Characterizing quality dimensions of local graduates and comparing the rankings of their relative importance among the stakeholders

By

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Abstract

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Massification of higher education in Hong Kong and elsewhere has trigged concern about the possible fall or already falling in its quality. To gauge higher education quality, a set of quantifiable attributes is needed. The purposes of this study are to construct a quality hierarchy consisting of quality dimensions, quality aspects, and quality attribute items; identify quality dimensions, group quality aspects into the dimensions, and prioritize quality attribute items among stakeholders – employers, academics and college administrators, college graduates, and tertiary students. The study also seeks suggestions from stakeholders how higher education quality can be maintained with a rapid and abrupt increase in the number of students. Definitions of quality education are visited, and suggestions to ensure higher education quality are provided by stakeholders.

A questionnaire containing 9 attribute aspects and 46 items was given to potential respondents through an online program and hard-copies. A total of 530 valid responses were used. To triangulate quantitative findings, 15 respondents from the 4 groups were interviewed through email, telephone, or face-to-face.

Ordinal Likert scale data were converted into interval-ratio logits using Rasch Winsteps. Two dimensions of the nine attribute aspects were identified using SPSS factor analysis. One dimension consists of Chinese, English, arithmetic, and information technology. Another dimension consists of analytical and problem-solving abilities, work attitude, inter-personal skills, management skills, and technical skills. Multidimensionality for the attributes was found using Rasch factor analysis. Correlations between attribute aspects were also found.

The samples collectively have ranked "sense of responsibility and commitment" under "work attitude" quality aspect as the most important. However, when stakeholder groups are examined separately, only Employers have ranked the same item as the most important. Academics and Graduates have ranked "problem-solving ability" under "analytical and problem-solving abilities" aspect as number one important. Students have ranked "expression of ideas in oral English" under "English language proficiency" as top important.

At the 0.05 level, SPSS nonparametric Kruskal-Wallis test has found stakeholders' views are significantly different for English, Chinese, and numerical competency. Rasch differentiating item functioning ("DIF") has identified 15 DIF items.

Two quality dimensions were run separately. Item measures indicate that Employers and Academics groups have wider ranges and larger standard deviations than Graduates and Students. Possible reasons are that employers and academics have more understanding of the attribute items or they in fact have wider views of the attribute items.

For the definition of quality education, most people have chosen “quality as fitness for purpose”, marginally more than “quality as transformation”. Finally, interviewees have provided suggestions to ensure higher education quality in this mass higher education era.

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List of Abbreviations

AMA – American Management Association

CRE – Common Recruitment Examination

DIF – Differentiating Item Functioning

EDB – Education Bureau of Hong Kong

HKALE – Hong Kong Advanced Level Examination (ended in 2012)

HKCAAVQ – Hong Kong Council for Academic Accreditation and Vocational Qualifications

HKCEE – Hong Kong Certificate of Education Examination (ended in 2010)

HKDSE – Hong Kong Diploma of Secondary School Examination (since 2012)

HKEAA – Hong Kong Examinations and Assessment Authority

HKSAR – Hong Kong Special Administrative Region, People's Republic of China.

GPA – Grade Point Average

LPAT – Language Proficiency Assessment for Teachers

MNSQ – Mean Square Errors

NET – Native English Teacher

OECD – Organization for Economic Co-operation and Development

QAC – Quality Assurance Council

UGC – University Grants Committee

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Chapter 1: Introduction

The landscape of the higher education sector of the Hong Kong Special Administrative Region ("HKSAR") has been changed dramatically in the last two decades. It has been shifted from an elite "ivory tower" university system to a mass education system (Mok 2007) or a universal system (Wan 2011). The change has come from both the public and private sectors. In particular the latter has grown rapidly since the early 2000s.

