	3	4	5
43. University lecturers give prompt responses to students' requests.	1	2	3	4	5
44. Students receive prompt, individualized attention from the college tutors.	1	2	3	4	5
45. The college course tutors give students' confidence and motivate students to achieve at a high level.	1	2	3	4	5
46. Open and honest communication among college staff, university staff, and students is a feature of the transnational program.	1	2	3	4	5
G. PROFESSIONAL DEVELOPMENT	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
47. The formal and informal staff development sessions conducted by the linking university demonstrate its commitment to a long-term, mutually beneficial partnership.	1	2	3	4	5
48. Staff development activities organized by the linking university enhance college staff's teaching ability.	1	2	3	4	5
49. Adequate staff exchange systems are in place to facilitate high quality professional development.	1	2	3	4	5
50. Visiting lecturers from the linking university provide invaluable advice to the college's teaching staff.	1	2	3	4	5

SECTION D: RATING QUALITY, SATISFACTION AND STANDARD OF THE COURSE

In education, an indication of the quality of a programme can be measured through perceptions of satisfaction with the programme and your opinions of the standard of the programme. Please circle one number below to indicate your overall perception of quality, satisfaction, and standard of the programme.

1. How satisfied are you with the transnational engineering programmes in terms of **overall academic course delivery services** provided by the Trans College and the linking university?

	Very Satisfied			Very Dissatisfied	
Northern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**
Southern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**

2. How satisfied are you with the transnational degree engineering programmes in terms of **overall administrative services** provided by the Trans College and the linking university?

	Very Satisfied			Very Dissatisfied	
Northern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**
Southern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**

3. How relevant is the syllabi covered in the transnational engineering degree programme to the local and global technical market demand?

	Very Relevant			Very Irrelevant	
Northern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**
Southern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**

4. How would you rate the **overall standard** of the course curriculum?

	Extremely Good			Extremely Poor	
Northern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**
Southern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**

5. Overall, how satisfied are you with the **quality** of the following transnational engineering programmes?

	Very Satisfied			Very Dissatisfied	
Northern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**
Southern's B. Eng (Hons)	**1**	**2**	**3**	**4**	**5**

SECTION E

IN RETROSPECT

A) What do you regard as the three (3) most distinctive, successful features of the transnational programmme? Briefly describe these distinctive successful features here.

1.

2.

3.

B) Which aspects of the transnational undegraduate programme would you change in order to enhance its effectiveness?

1.

2.

3.

(C) Are there any aspects of the transnational programme that are hindering your successful course delivery? If so, please describe them.

1.

2.

3.

D) What is the best way for an overseas university to conduct engineering courses with students in Malaysia? On the basis of your experiences in the transnational programs, please describe briefly your recommendation.

1.

2.

I AM VERY GRATEFUL FOR YOUR ASSISTANCE WITH THIS SURVEY. THANK YOU!
B.K. CHONG.

APPENDIX A.3

Employer Survey Questionnaire

Transnational Engineering Degree: What it means and how it works.

Employers' Perceptions

This questionnaire was developed to evaluate the quality of a locally-completed foreign engineering degree graduates (Trans & Northern engineering degree graduates) and how well the Northern University and Trans College have prepared graduates to meet the changing work and professional requirements.

The questionnaire consists of four sections:

Section A seeks information about relevant personal and professional details.

Section B asks for your perceptions of the graduate attributes possessed by the Northern-Trans graduates.

Section C asks for your opinion about the factors that contribute to the success or otherwise of the transnational degree (3+0) program.

Section D investigates your overall perception of quality and satisfaction on the work performance of graduates produced the Northern University's transnational (3+0) degree programme.

Section E provides space for you to make more comments.

Please complete the attached questionnaire as comprehensively as you can. Your feedback will be used to develop a proposal to improve the distance delivery of overseas engineering undergraduate program conducted at Trans College.

Thank you in advance for your kind cooperation and support. Please return the completed questionnaire as soon as possible. If you have any questions regarding the questionnaire, please contact the undersigned.

Yours sincerely

SECTION A – PERSONAL AND PROFESSIONAL DETAIL

PLEASE INDICATE YOUR PERSONAL AND PROFESSIONAL DETAILS BY WRITING CLEARLY IN THE SPACES PROVIDED OR TICKING THE BOX THAT BEST DESCRIBES YOU.

1. Age (years):

☐ 27 - 30 ☐ 36 -- 45

☐ 31 – 35 ☐ 45 -- 55

2. Gender: ☐ M ☐ F

3. Marital Status: ☐ Single ☐ Married

4. Name of the company attached to: ______________________________

5. Position at the company:__________________________

6. Years of working experience:_____________________________

7. No. of years at the current position:_______________

8. Responsibility at the company:_________________________________

9. University graduated from:____________________________________

10. Number of employees under your supervision:

Less than 10 ☐	31 to 50 ☐
11 to 20 ☐	51 to 100 ☐
21 to 30 ☐	More than 100 ☐

SECTON B: THE TRANSNATIONAL ENGINEERING DEGREE- *GOALS AND ACHIEVEMENTS*

Employers' Perceptions

Please reflect upon your job supervision experiences and how you rate the attributes of university graduates who have been working in your organization within the first twelve months of employment. Evaluate the work performance of Northern University's transnational ("3+0") graduates who are currently under your work supervision.

In each column, circle one response to each of the items that are listed. In the left-hand column, your responses will indicate your views regarding the importance of <u>the key competencies in relation to your organization.</u> In the right-hand column, your responses will indicate your perceptions of the performances of Northern University's transnational ("3+0") <u>graduates who are currently under your work supervision</u>.

IMPORTANCE OF THIS COMPENTENCY TO YOU	**GRADUATES' ATTRIBUTES**	**YOUR VIEW ON WORK PERFORMANCE OF TRANS-NORTHERN'S GRADUATES AT YOUR WORKPLACE**
Very Important Moderately Important Not Important	**A. TECHNICAL COMPETENCIES**	**Outstanding Moderate Poor**
1 2 3 4 5	1. My employee is able to apply mathematics, science and engineering knowledge in modelling and analysing engineering problems.	1 2 3 4 5
1 2 3 4 5	2. My employee is able to use software simulation tools to analyse engineering problems and develop solutions to the problems.	1 2 3 4 5
1 2 3 4 5	3. My employee is able to use test and measurement equipment to design, conduct experiments and analyse experimental data.	1 2 3 4 5
1 2 3 4 5	4. My employee is able to use given specifications for designing a prescribed engineering system.	1 2 3 4 5
1 2 3 4 5	5. My employee is able to design alternative systems based on technical and non-technical criteria.	1 2 3 4 5

Very Important		Moderately Important		Not Important	B. GENERIC COMPETENCIES	Outstanding		Moderate		Poor
1	2	3	4	5	6. My employee knows how to apply ethical and moral principles in professional activities.	1	2	3	4	5
1	2	3	4	5	7. My employee has clear display of professional engineering ethics in him/her.	1	2	3	4	5
1	2	3	4	5	8. My employee can integrate and apply technical advice provided by the academic staff in solving technical problems.	1	2	3	4	5
1	2	3	4	5	9. My employee understands the impact of engineering on business and economics in both local and global environments.	1	2	3	4	5
1	2	3	4	5	10. My employee is able to undertake problem identification, formulation and develop solution to problem.	1	2	3	4	5
1	2	3	4	5	11. My employee understands the needs of the engineering industry and community as a whole.	1	2	3	4	5
1	2	3	4	5	12. My employee is able to demonstrate quality-assurance criteria in relation to engineering practice.	1	2	3	4	5
1	2	3	4	5	13. My employee demonstrates continuous learning to overcome the obsolescence of changing technologies.	1	2	3	4	5
1	2	3	4	5	14. My employee has developed lifelong learning skills.	1	2	3	4	5
1	2	3	4	5	15. My employee is aware of the impact of global environmental changes on the development of engineering.	1	2	3	4	5

Very Important	Moderately Important	Not important			C. MANAGEMENT AND ORGANIZATION SKILLS	Outstanding	Moderate			Poor
1	2	3	4	5	16. My employee is able to plan and organize tasks efficiently and effectively.	1	2	3	4	5
1	2	3	4	5	17. My employee is able to work under minimal supervision.	1	2	3	4	5
1	2	3	4	5	18. My employee is able to cope with uncertainties, stress, and pressure.	1	2	3	4	5
1	2	3	4	5	19. My employee takes initiative to explore opportunities and develop new ideas.	1	2	3	4	5
1	2	3	4	5	20. My employee is able to work in teams.	1	2	3	4	5
1	2	3	4	5	21. My employee is able to contribute multidisciplinary viewpoints in problem solving.	1	2	3	4	5
1	2	3	4	5	22. My employee is able to brainstorm ideas in groups.	1	2	3	4	5
1	2	3	4	5	23. My employee has the capacity to work within deadlines fixed by the linking university.	1	2	3	4	5
1	2	3	4	5	24. My employee has acquired good management and organization skills.	1	2	3	4	5
1	2	3	4	5	25. My employee has concern for personal actions and consequences after studying Moral Studies.	1	2	3	4	5

Very Important Moderatel y Important Not important	D. COMMUNICATION AND SOCIAL SKILLS	Outstanding Moderate Poor
1 2 3 4 5	26. My employee has acquired good oral communication skills.	1 2 3 4 5
1 2 3 4 5	27. My employee is able to speak and write good English after studying in the degree program.	1 2 3 4 5
1 2 3 4 5	28. My employee has acquired good report writing skill.	1 2 3 4 5

SECTION C – CONTRIBUTORY ELEMENTS

There are many factors which contribute to good preparation of graduates (or otherwise) by the linking university at the Trans College. Through your supervision of the Northern University's "3+0" graduates, and from your observation of graduates' attribute, indicate the factors which you think have contributed to the success or otherwise of the "3+0" programme at Trans College.