For the publicly-funded sector, in 1991, The Hong Kong University of Science and Technology was established. In 1994, the former Hong Kong Polytechnic, City Polytechnic, and the Baptist College were given a university status and re-titled as The Hong Kong Polytechnic University, the City University of Hong Kong, and the Hong Kong Baptist University respectively. In 1999, the former Lingnan College was granted a university status and renamed as Lingnan University. These universities together with The University of Hong Kong, The Chinese University of Hong Kong, and The Hong Kong Institute of Education are funded by the University Grants Committee ("UGC"). They are collectively called the eight UGC-funded higher education institutes. There are two other higher education institutes that are not funded by UGC, but funded by the HKSAR Government - the Hong Kong Academy for Performing Arts, and the Hong Kong Institute of Vocational Education which is not a degree-granting institution.

For the private sector, the Open University of Hong Kong was granted a university status in 1997, and Shue Yan University in 2006. Other institutes offering bachelor degree programs include Chu Hai College of Higher Education, Hang Seng Management College, Tung Wah College, Caritas Institute of Higher Education, Centennial College, Technological and Higher Education Institute of Hong Kong (Education Bureau 2012). The Savannah College of Art and Design ("SCAD") is not listed in the website of the Education Bureau ("EDB").

Besides the 17 degree-granting institutes and the SCAD, there are a total of 19 tertiary institutes offering various local sub-degree programs. In addition to these, according to the EDB (Education Burean 2012), there are 421 non-local registered higher education programs and 682 non-local exempted higher education programs. These non-local programs come from Australia, Canada, Mainland China, the Philippines, the United Kingdom, the United States, and other countries. Recently, University of Nice of France has come to the HKSAR. Non-local registered programs are overseas programs delivered in Hong Kong through a non-self-accrediting institute. Non-local exempted programs are overseas programs delivered in Hong Kong through a self-accrediting institute. Private, non-self-accrediting institutes offering non-local programs need to register these programs and obtain approval from the EDB. Non-local programs having registered with the EDB does not equate to accreditation. These programs are not locally accredited unless they have gone through the accreditation process with the Hong Kong Council for Academic Accreditation and Vocational Qualifications ("HKCAAVQ").

The change has become more drastic since the year 2000 policy address of the former HKSAR Chief Executive Tung Chee Hwa. It set a policy objective to provide higher education places to 60 per cent of secondary school-leavers. This is more than the policy objective of the former British Prime Minister Tony Blair who had an agenda to provide higher education places to 50 per cent of secondary school-leavers or people under the age of 28 in the United Kingdom (Henderson 2011).

Considering the population of Hong Kong, the supply of higher education places is enormous. Since Tung's policy address in 2000, the supply of tertiary places has grown rapidly especially in the self-financing sector. This massive increase in the supply of higher education places exceeded the demand in the academic year 2005/2006 (Education Bureau 2008).

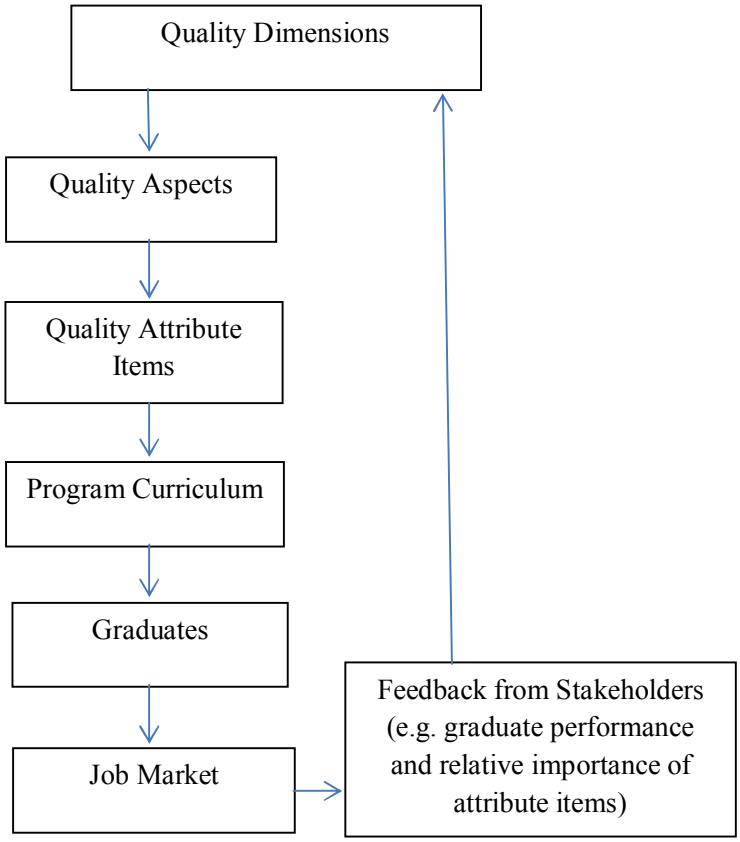
Both local and academics from the world have questioned about the quality of higher education in this massification era. Tam (1999) questions higher education quality with more and more supply of places. Lomas (2001) questions whether the development of mass education will end quality.

The falling quality of higher education has alarmed policy-makers in Hong Kong (Education Bureau 2008) and elsewhere in the world (Hersh and Benjamin 2010; OCED 2011; U.S. Department of Education 2006; Wilson 2010). This higher education quality issue has also raised serious concerns from employers in Hong Kong (Chow 2004; Hong Kong Lawyer 1997) and other countries (Hassim et al 2004; Henderson 2011; U.S. Department of Education 2006). Educators and academics worldwide (Brown 2010; Crumbley, Flinn, and Reichelt 2010; Dill 2005; Henderson 2011; Li 2010; Lomas 2001; Lui and Suen 2005; Sadler 2009; Tam 1999; Wan 2011; Zhou and Xie 2006) have the same concern in the falling of higher education quality. Wan (2011) points out that in Hong Kong the number of quality university graduates has been decreasing.

To gauge education quality, a set of quantifiable graduate attributes is needed. A quality hierarchy provides guidelines for a top-down design of courses in a program curriculum as well as how and where quality attribute items should be incorporated in different courses. The link (depicted in Figure 1.1) between quality dimensions and priorities ranked by stakeholders provide important information to stakeholders, in particular academics and college administrators when it comes to curriculum planning and design.

With a structured, hierarchical flow of quality dimensions, aspects, and attribute items, it is easier for program designers to plan and incorporate different attribute items into different courses of a curriculum; for academics to measure students' performance and ensure graduate quality.

Figure 1.1 Quality Dimensions and Quality Attributes Flow



With reference to Figure 1.1, quality dimensions consist of different quality aspects that are contributed by different quality attribute items. Given the required quality attributes, college program designers will ensure all the attribute items embedded in different courses of a program. They can also prioritize and assign weights of attribute items in the planning and arrangement of courses in program curricular in accordance with the relative rankings of the attribute items.

Graduates having acquired all the attributes will enter the job market. Colleges and universities can conduct employers' survey asking for opinion of the performance of their

graduates and the required graduate attributes as if surveys conducted by the Education Bureau (2000, 2006a, 2006b, 2010a, 2010b). Similar data can be collected from academics, graduates, and students. Upon receipt of the feedback, quality dimensions, quality aspects, and attribute items will be reviewed leading to a possible change of the program curricular meeting the changing environment.

Figure 1.1 is similar to a learning outcome hierarchy. Quality dimensions are analogous to a college's mission statement. Quality aspects are analogous to program intended learning outcomes of different programs. Quality attribute items are analogous to course intended learning outcomes. The flow goes as follows: students take different courses in a program leading to different course intended learning outcomes (quality attribute items attained). The achievement of different course intended learning outcomes makes students attain program intended learning outcomes (quality aspects). The collective fulfillment of program intended learning outcomes meet the mission statement (quality dimension).