Please indicate your views of the importance of each of the items that are identified in this section of the questionnaire**.**

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFT HAND COLUMN?				
A. COURSE CURRICULUM	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
1. The prescribed university degree curriculum is closely related to the job requirements as little training is required for the Northern's "3+0" fresh graduates.	1	2	3	4	5
2. From the observation of fresh graduates' performance, the difference in standard between Northern University's transnational engineering graduates and overseas graduates of similar ranking universities is not noticeable.	1	2	3	4	5
3. As the course is entirely conducted in English, the English linguistic skills of the Northern's transnational fresh graduates are good.	1	2	3	4	5
4. The ability of fresh graduates in solving real-life work related problems indicates that "3+0" engineering students have been exposed to this type of problem-solving cases during their course of studies.	1	2	3	4	5
B. LEARNING RESOURCES					
5. Due to good provision of learning resources, Northern's "3+0" graduates are familiar with the latest engineering equipment and software.	1	2	3	4	5
6. Northern's "3+0" fresh graduates can fit into workplaces and perform well because lecturers at Trans College are qualified academically and equipped with industry working experience	1	2	3	4	5

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFT HAND COLUMN?				
C. TEACHING, LEARNING AND ASSESSMENT PRACTICES	Strongly Agree		Not Sure		Strongly Disagree
7. The excellent quality of instruction provided by college tutors is clearly revealed in graduates' ability in performing their work.	1	2	3	4	5
8. The helpful feedback provided by lecturers to students on their work have trained graduates to be able to provide good feedback and comments.	1	2	3	4	5
9. Some factories' employees are able to enrol in this program as day and night lectures and practical classes are conducted for working students.	1	2	3	4	5
10. After going through the program, my employees have learned the skills of facilitating group discussion from lecturers.	1	2	3	4	5
D. LEADERSHIP					
11. Most of the employers know the vision and goals for the transnational ("3+0" program) degree program.	1	2	3	4	5
12. The excellence of the transnational degree engineering degree education is promoted to all manufacturing firms.	1	2	3	4	5
E. ADMINISTRATIVE SUPPORT					
13. The linking university and college are able to provide reliable details about graduates' when requested by employers to do so.	1	2	3	4	5
14. Adequate student services such as hostel accommodation, laboratory support, course and career advice are provided by the college.	1	2	3	4	5
15. Due to prompt and efficient administrative and technical services provided by the college, graduates are able to submit relevant documents to the company within a short timeframe.	1	2	3	4	5
16. Fresh graduates have no difficulty in presenting their certificates and transcripts during job interviews.	1	2	3	4	5

FACTORS THAT INFLUENCE THE SUCCESS OF THE PROGRAM	TO WHAT EXTENT DO YOU AGREE WITH THE STATEMENT IN THE LEFT HAND COLUMN?				
F. STAFF AND STUDENTS' RELATIONSHIP	**Strongly Agree**		**Not Sure**		**Strongly Disagree**
17. My employee does not hesitate to seek help from university lecturers and college tutors even though they have graduated.	1	2	3	4	5
18. Open and honest communication among staff, university staff, and students is a feature of the transnational program.	1	2	3	4	5
G. PROFESSIONAL EXPOSURE					
19. Students have the opportunities to attend both formal and informal guest lectures organized in and outside the college.	1	2	3	4	5
20. Students are given opportunities to undergo industrial training in manufacturing firms.	1	2	3	4	5

SECTION D: RATING QUALITY, SATISFACTION AND STANDARD OF THE ENGINEERING GRADUATES PRODUCED BY THE TRANS COLLEGE AND NORTHERN UNIVERSITY

In education, the indication of the quality of a programme can be measured through your perceptions of the quality of graduates produced. Please tick (√) one of the boxes below to indicate your overall perception of the quality of graduates jointly produced by the Trans College and Northern University.

1. Based on your professional experience and opportunities to observe the performance of engineering degree graduates produced by the Northern University and Trans College, what is your impression about the overall quality of the graduates?

Excellent ☐ Good ☐ Satisfactory ☐ Fair ☐ Poor ☐

2. How do Northern University-Trans College's graduates compared with graduates from other universities in regards to general characteristics expected of university graduates?

   Much better ☐

   Somewhat better ☐

   About the same ☐

   Not as good ☐

   Much worse ☐

3. How effective is the Northern University--Trans College in preparing graduates to meet the needs of the work force?

   Very effective ☐

   Effective ☐

   Somewhat effective ☐

   Ineffective ☐

   Very ineffective ☐

SECTION E

IN RETROSPECT

A) What do you regard as the three (3) most distinctive, successful features of the graduates produced by the Northern University and Trans College? Briefly describe these distinctive successful features here.

1. ______________________________

2. ______________________________

3. ______________________________

B) What are the some other important skills which you think should be possessed by the transnational graduates of the Northern University from Trans College?

1. ______________________________

2. ______________________________

C) Which aspects of the locally-completed foreign degree program (in terms of academic curriculum, learning resources, teaching and learning practices, administrative support, leadership, etc.) would you change in order to enhance its effectiveness in preparation of graduates for employment?

1. ______________________________

2. ______________________________

3. ______________________________

D) What is the best way for an overseas university to conduct engineering courses with students in Malaysia? Do you think that the transnational degree program arrangement (3+0 program arrangement) at Trans College is appropriate?

1. ______________________________

2. ______________________________

I AM VERY GRATEFUL FOR YOUR ASSISTANCE WITH THIS SURVEY. THANK YOU!

B.K. CHONG.

APPENDIX B

Results of Quantitative Analysis

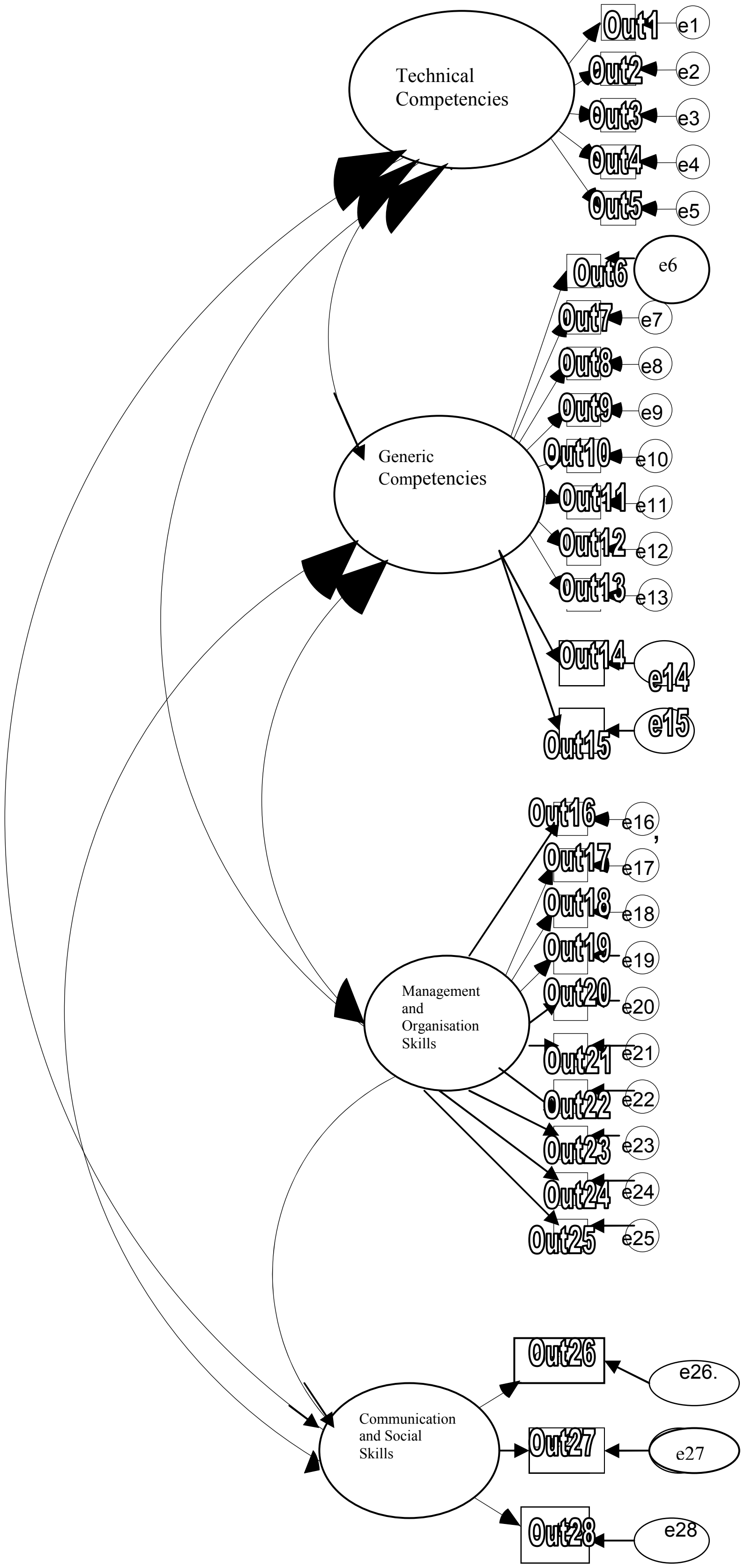

Figure B.1
Path Diagram for the 4-Dimension *Outcomes* Construct
Note: "Out" referred to be as *Outcomes* item

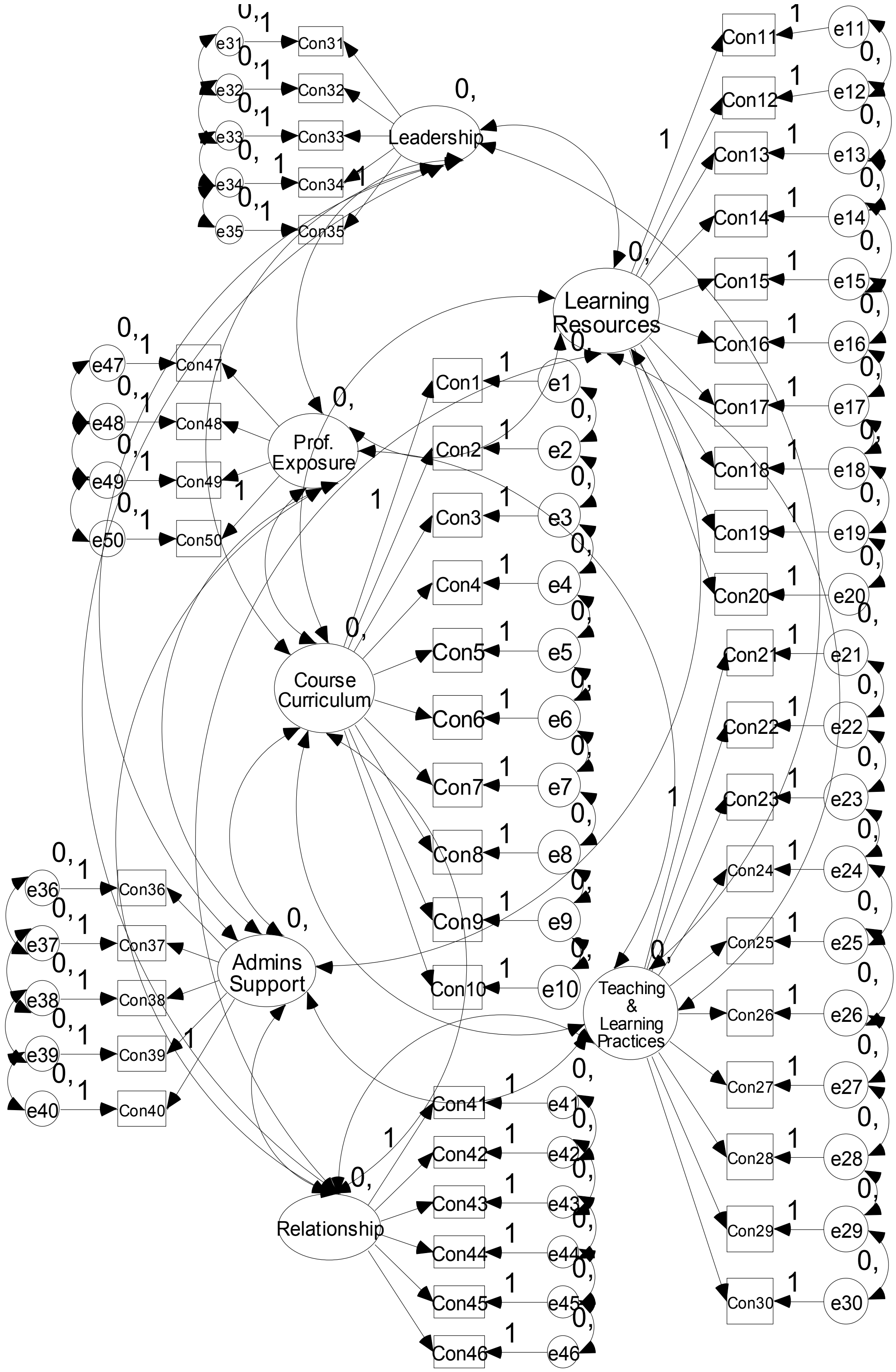

Figure B.2

Path Diagram for the 7-Dimension *Contributory* Construct

Note: “Con” referred to be as *Contributory* item

Table B.1
Eigenvalues of Outcomes Dimensions for the Proposed *Outcomes* Construct
(Total Variance Explained)

Dimension	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.665	30.948	30.948	3.952	14.113	14.113
2	2.364	8.444	39.392	2.929	10.460	24.572
3	1.883	6.723	46.115	2.616	9.341	33.914
4	1.379	4.926	51.041	2.476	8.843	42.756
5	1.227	4.383	55.424	2.448	8.742	51.498
6	1.130	4.037	59.461	1.949	6.961	58.459
7	1.040	3.713	63.174	1.320	4.715	63.174
8	.910	3.251	66.425			
9	.862	3.077	69.502			
10	.744	2.657	72.159			
11	.741	2.646	74.805			
12	.706	2.522	77.328			
13	.651	2.326	79.654			
14	.614	2.191	81.845			
15	.575	2.052	83.897			
16	.544	1.942	85.839			
17	.482	1.721	87.560			
18	.456	1.630	89.190			
19	.439	1.568	90.758			
20	.396	1.415	92.173			
21	.377	1.345	93.518			
22	.349	1.245	94.763			
23	.331	1.181	95.944			
24	.285	1.019	96.963			
25	.273	.974	97.937			
26	.232	.829	98.766			
27	.187	.669	99.435			
28	.158	.565	100.000			

Extraction Method: Principal Component Analysis.

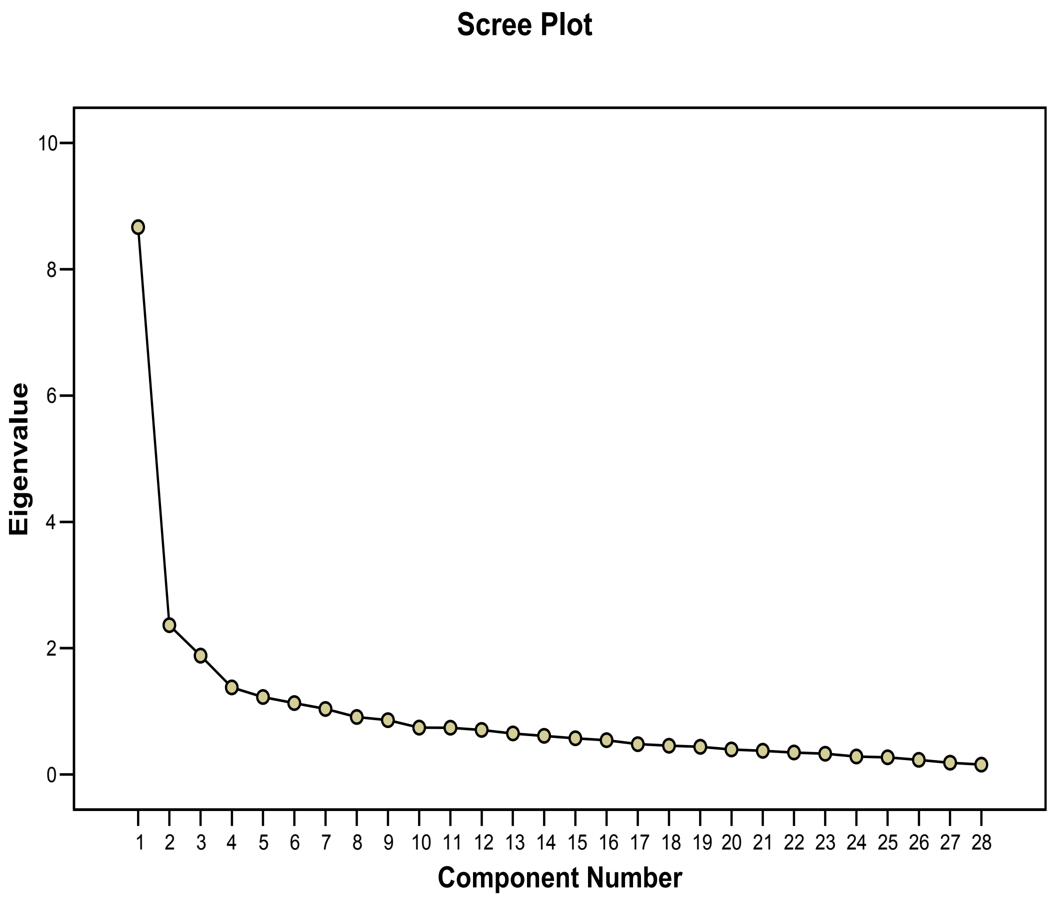

Figure B.3
Scree Plot for the Proposed *Outcomes* Construct with 28 Items (Exploratory Factor Analysis for the Proposed *Outcomes* Construct)

Table B.2
Exploratory Factor Analysis of the Proposed *Outcomes* Construct (Communalities)

***Outcomes* Item**	Initial
1. Application of maths and science	1.000
3. Use test and measurement equipment	1.000
4. Use given specification for design	1.000
5. Design alternative systems	1.000
7. Learned professional engineering ethics	1.000
8. Integrate & apply technical advice provided	1.000
9. Understand impact of engineering on business	1.000
10. Can undertake problem identification & solution	1.000
11. Understand the needs of engineering industry	1.000
12. Demonstrate quality-assurance criteria in engineering practice	1.000
13. Demonstrate continuous learning to overcome obsolescence in technology	1.000
14. Develop lifelong learning skill	1.000
15. Aware of the impact of global changes in engineering	1.000
16. Plan & organize tasks efficiently	1.000
17. Work under minimal supervision	1.000
18. Cope with uncertainty and stress	1.000
19. Initiative in exploring opportunity	1.000

Table B.2 (cont'd)

20. Work in team through college's extra curricular activities	1.000
21. Contribute multidisciplinary viewpoints in solving points	1.000
22. Brainstorm ideas in groups	1.000
23. Can work within university deadlines	1.000
24. Develop study skill in preparing for exam	1.000
26. Good communication skills	1.000
27. Able to speak and write good English	1.000
28. Acquire good report writing skill	1.000
2. Use software simulation tools	1.000
6. Apply ethical & moral principles	1.000
25. Show concern to people	1.000

Extraction Method: Principal Component Analysis.

Table B.3
Rotated Component Matrix for the Proposed 4-Dimension *Outcomes* Construct

***Outcomes* Items**	**Dimension**						
	1	2	3	4	5	6	7
12. Demonstrate quality-assurance criteria in engineering practice	**.769**						
14. Develop lifelong learning skill	**.706**						
13. Demonstrate continuous learning to overcome obsolescence in technology	**.693**						
8. Integrate & apply technical advice provided	**.637**						
11. Understand the needs of engineering industry	**.595**	.304					
15. Aware of the impact of global changes in engineering	**.571**						.303
9. Understand impact of engineering on business	**.563**					.333	
7. Learned professional engineering ethics	**.503**				.385		.375
27. Able to speak and write good English		**.832**					
26. Good communication skills		**.710**					
28. Acquire good report writing skill		**.698**					
19. Initiative in exploring opportunity		**.491**	.316				
23. Can work within university deadlines			**.851**				
24. Develop study skill in preparing for exam			**.794**				
16. Plan & organize tasks efficiently			**.517**		.463		
2. Use software simulation tools	.312			**.729**			
4. Use given specification for design				**.705**			
5. Design alternative systems				**.668**			
3. Use test and measurement equipment				**.560**	.308	.374	
6. Apply ethical & moral principles					**.746**		
1. Application of maths and science				**.459**	.566		
18. Cope with uncertainty and stress		.457			**.517**		
10. Can undertake problem identification & solution	**.404**				.515		
17. Work under minimal supervision		.434	**.408**		.452		
20. Work in team through college's extra curricular activities						**.868**	
21. Contribute multidisciplinary viewpoints in solving points			.353			**.569**	
22. Brainstorm ideas in groups			.413			**.456**	
25. Show concern to people							**.774**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 9 iterations.
b. Figures in bold have factor loading above 0.4
Q1 and Q28 means Question 1 to Question 28

Table B.4
Eigenvalues of the Proposed *Outcomes* Construct—Total Variance Explained (after deleting Q6, Q18, and Q25)

Dimension	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.071	32.284	32.284	3.998	15.992	15.992
2	2.217	8.867	41.151	2.959	11.834	27.826
3	1.788	7.151	48.302	2.742	10.969	38.795
4	1.359	5.434	53.736	2.651	10.604	49.399
5	1.066	4.263	57.999	2.150	8.600	57.999
6	.961	3.843	61.842			
7	.922	3.688	65.530			
8	.899	3.597	69.127			
9	.767	3.066	72.194			
10	.732	2.927	75.121			
11	.669	2.676	77.797			
12	.657	2.626	80.423			
13	.578	2.313	82.736			
14	.545	2.182	84.918			
15	.499	1.997	86.915			
16	.471	1.882	88.797			
17	.453	1.814	90.611			
18	.410	1.640	92.251			
19	.362	1.450	93.700			
20	.344	1.376	95.076			
21	.314	1.256	96.332			
22	.283	1.130	97.463			
23	.265	1.060	98.523			
24	.201	.802	99.325			
25	.169	.675	100.000			

Extraction Method: Principal Component Analysis.