The study will also attempt to identify stakeholders' definitions of quality higher education, and ask for their suggestions as to how higher education institutes can ensure quality education with a massively increase in the number of students.

Chapter 2 reviews the development of the higher education sector in Hong Kong, in particular the proliferation of the private, self-financing sector. The local higher education sector has entered into a post-massification or universal higher education era (Wan 2011). Due to the substantial increase in the supply of higher education places and student enrolment, competition for students has become extremely severe. To compete for students, institutes lower their admission requirements and inflate grades to leniently exit students. In Japan some universities have an open admissions policy (Kariya 2011). Competing for students has contributed to a certain extent to grade inflation (Kuhn,

Warren, Maletta, and Branford 2011; Smith and Fleisher 2011; Walsh 2010) that lowers students' studying efforts (Babcock 2010; Crumbley, Flinn, and Reichelt 2010; Dill 2005; Hunt and Gardin 2007). Whether larger student enrolment has caused lower average standard leading to grade inflation or grade inflation has caused lower average standard has not yet been researched.

Different definitions of higher education quality are discussed. In order to measure education quality, it is necessary to have a set of quantifiable graduate attributes. The attributes discussed in this chapter include: in the HKSAR, the studies conducted by the EDB (Education Bureau 2010a; Education Bureau 2010b); in the United States, the studies conducted by the American Management Association (2010) and the Partnership for 21st Century Skills (n.d.); in Australia, the Australian Government (2008), and Shah and Chenicheri (2011); in Canada, The Conference Board of Canada (2000), in Europe and other developed economies, the Organization for Economic Co-operation and Development (2001). While slight differences in their lists of graduate attributes are found among different research units, the graduate attributes different literatures have identified are very close and similar. A comparison mapping of the different graduate attributes has been performed and produced in this chapter.

Chapter 3 discusses the research methodology of the study. The chosen sample size has met the minimum sample size requirement for using the Rasch model (Green and Frantom 2002; Kubinger, Rasch, and Yanagida 2009; Linacre 2011). A questionnaire containing 9 attribute aspects and 46 items was given to potential respondents through an online program my3q and in hard-copies. A total of 541 questionnaires were received through the online program and in hard-copies. There were 11 invalid questionnaires that were removed from the analysis. A total of 530 questionnaires were used for the analysis. To triangulate quantitative findings, 15 respondents from the 4 groups were interviewed through email, telephone, or face-to-face.

Ordinal Likert scale data were converted into interval-ratio logits using Rasch WINSTEPS. Reasons for using Rasch model are discussed. Two dimensions of the nine attribute aspects were identified using SPSS factor analysis. One consists of critical thinking, work attitude, inter-personal skills, management skills, and technical skills. The other dimension consists of Chinese, English, numerical competency, and information technology. SPSS nonparametric Kruskal-Wallis test has found correlations between attribute aspects. Rasch factor analysis has identified multidimensionality among attributes. Nonparametric Kruskal-Wallis test and Rasch factor analysis will be discussed in this chapter.

While there are differences among stakeholders in the ranking of attributes' relative importance, the sample has ranked "work attitude" as the most important. SPSS nonparametric Kruskal-Wallis test has found some significant differences among groups at the 0.05 level in the ranking of Chinese, English, and numerical competency. Rasch DIF was performed for the 46 items, and 15 DIF items were found among the 46 attribute items. When attributes were separated into two dimensions and Rasch DIF analysis was run, the number of DIF items was reduced to 12. DIF items were expected because respondents were different, unlike students with similar background write a test of a course at school.

Different definitions of quality higher education are discussed. Most people have chosen "quality as fitness for purpose", marginally more than "quality as transformation". The other two definitions of quality education "quality as excellence" and "quality as value for money" have received less votes.

Chapter 4 reports findings of the study. The results are reported for the overall sample (N = 530), then for the four stakeholder groups: employers, academics and college administrators, college graduates, and current tertiary students.