Table B.5
Rotated Component Matrix for the Proposed *Outcomes* Construct
(after deleting Q6, Q18, and Q25)

	Dimension				
	1	2	3	4	5
12. Demonstrate quality-assurance criteria in engineering practice	**.748**				
14. Develop lifelong learning skill	**.719**				
13. Demonstrate continuous learning to overcome obsolescence in technology	**.675**				
15. Aware of the impact of global changes in engineering	**.650**				
8. Integrate & apply technical advice provided	**.649**	.305			
9. Understand impact of engineering on business	**.567**				.358
7. Learned professional engineering ethics	**.549**				
11. Understand the needs of engineering industry	**.544**			.353	
10. Can undertake problem identification & solution	**.447**				.384
23. Can work within university deadlines		**.849**			
24. Develop study skill in preparing for exam		**.805**			
16. Plan & organize tasks efficiently		**.604**			
17. Work under minimal supervision		**.486**		.345	
22. Brainstorm ideas in groups		**.448**			.432
5. Design alternative systems			**.715**		
4. Use given specification for design			**.699**		
2. Use software simulation tools			**.649**		
3. Use test and measurement equipment			**.636**		.394
1. Application of maths and science			**.574**		.405
27. Able to speak and write good English				**.844**	
28. Acquire good report writing skill				**.719**	
26. Good communication skills				**.714**	
19. Initiative in exploring opportunity		.373	.351	**.458**	
20. Work in team through college's extra curricular activities					**.816**
21. Contribute multidisciplinary viewpoints in solving points		.372			**.588**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 6 iterations.
b. Figures in bold have factor loading above 0.4
Q1 and Q28 means Question 1 to Question 28

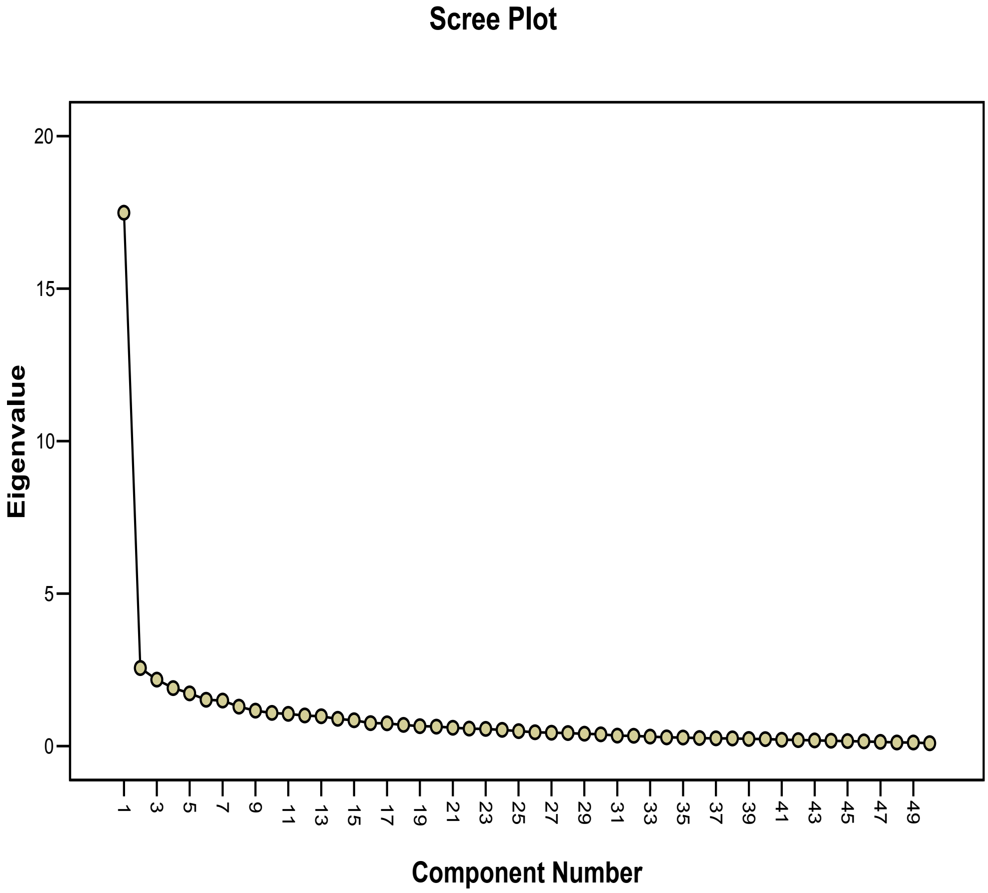

Figure B.4
Scree Plot for the Proposed 7-Dimension *Contributory* Construct
(Using Exploratory Factor Analysis)

Table B.6
Eigenvalues of the Proposed *Contributory* Construct
(Total Variance Explained)

Dimension	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	17.489	34.979	34.979	4.466	8.932	8.932
2	2.561	5.123	40.101	4.100	8.199	17.131
3	2.182	4.363	44.465	3.801	7.603	24.734
4	1.904	3.808	48.273	3.461	6.922	31.656
5	1.731	3.462	51.735	3.099	6.199	37.854
6	1.523	3.046	54.781	3.041	6.082	43.936
7	1.492	2.983	57.764	2.693	5.387	49.323
8	1.296	2.591	60.356	2.686	5.373	54.696
9	1.165	2.331	62.686	2.664	5.327	60.023
10	1.089	2.177	64.864	1.722	3.444	63.467
11	1.060	2.120	66.984	1.438	2.875	66.342
12	1.005	2.010	68.994	1.326	2.651	68.994
13	.980	1.960	70.953			
14	.896	1.791	72.744			
15	.847	1.695	74.439			
16	.756	1.512	75.951			
17	.748	1.496	77.448			
18	.695	1.390	78.838			
19	.658	1.316	80.154			
20	.641	1.283	81.437			
21	.605	1.210	82.647			
22	.574	1.148	83.795			
23	.566	1.131	84.927			
24	.534	1.068	85.995			
25	.494	.989	86.984			
26	.455	.910	87.893			
27	.442	.883	88.776			
28	.431	.862	89.638			
29	.408	.815	90.453			
30	.389	.778	91.231			
31	.346	.692	91.923			
32	.337	.675	92.598			
33	.311	.622	93.220			
34	.291	.581	93.801			
35	.283	.567	94.368			
36	.266	.533	94.901			
37	.257	.514	95.415			
38	.252	.505	95.919			
39	.238	.476	96.395			
40	.231	.463	96.858			
41	.212	.425	97.283			
42	.199	.399	97.681			
43	.189	.378	98.059			
44	.178	.356	98.415			
45	.164	.329	98.743			
46	.154	.309	99.052			
47	.139	.277	99.330			
48	.120	.240	99.569			
49	.119	.237	99.807			
50	.097	.193	100.000			

Table B.7
Rotated Component Matrix for 7-Dimension *Contributory* Construct

	Dimension						
***Contributory* Item**	1	2	3	4	5	6	7
3. Course offered is of the same quality	**.719**						
4. Degree program is delivered and assessed in English	**.651**						
7. Linking university assess KDU's students at the same standard	**.648**						
6. Coursework problems are real-life work related problems	**.635**						
5. Course content is related to technical needs of the job market	**.575**						
9. College lecturers provide input to the development of course curriculum	**.559**						.431
8. Students have to follow the same final year project's format	**.553**						
2. Curriculum mirrors linking university's curriculum	**.536**		.319				.377
1. Curriculum is updated systematically	**.508**						
22. College tutors make lecture very interesting and simulating		**.723**					.309
23. College lecturers have strong theoretical and practical knowledge	.380	**.680**					
21. College teaching staff implement good pedagogical practices effectively		**.609**					.347
24. College teaching staff give helpful feedback to students' works		**.555**	.405				
44. Students receive prompt, individualized attention from college tutors		**.529**				.351	
26. College lecturers are able to facilitate discussion in class		**.528**		.384			
39.Administrative and technical services are provided promptly and efficiently			**.707**				
38. Adequate student services are provided by the college			**.636**				
31. College leaders make clear to all the vision and goals for the degree program			**.588**				
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision			**.577**				
37. Administrative and records management system maintain student records effectively			**.517**				
19. Adequate electronic access to linking university's library			**.487**		**.473**		

Table B.7 (cont'd)

***Contributory* Item**	1	2	3	4	5	6	7
40.Transcripts and degree certificates are issued promptly by linking university.			**.483**	.323			
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately		.403	**.461**			.353	
27. Day and night lectures and practical classes are available			**.458**	.374			
34. Strong collaboration link between linking university and college				**.697**			
35. The excellence of engineering degree education is promoted to students and community				**.612**			
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries	.341			**.606**			
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession				**.587**			.377
29. Input by linking university staff ensure consistency in assignments and examination papers				**.513**			
28. College teaching staff provide input to the development of assignments and examination papers		.427		**.480**			
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate		.337		**.446**			
15. Course materials provided by linking university are comprehensive					**.717**		
17. Sufficient college teaching staff with extensive industry experiences are available					**.668**	.336	
20. Course materials are posted effectively on linking university's webpage			.346		**.636**		
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff					**.610**		
14. Course materials provided by college tutor are comprehensive		.305			**.593**		.419
18. Sufficient linking university staff provide students with advice on daily questions					**.532**		.400
13. Sufficient qualified local teaching staff members are available		.466			**.474**		.335
25. Marked assignments are returned with proper feedback and comments		.339			**.376**		
46. There is open and honest communication among college staff, university staff and students						**.676**	

Table B.7 (cont'd)

***Contributory* Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
45. College course tutors give students' confidence and motivate students to achieve at a high level		.404				**.648**	
43. University lecturers give prompt responses to students' requests						**.622**	
41. Linking university staff meet with students privately to gather their views and address their concerns						**.622**	
42. College tutors play active roles in addressing students' requests		.367				**.570**	
11. Library facilities, teaching aids, computing & engineering lab provision are up-to-date							**.669**
12. Sufficient computers and engineering equipment are available							**.637**
10. The number of Wajib subjects prescribed is appropriate							**.523**
49. Adequate student exchange systems are in place to facilitate professional development				.386		.376	***.466***
48. Students understand professional engineering practice through professional exposure activities organized by the school				.419		.372	***.464***
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university				.381		.391	***.428***

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 15 iterations.
b. Items in bold have factor loadings of more than 0.4.