Summary, person and item fit statistics are reported. The overall person and item reliabilities are high. There are 24 misfit items, but they are not necessary bad items. Therefore, they are not removed from the analysis. However, this indicates running one-dimensional Rasch on the 46 items is inappropriate. The four stakeholder groups with two dimensions are analyzed using Rasch.

Differences among stakeholder groups are expected. Misfit items reflect stakeholders' different views in the relative importance of the attributes. Furthermore, while the misfit items are statistically significant at the 0.05 level, they are not so misfit practically by examining the mean-square errors (MNSQ).

The chapter also examines the overall ranking of the relative importance of attributes as well as rankings by different stakeholder groups. Further comparison among stakeholders in the ranking of attributes for the two dimensions was conducted, and their respective item maps are shown.

The rationale behind rating the importance of each attribute group can be found in the later part of this chapter. This is followed by reporting comments obtained from interviews of respondents on ensuring and promoting quality higher education in Hong Kong.

Chapter 5 is the discussion and conclusion chapter. It discusses the survey results and compares with findings from other studies including the studies of the EDB and other countries. It is not surprising to find differences in the identified or suggested graduate attributes among countries and their different rankings of the relative importance of graduate attributes due to differences among countries. Stakeholder groups having

different rankings of the attributes are also within expectation because of their different backgrounds, needs, and concerns. The current dilemma in higher education in Hong Kong will also be discussed, and the chapter will end with a short remark.

Chapter 2: Literature Review

The higher education places in Hong Kong have proliferated enormously since the 2000 Policy Address delivered by Mr. Tung Che Hwa, the former HKSAR Chief Executive Officer. A crucial objective of the HKSAR Government was set to provide post-secondary education to 60 per cent of senior secondary school-leavers by the year 2010. The objective was achieved in the academic year 2005/06 when the post-secondary education participation rate of the 17-20 age cohort reached 66 per cent (Education Bureau 2008).

In the past decade, we have witnessed dramatically structural change to the higher education sector in Hong Kong – from an elite "ivory tower" university system to a mass education system (Chan and Lo 2007; Lee and Gopinathan 2003; Mok 2007; Wan 2011). Massification in higher education refers to the situation when the supply of places exceeds 50 per cent of secondary or high school leavers. Since Hong Kong started in the academic year 2005/06 to provide higher education places to more than 60 per cent of senior secondary school-leavers, Hong Kong is effectively in a post-massification era (Kember 2010) or a universal system (Wan 2011).

Self-financing institutions have mushroomed in numbers and inundated the supply of tertiary places by folds. The higher education reform has been focusing on quantity, the supply of higher education places instead of quality (Wan 2011). The supply of places in some years has exceeded the demand in the self-financing sector (Education Bureau 2008). This excess supply in higher education places (see Table 2.1) has intimated in particular self-financing institutes to admit students without meeting the minimum entrance requirements (Wan 2011). Students may have become a profitable "dim sum" of these institutes (Chan 2012). However, if the input-output relationship (Blackmur 2010;

Harvey and Green 1993) holds, it is skeptical how tertiary education institutes can possibly turn sub-standard students into high quality graduates.

The general public has begun to question about the quality of higher education in Hong Kong (Education Bureau 2008). Tam (1999) queries about the possible fall in higher education quality as more and more spaces became available. Wan (2011) comments that the number of high quality university graduates has been falling. Graduates before the 1990s were highly talented and intelligent. Similar concern has been raised elsewhere in the world, for example, in Italy, Fornari and Pompili (2010) look into the dilemma in keeping education excellence in a mass higher education system. In Japan, Kariya (2011) points out that universal education in higher education has led universities to adopt an open admissions policy that in turn led to grade inflation and credential inflation.