Table B.8
Rotated Component Matrix for 8-Dimension *Contributory* Construct
(with no deletion of item)

Contributory Item	Dimension							
	1	2	3	4	5	6	7	8
3. Course offered is of the same quality	**.733**							
7. Linking university assess transnational students at the same standard	**.660**							
4. Degree program is delivered and assessed in English	**.655**							
6. Coursework problems are real-life work related problems	**.622**							
9. College lecturers provide input to the development of course curriculum	**.581**						.339	
5. Course content is related to technical needs of the job market	**.567**							
8. Students have to follow the same final year project's format	**.566**							
2. Curriculum mirrors linking university's curriculum	**.509**						.474	
1. Curriculum is updated systematically	**.477**					.315		
35. The excellence of engineering degree education is promoted to students and community		**.755**						
34. Strong collaboration link between linking university and college		**.751**						
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries		**.661**						
28. College teaching staff provide input to the development of assignments and examination papers		**.501**	.373					
29. Input by linking university staff ensure consistency in assignments and examination papers		**.488**						
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate		**.464**						
25. Marked assignments are returned with proper feedback and comments		.411			**.355**			
22. College tutors make lecture very interesting and simulating			**.747**					
21. College teaching staff implement good pedagogical practices effectively			**.697**					.342
23. College lecturers have strong theoretical and practical knowledge	.352	.368	**.603**					
24. College teaching staff give helpful feedback to students' works			**.498**	.399				
44. Students receive prompt, individualized attention from college tutors		.311	**.481**			.373		
26. College lecturers are able to facilitate discussion in class		.449	**.469**			.305		

Table B.8 (cont'd)

***Contributory* Item**	**Dimension**							
	1	2	3	4	5	6	7	8
13. Sufficient qualified local teaching staff members are available			.446		**.441**		.370	
39.Administrative and technical services are provided promptly and efficiently				**.725**				
38. Adequate student services are provided by the college				**.678**				
37. Administrative and records management system maintain student records effectively				**.551**				
40. Transcripts and degree certificates are issued promptly by linking university.				**.529**				
31. College leaders make clear to all the vision and goals for the degree program		.399		.506			.301	
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision		.333		**.506**			.356	
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately			.377	**.462**		.364		
27. Day and night lectures and practical classes are available		.424		**.450**				
15. Course materials provided by linking university are comprehensive					**.724**			
17. Sufficient college teaching staff with extensive industry experiences are available					**.665**	.325		
20. Course materials are posted effectively on linking university's webpage					**.631**			
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff					**.601**			.346
14. Course materials provided by college tutor are comprehensive			.343		**.565**		.350	
18. Sufficient linking university staff visit the college often enough to advice on daily questions					**.512**		.476	
19. Adequate electronic access to linking university's library				.433	**.471**		.352	
46. There is open and honest communication among college staff, university staff and students						**.704**		
45. College course tutors give students' confidence and motivate students to achieve at a high level			.369			**.660**		
43. University lecturers give prompt responses to students' requests						**.627**		

Table B.8 (cont'd)

***Contributory* Item**	**Dimension**							
	1	2	3	4	5	6	7	8
41. Linking university staff meet with students privately to gather their views and address their concerns						**.605**		
42. College tutors play active roles in addressing students' requests			.368			**.556**		
11. Library facilities, teaching aids, computing & engineering lab provision are up-to-date							**.767**	
12. Sufficient computers and engineering equipment are available							**.690**	
10. The number of Wajib subjects prescribed is appropriate							***.440***	
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession								**.729**
49. Adequate student exchange systems are in place to facilitate professional development								**.644**
48. Students understand professional engineering practice through professional exposure activities organized by the school								**.563**
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university						.319		**.495**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 9 iterations.

Table B.9
Rotated Component Matrix for 8-Dimension *Contributory* Construct (with deletion of item 10)

Contributory Item	Dimension							
	1	2	3	4	5	6	7	8
3. Course offered is of the same quality	**.733**							
7. Linking university assess transnational engineering students at the same standard	**.657**							
4. Degree program is delivered and assessed in English	**.652**							
6. Coursework problems are real-life work related problems	**.624**							
9. College lecturers provide input to the development of course curriculum	**.590**						.339	
5. Course content is related to technical needs of the job market	**.577**							
8. Students have to follow the same final year project's format	**.566**							
2. Curriculum mirrors linking university's curriculum	**.515**						.474	
1. Curriculum is updated systematically	**.477**				.321			
35. The excellence of engineering degree education is promoted to students and community		**.752**						
34. Strong collaboration link between linking university and college		**.748**						
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries		**.661**						
28. College teaching staff provide input to the development of assignments and examination papers		**.500**	.375					
29. Input by linking university staff ensure consistency in assignments and examination papers		**.487**						
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate		**.461**	.303					
25. Marked assignments are returned with proper feedback and comments		.411				**.340**	.308	
22. College tutors make lecture very interesting and simulating			**.753**					
21. College teaching staff implement good pedagogical practices effectively			**.702**					.336
23. College lecturers have strong theoretical and practical knowledge	.355	.368	**.605**					

Table B.9 (cont'd)

Contributory **Item**	**Dimension**							
	1	2	3	4	5	6	7	8
24. College teaching staff give helpful feedback to students' works			**.490**	.403				
44. Students receive prompt, individualized attention from college tutors		.307	.480		**.375**			
26. College lecturers are able to facilitate discussion in class		.448	**.469**		.311			
13. Sufficient qualified local teaching staff members are available			.451			**.418**	.390	
39.Administrative and technical services are provided promptly and efficiently				**.726**				
38. Adequate student services are provided by the college				**.679**				
37. Administrative and records management system maintain student records effectively				**.552**				
40. Transcripts and degree certificates are issued promptly by linking university.				**.533**				
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision		**.333**		.508			.351	
31. College leaders make clear to all the vision and goals for the degree program		**.399**		.508			.300	
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately			.373	**.462**	.378			
27. Day and night lectures and practical classes are available		.422		**.452**				
19. Adequate electronic access to linking university's library				.441		**.405**	.415	
46. There is open and honest communication among college staff, university staff and students					**.710**			
45. College course tutors give students' confidence and motivate students to achieve at a high level			.359		**.676**			
43. University lecturers give prompt responses to students' requests					**.634**			
41. Linking university staff meet with students privately to gather their views and address their concerns					**.593**			
42. College tutors play active roles in addressing students' requests			.361		**.561**			

Table B.9 (cont'd)

Contributory **Item**	**Dimension**							
	1	2	3	4	5	6	7	8
15. Course materials provided by linking university are comprehensive						**.742**		
17. Sufficient college teaching staff with extensive industry experiences are available					.329	**.660**		
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff						**.617**		.327
20. Course materials are posted effectively on linking university's webpage						**.612**		
14. Course materials provided by college tutor are comprehensive			.350			**.555**	.360	
11. Library facilities, teaching aids, computing & engineering lab provision are up-to-date							**.766**	
12. Sufficient computers and engineering equipment are available							**.699**	
18. Sufficient linking university staff provide students with advice on daily questions						**.457**	.523	
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession								**.735**
49. Adequate student exchange systems are in place to facilitate professional development								**.644**
48. Students understand professional engineering practice through professional exposure activities organized by the school								**.580**
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university							.300	**.521**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 8 iterations.
b. Items in bold have factor loadings of more than 0.4.

Table B.10
***Contributory* Dimensions and Items of the 8-Dimension *Contributory* Construct (derived from Exploratory Factor Analysis)**

Course Curriculum
3. Course offered is of the same quality
7. Linking university assess transnational engineering students at the same standard
4. Degree program is delivered and assessed in English
6. Coursework problems are real-life work related problems
9. College lecturers provide input to the development of course curriculum
5. Course content is related to technical needs of the job market
8. Students have to follow the same final year project's format
2. Curriculum mirrors linking university's curriculum
1. Curriculum is updated systematically
Leadership
35. The excellence of engineering degree education is promoted to students and community
34. Strong collaboration link between linking university and college
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries
28. College teaching staff provide input to the development of assignments and examination papers
29. Input by linking university staff ensure consistency in assignments and examination papers
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate
31. College leaders make clear to all the vision and goals for the degree program
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision
Teaching, Learning, and Assessment Practices
22. College tutors make lecture very interesting and simulating
21. College teaching staff implement good pedagogical practices effectively
23. College lecturers have strong theoretical and practical knowledge
24. College teaching staff give helpful feedback to students' works
26. College lecturers are able to facilitate discussion in class
Administrative Support
39.Administrative and technical services are provided promptly and efficiently
38. Adequate student services are provided by the college
37. Administrative and records management system maintain student records effectively
40. Transcripts and degree certificates are issued promptly by linking university.
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately
27. Day and night lectures and practical classes are available
Staff and Students' Relationship
46. There is open and honest communication among college staff, university staff and students
45. College course tutors give students' confidence and motivate students to achieve at a high level
44. Students receive prompt, individualized attention from college tutors
43. University lecturers give prompt responses to students' requests
41. Linking university staff meet with students privately to gather their views and address their concerns
42. College tutors play active roles in addressing students' requests

Table B.10 (cont'd)

Learning Resources
13. Sufficient qualified local teaching staff members are available
15. Course materials provided by linking university are comprehensive
17. Sufficient college teaching staff with extensive industry experiences are available
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff
19. Adequate electronic access to linking university's library
20. Course materials are posted effectively on linking university's webpage
25. Marked assignments are returned with proper feedback and comments
14. Course materials provided by college tutor are comprehensive
18. Sufficient linking university staff are available to provide students with advice on daily questions
Tangibles
11. Library facilities, teaching aids, computing & engineering lab provision are up-to-date
12. Sufficient computers and engineering equipment are available
Professional Exposure
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession
49. Adequate student exchange systems are in place to facilitate professional development
48. Students understand professional engineering practice through professional exposure activities organized by the school
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university

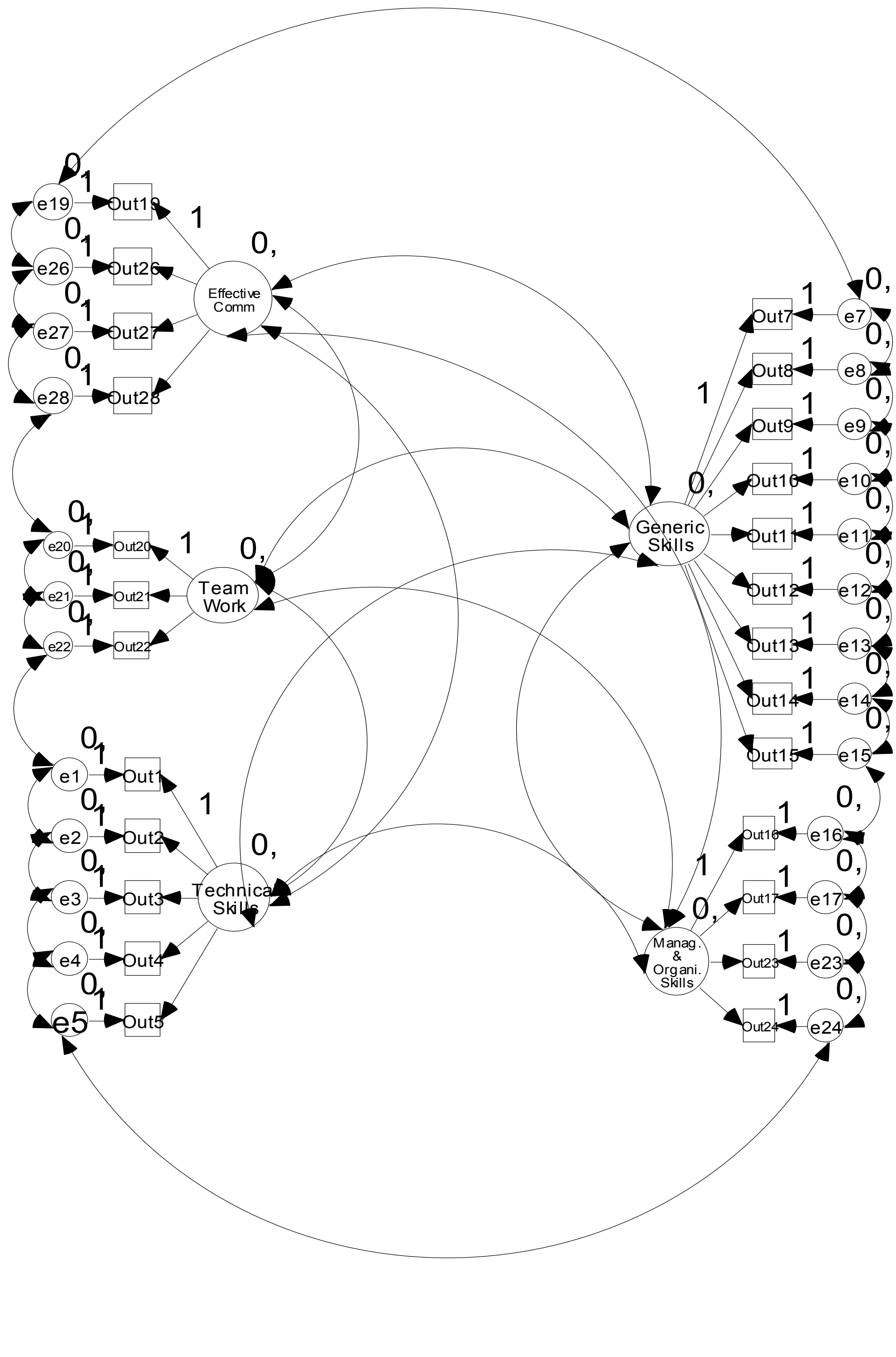

Figure B.5

Path Diagram for the 5-Dimension *Outcomes* Construct

Note: "Out1 to Out28" represent Question 1 to 28 of the *Outcomes* survey items. (Q6, Q18 and Q25 were deleted)

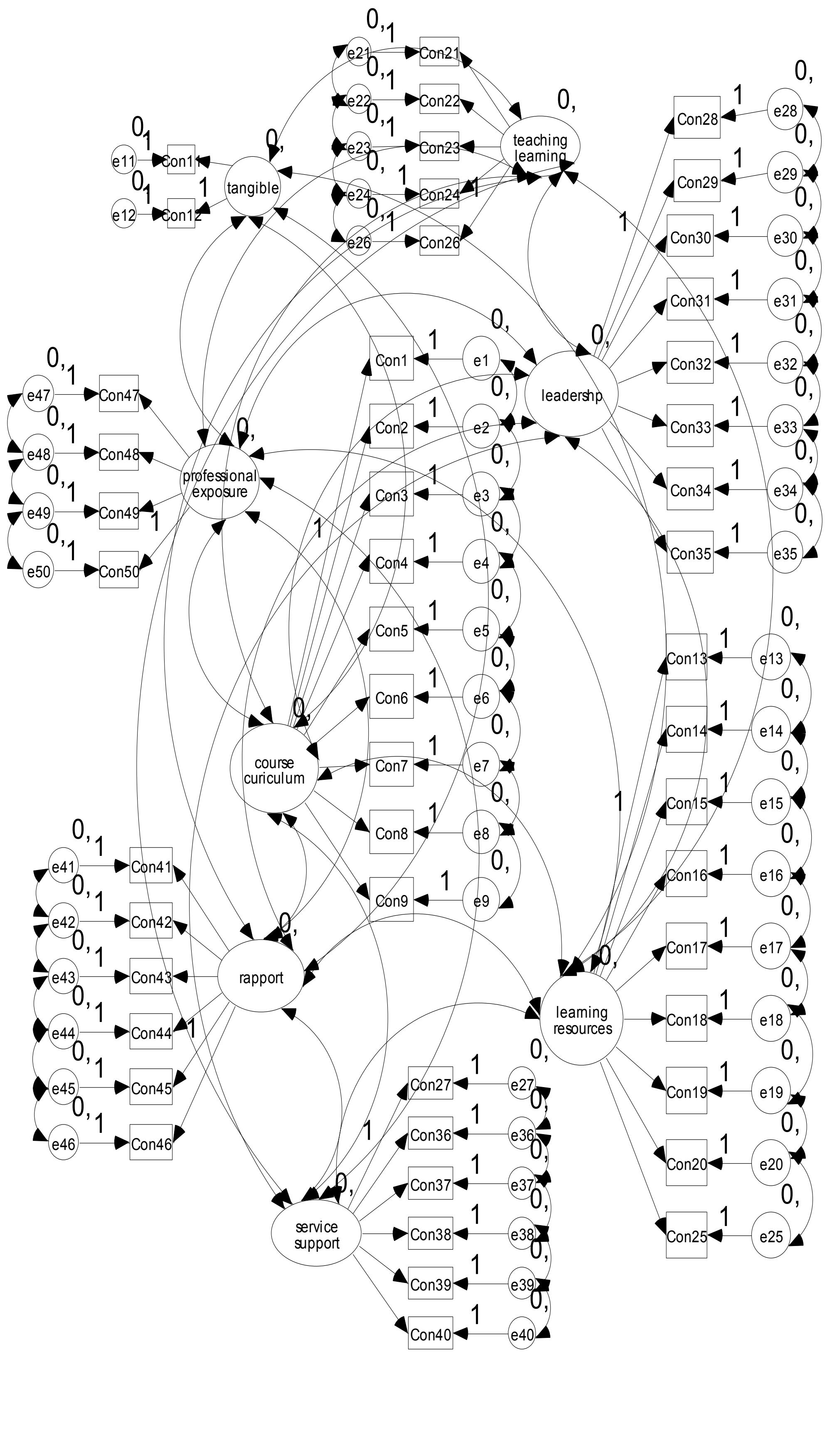

Figure B.6
Path Diagram of the 8-Dimension *Contributory* Construct
(Q10 was deleted)

Note: "Con1 to Con50" represent questions 1 to 50 of the *Contributory* items.

Table B.11
Independent Samples T-test for Comparison of Students' Perceptions on Learning *Outcomes* and *Contributory* Dimensions

		Levene's Test for Equality of Variances					
Dimensions		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff
Technical Competencies	Equal variances assumed	3.401	.067	-1.273	190	.205	-.10
	Equal variances not assumed			-1.260	173.077	.209	-.10
Generic Competencies	Equal variances assumed	7.391	.007	-2.721	190	.007	-.20
	Equal variances not assumed			-2.687	165.913	.008	-.20
Management and Organization Skills	Equal variances assumed	.027	.868	-1.377	190	.170	-.12
	Equal variances not assumed			-1.378	189.122	.170	-.12
Communication and Social Skills	Equal variances assumed	3.787	.053	-2.678	190	.008	-.23
	Equal variances not assumed			-2.669	184.708	.008	-.23
Teamwork	Equal variances assumed	.548	.460	-.485	190	.629	-.05
	Equal variances not assumed			-.486	189.977	.627	-.05
Course Curriculum	Equal variances assumed	.767	.382	.747	190	.456	.07
	Equal variances not assumed			.745	185.961	.457	.07
Teaching, Learning and Assessment Practices	Equal variances assumed	.155	.695	-1.716	190	.088	-.21
	Equal variances not assumed			-1.718	189.285	.088	-.21
Administrative Support	Equal variances assumed	.746	.389	.867	190	.387	.09
	Equal variances not assumed			.863	182.291	.390	.09
Staff and Students' Relationship	Equal variances assumed	.428	.514	-.356	190	.722	-.04
	Equal variances not assumed			-.356	189.038	.722	-.04
Learning Resources	Equal variances assumed	.019	.891	.465	190	.642	.05
	Equal variances not assumed			.464	187.530	.643	.05
Tangibles	Equal variances assumed	.284	.595	-3.456	190	.001	-.52
	Equal variances not assumed			-3.447	186.334	.001	-.52
Professional Exposure	Equal variances assumed	9.467	.002	.209	190	.835	.03
	Equal variances not assumed			.206	167.580	.837	.03
Leadership	Equal variances assumed	1.693	.195	1.870	190	0.063	.19
	Equal variances not assumed			1.855	176.060	0.065	.19

Table B.12
Means of *Outcomes* and *Contributory* Items Accorded by All the Students and Staff