This chapter will first examine the recent development of the higher education sector in Hong Kong. It will then review literatures on the suspected falling quality of higher education and grade inflation followed by different definitions of quality education. To investigate if quality of higher education is really falling, attributes constituting quality education need to be identifiable and measurable. Different rankings of the relative importance of graduate attributes researched in different countries will be visited. The chapter will end with a short conclusion.

Recent Development of the Higher Education Sector

Every year the University Grants Committee ("UGC") provides the 8 UGC-funded institutions collectively an average of 14,500 first-year-first-degree subsidized entry places. These places account for approximately 18 per cent of the total demand for tertiary education places from the 17-20 age cohort comparing with only 2 per cent in the 1970s (Wan 2010). They are far below the 60 per cent objective. Students, who are unable to secure places at UGC-funded programs, choose self-financing programs. As a

result, a kind of two-tier tertiary education system has gradually been developed. The UGC-funded programs are perceived as superior to self-financing programs. Albeit the inferior perception of the general public the role that self-financing programs plays is increasingly crucial. The UGC-funded programs offer places to the top 18 per cent senior secondary school-leavers, while self-financing programs accommodate the balance to meet the 60 per cent objective.

The current situation of the tertiary education sector in Hong Kong is that supply of places has exceeded demand. The Education Bureau (2008, p. 6) indicates that "the supply of places has overtaken the demand for the first time in the 2005/06 academic year". The figures depicted in Table 2.1 are extracted from the UGC report (UGC 2010a, Table 1, p. 155 and Table 2, p. 157) concerning the supply and actual intakes of full-time post-secondary places that include the eight UGC-funded first-year-first-degree, the Hong Kong Academy for Performing Arts, the Vocational Training Council, UGC-funded institutions' proper and continuing education arms, publicly-funded and self-financing sub-degrees.

Table 2.1: Supply of and Demand for Higher Education Places

Academic Year	Supply of Places	Actual Intake	Unfilled Supply
2000/01	24,047	23,758	289
2001/02	27,756	27,939	-183
2002/03	31,113	31,764	-651
2003/04	34,873	34,659	214
2004/05	41,971	42,822	-851
2005/06	49,382	45,779	3,603
2006/07	50,139	47,062	3,077
2007/08	52,832	49,696	3,136
2008/09	53,958	49,559	4,399
2009/10*	54,015	53,715	300

Source: University Grants Committee of Hong Kong (2010a). 2009/10* were provisional numbers.

There are institutions with insufficient students, but there are institutions over-admitting students. With thousands of unfilled spaces, institutions have to compete severely for students by different means. Every now and then, in particular sometime around the release of secondary school public examination results and in the summer months, printed media are flooded with advertisements of various tertiary education programs. Millions of dollars are spent on advertising and promotion to recruit students. If these monies are spent on enhancing and enriching teaching and learning activities, students definitely will benefit more. To name a few examples, The University of Hong Kong spent around HK$6.5 million in 2008 and over HK$8 million in 2009 on its publicity (The University of Hong Kong 2009, p. 49). It does not mention whether this publicity spending has included student recruitment. The Hong Kong Polytechnic University spent around HK$12.8 million in 2010 and around HK$12.2 million in 2011 on advertisement and recruitment (The Hong Kong Polytechnic University 2011, p. 46). The City University of Hong Kong spent around HK$6.4 million in 2009 and HK$8 million in 2010 on its publicity (City University of Hong Kong 2010, p. 110). Although the breakdowns of these spending have not been revealed, millions of dollars are spent on promoting either the institutions or their programs. The ultimate purpose is to recruit students. From the past experience of working for a self-financing institute, the average advertising cost per newly recruit student in a non-local bachelor's degree program has been over HK$10,000. Referral students are excluded from this estimate.

Mass education has reversed the personas between students and institutions. Institutions used to choose students. Anyone having lived in Hong Kong long enough must recall that it was very difficult to be admitted to any of the two oldest universities before 1994, when the third university, The Hong Kong University of Science and Technology, was established. The University of Hong Kong and The Chinese University of Hong Kong were able to choose students stringently. Now, for those not offered a place by one of the eight UGC-funded institutes, students choose self-financing institutions.