***Outcomes* Item**	University	Mean (Student)	Std. Deviation	Mean (Staff)	Std. Deviation
Technical Competencies					
1. Application of maths and science	Northern	2.83	.779	2.93	.740
	Southern	2.94	.583	2.90	.746
2. Use software simulation tools	Northern	3.08	.917	2.87	.629
	Southern	3.06	.802	2.77	.669
3. Use test and measurement equipment	Northern	2.91	.860	2.87	.730
	Southern	2.95	.609	2.74	.815
4. Use given specification for design	Northern	2.89	.687	2.67	.606
	Southern	3.06	.722	2.55	.723
5. Design alternative systems	Northern	2.96	.783	2.97	.765
	Southern	3.15	.716	2.97	.706
Generic Competencies					
7. Learned professional engineering ethics	Northern	2.72	.617	3.30	.702
	Southern	2.99	.810	2.68	.748
8. Integrate and apply technical advice provided	Northern	2.83	.622	2.70	.702
	Southern	3.08	.646	2.35	.839
9. Understand impact of engineering on business	Northern	2.79	.792	3.07	.907
	Southern	2.97	.731	2.77	.920
10. Can undertake problem identification & solution	Northern	2.82	.783	2.87	.900
	Southern	3.04	.650	2.61	.803
11. Understand the needs of engineering industry	Northern	2.77	.800	2.87	.730
	Southern	2.96	.803	2.84	.688
12. Demonstrate quality-assurance criteria in engineering practice	Northern	2.80	.774	3.13	.730
	Southern	3.10	.718	2.87	.806
13. Demonstrate continuous learning to overcome obsolescence in technology	Northern	2.85	.797	3.13	.776
	Southern	2.94	.633	2.90	.870
14. Develop lifelong learning skill	Northern	2.76	.817	3.20	.761
	Southern	2.87	.630	2.68	.909
15. Aware of the impact of global changes in engineering	Northern	2.80	.774	3.40	.894
	Southern	2.96	.724	3.26	1.064
Management & Organization Skills					
16. Plan & organize tasks efficiently	Northern	2.55	.701	2.67	.758
	Southern	2.82	.770	2.26	.893
17. Work under minimal supervision	Northern	2.37	.780	2.90	.712
	Southern	2.81	.873	2.61	.882
22. Brainstorm ideas in groups	Northern	2.77	.786	2.47	.629
	Southern	2.66	.728	2.19	.873
23. Can work within university deadlines	Northern	2.73	.743	2.80	1.095
	Southern	2.64	1.010	1.87	.806
24. Develop study skill in preparing for exam	Northern	2.75	.807	2.60	.563
	Southern	2.84	.861	2.10	.746

Table B.12 (cont'd)

Communication & Social Skills					
19. Initiative in exploring opportunity	Northern	2.61	.741	2.87	.776
	Southern	2.80	.765	2.26	.999
26. Good communication skills	Northern	2.51	.655	2.93	1.015
	Southern	2.77	.777	2.58	.958
27. Able to speak and write good English	Northern	2.50	.791	2.87	.937
	Southern	2.62	.722	2.68	.909
28. Acquire good report writing skill	Northern	2.60	.742	2.93	.944
	Southern	2.94	.874	2.77	.884
Teamwork					
20. Work in team through college's extra curricular activities	Northern	2.83	.833	2.30	.750
	Southern	2.79	.988	1.84	.735
21. Contribute multidisciplinary viewpoints in solving points	Northern	2.76	.732	2.70	1.022
	Southern	2.90	.810	2.48	.996
***Contributory* Item**					
Course Curriculum					
1. Curriculum is updated systematically	Northern	2.57	.953	2.30	.877
	Southern	2.45	.903	1.94	.892
2. Curriculum mirrors linking university's curriculum	Northern	2.74	.888	2.20	.664
	Southern	2.86	.954	1.84	.934
3. Course offered is of the same quality	Northern	2.66	.842	2.00	1.050
	Southern	2.50	1.059	1.48	.769
4. Degree program is delivered and assessed in English	Northern	2.00	.938	2.17	1.117
	Southern	1.72	.986	1.68	.791
5. Course content is related to technical needs of the job market	Northern	2.52	1.022	2.13	1.008
	Southern	2.52	.969	1.71	.902
6. Coursework problems are real-life work related problems	Northern	2.72	.894	2.67	1.155
	Southern	2.76	1.129	2.10	1.106
7. Linking university assess students at the same standard	Northern	2.70	.923	2.47	1.106
	Southern	2.33	1.146	1.77	.920
8. Students have to follow the same final year project's format	Northern	2.52	.943	2.40	.855
	Southern	2.28	1.181	1.97	.912
9. College lecturers provide input to the development of course curriculum	Northern	2.46	.919	2.43	1.251
	Southern	2.80	1.163	2.42	1.336
Tangibles					
11. Library facilities, teaching aids, computing and engineering lab provision are up-to-date	Northern	2.80	1.160	1.97	.890
	Southern	3.22	1.124	1.74	.729
12. Sufficient computers and engineering equipment are available	Northern	2.90	1.120	1.93	.740
	Southern	3.52	1.168	1.61	.667

Table B.12 (cont'd)

Learning Resources					
13. Sufficient qualified local teaching staff members are available	Northern	2.67	1.060	1.80	.484
	Southern	3.10	1.337	1.52	.626
14. Course materials provided by college tutor are comprehensive	Northern	3.01	1.134	2.63	.964
	Southern	3.03	1.159	1.65	.798
15. Course materials provided by linking university are comprehensive	Northern	2.76	1.103	2.77	.935
	Southern	2.56	1.122	2.26	1.125
16. Sufficient university teaching staff are available to provide academic guidance to local teaching staff	Northern	2.87	1.071	2.00	.871
	Southern	2.80	1.015	1.55	.675
17. Sufficient college teaching staff with extensive industry experiences are available	Northern	2.70	1.097	2.97	.999
	Southern	2.73	1.090	2.42	1.119
18. Linking university staff visit the college often enough to advice on daily questions	Northern	2.93	1.087	2.80	1.095
	Southern	2.84	.992	1.55	.675
19. Adequate electronic access to linking university's library	Northern	2.87	1.150	3.17	.986
	Southern	2.75	1.086	1.65	.877
20. Course materials are posted effectively on linking university's webpage	Northern	2.99	1.163	2.87	.937
	Southern	2.44	1.104	2.26	.855
25. Marked assignments are returned with proper feedback and comments	Northern	2.80	1.082	2.07	.740
	Southern	2.88	1.094	2.16	1.098
Teaching, Learning, & Assessment Practices					
21. College teaching staff implement good pedagogical practices effectively	Northern	2.73	.962	1.60	.498
	Southern	2.98	1.063	1.45	.506
22. College tutors make lecture very interesting and simulating	Northern	2.78	1.067	1.77	.626
	Southern	3.18	1.140	1.58	.564
23. College lecturers have strong theoretical and practical knowledge	Northern	2.62	1.004	2.30	.877
	Southern	2.81	1.116	1.94	.892
24. College teaching staff give helpful feedback to students' works	Northern	2.80	1.040	1.63	.556
	Southern	2.88	1.094	1.61	.495
26. College lecturers are able to facilitate discussion in class	Northern	2.80	1.112	1.90	.712
	Southern	2.95	1.123	1.65	.798
Administrative Support					
27. Day and night lectures and practical classes are available	Northern	2.52	.989	1.43	.504
	Southern	2.34	1.075	1.29	.461
36. Appropriate administrative arrangement to secure student feedback and respond to feedback immediately	Northern	2.71	.967	2.37	.928
	Southern	2.81	.982	1.94	.814
37. Administrative and records management system maintain student records effectively	Northern	2.68	.960	2.23	.626
	Southern	2.65	1.019	1.94	.727
38. Adequate student services are provided by the college	Northern	2.86	.979	2.33	.922
	Southern	2.71	.935	2.10	.944
39. Services are provided promptly and efficiently	Northern	2.84	1.030	2.23	.858
	Southern	2.76	.986	1.97	.948
40.Transcripts and degree certificates are issued promptly by linking university.	Northern	2.63	.980	2.60	.894
	Southern	2.44	.925	2.45	.925

Table B.12 (cont'd)

Leadership					
28. College teaching staff provide input to the development of assignments and examination papers	Northern	2.80	.986	2.40	.894
	Southern	2.75	.968	2.29	1.189
29. Input by linking university staff ensure consistency in assessments	Northern	2.76	1.042	2.63	1.098
	Southern	2.64	1.040	1.84	.934
30. The responsibility for marking and moderation of students' scripts by both university and college staff is appropriate	Northern	2.71	1.054	2.07	.640
	Southern	2.72	.900	1.68	.599
31. College leaders make clear to all the vision and goals for the degree program	Northern	2.75	1.044	2.07	.868
	Southern	2.51	.882	1.90	.831
32. Academic and management staff demonstrate a shared responsibility in ensuring quality engineering education provision	Northern	2.73	1.049	2.17	.834
	Southern	2.49	.870	1.94	.854
33. Engineering degree education is clearly linked to the growth of both local and global engineering industries	Northern	2.64	.979	2.13	.973
	Southern	2.42	.901	1.65	.798
34. Strong collaboration link between linking university and college	Northern	2.71	1.011	2.40	.675
	Southern	2.31	.940	2.06	.854
35. The excellence of engineering degree education is promoted to students and community	Northern	2.66	1.041	2.40	.855
	Southern	2.39	.909	1.90	.746
Staff and Students' Relationship					
41. Linking university staff meet with students privately to gather their views and address their concerns	Northern	2.78	1.014	2.90	1.094
	Southern	2.76	1.084	1.94	.964
42. College tutors play active roles in addressing students' requests	Northern	2.74	.936	2.53	.860
	Southern	2.80	1.044	2.52	.996
43. University lecturers give prompt responses to students' requests	Northern	2.72	.918	2.80	.961
	Southern	2.69	.992	2.23	.920
44. Students receive prompt, individualized attention from college tutors	Northern	2.87	.940	1.97	.414
	Southern	2.84	1.152	1.48	.508
45. College course tutors give students' confidence and motivation	Northern	2.71	1.075	1.90	.481
	Southern	2.91	1.256	1.52	.508
46. There is open and honest communication among students and staff	Northern	2.77	1.049	2.03	.490
	Southern	2.84	1.170	1.81	.703
Professional Exposure					
47. Students understand professional engineering practice through formal and informal guest lectures conducted by the linking university	Northern	2.80	1.112	2.97	.890
	Southern	2.91	.877	2.48	.851
48. Students understand professional engineering practice through professional exposure activities organized by the school	Northern	2.84	1.062	3.20	1.031
	Southern	2.77	.941	2.77	1.023
49. Adequate student exchange systems are in place to facilitate professional development	Northern	2.80	1.082	3.20	.847
	Southern	2.98	1.025	3.16	1.068
50. Visiting lecturers from the linking university provide students with good advice about the engineering profession	Northern	2.84	1.141	2.93	.785
	Southern	2.52	1.030	2.45	1.028

Table B.13
One-way ANOVA for Comparison of Perceptions of Students, Staff, and Employers

***Outcomes* Items**	(I) Perception of Employers/Staff/ Students	(J) Perception of employers/ Staff/Students	Mean Difference (I-J)	Sig.
1. Application of maths and science	Students	Staff	-.11	.789
		Employers	.43	.071
	Staff	Employers	.53(*)	.049
2. Use software simulation tools	Students	Staff	.21	.494
		Employers	.53(*)	.043
	Staff	Employers	.32	.425
3. Use test and measurement equipment	Students	Staff	.05	.962
		Employers	.36	.182
	Staff	Employers	.32	.385
4. Use given specification for design	Students	Staff	.22	.282
		Employers	.04	.969
	Staff	Employers	-.18	.637
5. Design alternative systems	Students	Staff	-.01	.998
		Employers	-.24	.447
	Staff	Employers	-.23	.582
7. Display of professional engineering ethics	Students	Staff	-.58(*)	.000
		Employers	.42(*)	.035
	Staff	Employers	1.00(*)	.000
8. Integrate & apply technical advice provided	Students	Staff	.13	.669
		Employers	.23	.394
	Staff	Employers	.10	.874

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Table B.13 (cont'd)

9. Understand impact of engineering on business	Students	Staff	-.27	.250
		Employers	-.26	.410
	Staff	Employers	.02	.997
10. Can undertake problem identification and solution	Students	Staff	-.05	.950
		Employers	.47	.053
	Staff	Employers	.52	.070
11. Understand the needs of engineering industry	Students	Staff	-.09	.822
		Employers	-.13	.771
	Staff	Employers	-.03	.987
12. Demonstrate quality-assurance criteria in engineering practice	Students	Staff	-.33	.109
		Employers	.15	.696
	Staff	Employers	.48	.079
13. Demonstrate continuous learning to overcome obsolescence in technology	Students	Staff	-.29	.207
		Employers	.40	.110
	Staff	Employers	.68(*)	.010
14. Develop lifelong learning skill	Students	Staff	-.44(*)	.030
		Employers	.11	.846
	Staff	Employers	.55	.054
15. Aware of the impact of global changes in engineering	Students	Staff	-.60(*)	.002
		Employers	-.25	.428
	Staff	Employers	.35	.285
16. Plan & organize tasks efficiently	Students	Staff	-.11	.734
		Employers	.10	.823
	Staff	Employers	.22	.544
17. Work under minimal supervision	Students	Staff	-.53(*)	.005
		Employers	.27	.357
	Staff	Employers	.80(*)	.002
22. Brainstorm ideas in groups	Students	Staff	.31	.128
		Employers	.27	.302
	Staff	Employers	-.03	.987
23. Can work within organization's deadlines	Students	Staff	-.07	.909
		Employers	.03	.989
	Staff	Employers	.10	.906
24. Develop study skill in preparing for exam	Students	Staff	.15	.586
		Employers	.05	.958
	Staff	Employers	-.10	.881

Table B.13 (cont'd)

19. Initiative in exploring opportunity	Students	Staff	-.26	.260
		Employers	.06	.950
	Staff	Employers	.32	.339
26. Good communication skills	Students	Staff	-.42(*)	.023
		Employers	-.24	.404
	Staff	Employers	.18	.676
27. Able to speak and write good English	Students	Staff	-.37	.088
		Employers	-.10	.874
	Staff	Employers	.27	.499
28. Acquire good report writing skill	Students	Staff	-.34	.100
		Employers	.00	1.000
	Staff	Employers	.33	.296
20. Work in team through college's extra curricular activities	Students	Staff	.53(*)	.007
		Employers	.83(*)	.000
	Staff	Employers	.30	.408
21. Contribute multidisciplinary viewpoints in solving points	Students	Staff	.06	.930
		Employers	-.04	.978
	Staff	Employers	-.10	.901

* The mean difference is significant at the .05 level.

APPENDIX C

Results of Qualitative Analysis

Descriptive Comments from Students, Staff, and Employers

To measure the quality of transnational engineering education, students', staff's, and employers' views were collected to capture the complexity of students', staff's and employers' perceptions. The major themes and issues that emerged from the analysis of open-ended questions are as follows:

(i) Commendations from students

Theme 1: Learning experience that challenged students' study

Southern students reported challenging experiences that related to their study. They praised the high quality and standard maintained in Southern programme as their assessments were evaluated by the academic staff at the university. They also commented on the challenging assignment questions set by the university and recognized the uniformity in assignments and examination papers' markings. Some students stated that it was necessary to invite academic staff to conduct lectures more frequently at the college since assignments and examination papers were marked by them.

Illustrative comments:

"Linking university should send lecturers from the university to teach students, say maybe twice a month, for a subject."

"Please send some overseas lecturers to teach the class."

"The lecturers from the linking university have to come to Malaysia to teach us because they are marking our papers."

Theme 2: Facilities and learning resources

Due to 2-week residential requirement imposed by Southern University, Southern students were very familiar with the physical facilities and learning resources that were available at Southern University, hence they were expecting the college to have extensive laboratory facilities equipped with high quality engineering hardware and simulation software tools.

Illustrative comments:

"We all hope that the college would increase the number of books, resources etc…"

"Better laboratory facilities for students and more laboratory-based course work."

"Lack of resources at the college like books, lab facilities etc."

"The facilities basically have to be the same as facilities at the linking university"

Theme 3: Regular monitoring by the linking university

Some of the students highlighted the need of closer monitoring by the linking university towards provision of learning resources, physical facilities and class delivery at the college.

Illustrative comment:

"The linking university should conduct regular monitoring of class delivery and resources needed for proper conduct of courses in Malaysia."

Theme 4: Industrial training

It was not compulsory for students to undertake industrial training during their undergraduate studies. Since "industrial training" was incorporated as an optional requirement of the programme, many students did not take the initiatives to undertake the trainings during the long break. Some students expressed the necessity of making it mandatory for all engineering students to gain the real engineering work exposure through industrial training.

Illustrative comment:
"Introduce industrial training course in any semester of the degree study."

(ii) Commendations from staff:

Academic staff provided quality feedback in the open-ended questions. They were able to specifically identify the both successful and unsuccessful features of the programs and comments on the prospective steps that have to be taken to enhance the effectiveness of transnational course delivery.

Academic staff expressed the following concerns and identified several aspects of transnational engineering program that needed to enhance programme's effectiveness.

Theme 1: Localize course content to suit local engineering development

Staff emphasized that the syllabi must be updated regularly to reflect current development in the field of engineering and assessment must include more practical aspects of the course. Visiting staff from the linking university must put effort in forging closer ties with the local industry to ensure that local industry's needs were met.

Illustrative comments:
“Syllabus must be updated with a strong sense of industry/market needs.”

“Localize course content to suit local development and environment.”

“Up-to-date course content and syllabus to reflect current local and world environments.”

“Flexibility should be given to local tutors to customize content to reflect local situation.”

“The university and the college must have active linkage with engineering industry.”

Theme 2: Electronic delivery mechanism

There was a high expectations expressed by academic staff for a higher level utilization of electronic delivery mechanism such as using video technologies as a means for delivering lectures, guest presentations, and laboratory demonstrations. They also expected the linking university to hold frequent real time interaction through teleconferencing or multimedia studio access to enable both students and staff to gain invaluable insights and knowledge from lectures or discussion facilitated by the linking university.

Illustrative comments:
“Some teleconferencing sessions have to be conducted between the college and the linking university.”

"Increase the usage of audio and visual aids through video conferencing for students to gain insights and knowledge from lectures by the respective unit chair at the linking university."

Theme 3: Quality assurance mechanism

Some academic staff objected to the different transnational operation systems practiced by different transnational universities. They expressed the need to formalize a quality assurance mechanism to be adopted by institutions providing transnational education.

Illustrative comment:
"To establish a formal quality assurance process, e.g. co-ordinating visits, moderating assessment, student admission etc."

Theme 4: Revamping assessment system

Academic staff responded unfavourably to the effectiveness of the assessment system adopted in the Northern programme. Staff critically commented that the assignments and examination papers had to be externally marked by staff at the linking university to ensure consistency in assessments.

Illustrative comments:
"Assessment system of Northern programme has to be revamped. Papers have to be marked wholly by on-campus university unit chairs or professors."

"Linking university should assess students with no difference in standards from students studying at the linking university's own campus."

Theme 5: Student-exchange programme

Staff also commented that some learning activities such as student-exchange programme must be implemented in the transnational degree programme. With the student-exchange programme in place, staff indicated that students would be provided with opportunity to improve their analytical and thinking skills through interacting with students at the linking university's own campus.

Illustrative comment:
"Engaging students in student-exchange programme whereby certain students from on-campus mode are transferred here and vice versa. This is to aids in local students' analytical and practical thinking skills."

(iii) Commendations from employer:

Employers responded enthusiastically to the open-ended questions regarding the transnational engineering education. They strongly encouraged the collaboration between industry and the educational institutions. The major themes and issues that emerged from the analysis of open-ended questions are as follows:

Theme 1: Close working relationship with the industry

Employers emphasized the importance of having close working relationship between college and industry to ensure the relevance of course content with the needs of industry. They stressed that course conducted must stay current with the engineering development in the industry. College also should encourage students to actively carry out industrial related project.

Illustrative comments:
"Studies need to be done from time to time to check if the subject taught still appropriate for the current industrial needs."

"Need to work with local industry to cater to their industrial needs."

"To encourage students to carry out more external projects which meet the industry's needs."

"To visit the local multinational companies and private small medium industries to understand their needs."

"Get to know the latest engineering equipment and software."

Theme 2: Electronic delivery mechanism

Employers also expected the electronic delivery mechanism to be widely and effectively introduced in the course. They viewed the technology delivery mode as a means to promote interaction and brainstorming of ideas.

Illustrative comments:
"Conduct course through video conferencing facilities. This will give students the opportunity to interact with others virtually."

Theme 3: Professional exposure

Practical engineering training held in the engineering work environment would be a value added exposure to students. Employers encouraged strongly the imposition of industrial training requirement to be part of the undergraduate engineering training. They commented that college should organize frequent site visit to factories to widen students' horizon of engineering concepts and practices.

Illustrative comments:
"Must have adequate industrial exposure in actual work environment."

"Industrial exposure, especially at the early stage of the program is a key to success in engineering study."

"More real work environment training."

"Plan frequent visit to local industries."

Theme 4: Communication and problem solving skills

Employers wished to see graduates equipped with high level of competence in both written and spoken communication. They expressed the importance of having the ability to make effective oral and written technical and non-technical presentations. Apart from the communication skill, they also indicated that graduates must have the ability to identify technical problems and find creative solution to solve ill-defined situations and problems.

Illustrative comments:

"English would play an important role. Encourage proper English usage and have extra accelerated learning would help."

"Should emphasize communication and leadership skills."

"Graduates should acquire good oral communication and report writing skills."

"Must possess creative problem solving skills."