Self-financing programs and institutions severely fight for students using different marketing and promotion tools, not to mention degree mills that attract customer students by all means. Some even admit students without meeting the minimum admission requirements (Wan 2011). College admissions classify this as "special admission" or a terminology deemed equivalent. It is not unusual to have a certain percentage of intakes falling into the special admission category. Mature students having worked for a number of years returning to school may seek mature entry under special admission. Candidates without the minimum admission requirements who have merits from other non-academic areas such as sports may also seek special admission.

According to the Education Bureau (2008), students enrolled in full-time accredited self-financing post-secondary programs jumped from 10.92 per cent in 2000/01 to 47.46 per cent in 2006/07; the number of self-financing accredited tertiary education providers increased from 4 in 2000/01 to 20 in 2006/07; and the number of accredited self-financing tertiary programs went up from 20 to 302 during the same period.

In addition to self-financing accredited full-time post-secondary programs in Hong Kong, there are non-local programs jointly operated by a local institution and an overseas college or university. These programs need only local registration but not accreditation because they are accredited in their home countries. According to the Non-local Courses Registry (2010), from 2001 to 2010, less than 23 per cent of registered non-local programs remain registered in 2010, and less than 55 per cent of exempted non-local programs survived during the same period.

Non-local registered programs are operated by non-self-accrediting local institutions. Non-local exempted programs are operated by the 11 local, self-accrediting institutions (the eight UGC-funded institutions, the Hong Kong Academy for Performing Arts, Open University of Hong Kong, and Shue Yan University). The number of registered non-local

programs cancelled has increased from 43 in 2001 to 233 in 2010 and for the exempted non-local courses, from 5 in 2001 to 475 in 2010. Non-local programs in the local mature higher education sector appear to be very market-oriented and volatile.

The 2012/13 intake marked a structural change of the higher education sector in Hong Kong. The study time for Bachelor degrees will be increased from three years to four years. Accordingly, secondary school education is decreased from seven years to six years. The Hong Kong Certificate of Education Examination for Form 5 students ended in 2010; the Hong Kong Advanced Level Examination ("HKALE") for Form 7 students ended in 2012; the Hong Kong Diploma of Secondary School Examination ("HKDSE") for Form 6 students began in 2012. Form 6 is equivalent to the North American Grade 12, Mainland China senior high school completion, and Australian Year 12. There were two cohorts of secondary school-leavers seeking university admission in the academic year 2012/13. In this double-cohort year, HKALE candidates competed for three-year bachelor degree places, and HKDSE candidates competed for four-year bachelor degree places. The new system is known as the new 3-3-4 system that is similar to the system of mainland China and North America. Students attend three years of junior high school, followed by three years of senior high school, and then go for four years of bachelor's degree.

According to the Joint University Programmes Admissions System (JUPAS) (2012) and the Hong Kong Examination and Assessment Authority (2012), for the September 2012 double-cohort intake, UGC has offered 15,000 government-funded places to around 41,000 HKALE candidates and 15,000 places to 72,876 HKDSE candidates. There were around 84,000 (close to 74 per cent of total candidates of the double cohorts) secondary school-leavers who were not offered a government-funded place. A lot of these students had to look for self-financing programs. This has provided amber opportunities to self-financing institutions. The following section will discuss the possible fall in higher education quality as a result of this surge in the supply of higher education places.

Falling Quality of Tertiary Education

The falling quality of higher education has alarmed policy-makers in Hong Kong (Education Bureau 2008) and elsewhere in the world (Hersh and Benjamin 2010; Organisation for Economic Co-operation and Development 2011; U.S. Department of Education 2006; Wilson 2010), employers in Hong Kong (Chow 2004; Education Bureau 2008; Hong Kong Lawyer 1997; Wan 2011) and other countries (Crumbley, Flinn, and Reichelt 2010; Hassim et al 2004; Henderson 2011; U.S. Department of Education 2006), educators and academics worldwide (Brown 2010; Crumbley, Flinn, and Reichelt 2010; Dill 2005; Henderson 2011; Kember 2010; Li 2010; Lomas 2001; Lui and Suen 2005; Sadler 2009; Tam 1999; Wan 2011; Zhou and Xie 2006). Wan (2011) points out that in Hong Kong the number of quality university graduates has been decreasing.

In early March 2010, American President Obama warned the falling education standards of the United States, and the country was not producing the highest proportion of college graduates among wealthy nations (Wilson 2010). Hersh and Benjamin (2010, p. 1) report that in the United States, "more than half of college graduates cannot calculate the change from $3.00 for a $1.95 sandwich and a cup of soup for 60 cents."

In the United Kingdom, Henderson (2011, p.1) points out that education quality has been damaged fundamentally. Many pupils are "functionally illiterate"; they do not have adequate knowledge in the basic 3Rs (reading, writing, and arithmetic). Many of them are unable to do simple arithmetic. This situation is similar to the United States. This perhaps is due to the heavy reliance on calculator.

The HKSAR Government might have taken the lead to implicitly accept the falling quality of local graduates. Since January 1, 2003, applicants for HKSAR Government posts at degree and professional levels must pass the two language tests (Use of English and Use of Chinese) of the Common Recruitment Examination ("CRE"). Some

government jobs require Level 1 in these language tests, and some require a higher standard at Level 2. Some posts require an aptitude test. Since September 1, 2008, all applicants for these posts are required to take the Basic Law Test operated through the CRE. In other words, all applicants are required to sit for at least three CRE papers, and some posts require all four tests in addition to a bachelor degree.

Exemptions in the CRE language papers can be granted to applicants who have obtained grades "C" or "D" from the HKALE or the General Certificate of Education Advanced Level ("GCEAL"). HKALE and GCEAL are meant for undergraduate admissions, but not for graduates to make up their language deficiency at admission some years ago. Even if their language proficiency has not met the undergraduate admission requirement at the beginning, they should have improved it after three years of local university education that adopts English as the medium of instruction. There are still graduate candidates failing the CRE language papers.

In an email answer on July 19, 2010 from the Civil Service Examinations Unit of the Civil Service Bureau, for the Use of English and Use of Chinese papers, the percentage of candidates obtaining Level 1 or above is about 70 per cent, and the percentage of candidates obtaining Level 2 is about 60 per cent. In other words, some 30 per cent of our graduates do not meet the minimum language requirement for government's degree or professional posts.

To teach English in primary and secondary schools in Hong Kong, teachers have to be graduates from an English major or English-related discipline. Otherwise, they need to pass the Language Proficiency Assessment for Teachers ("LPAT") examination within the first year of service. English teachers under the Native English Teacher ("NET") scheme are exempted because English is supposed to be the native language of these NET teachers. The scheme has not appeared to be very successful in Hong Kong. There

are English teachers under the NET scheme who are not locals but whose mother tongue is not English. However, these non-English mother tongue English teachers are not required to pass the LPAT because they are employed under the NET scheme.

The LPAT is held once a year. Candidates are graded standards-based. The LPAT (English Language) 2011 Assessment Report indicates that there was only 37 per cent of the candidates who passed the writing part, and 50 per cent passed the speaking part (Hong Kong Examinations Assessment Authority 2012b). This perhaps can explain partially why the English language standard has been falling in Hong Kong. This seriously affects students' learning at the tertiary level because the medium of instruction and study materials in most courses are basically English.

Why do university graduates fail the CRE language papers? Has the language standard among graduates in Hong Kong fallen? Do grades reflect the same standards as grades awarded prior to 2003? The HKSAR Government indirectly indicates the distrust of the language proficiency of graduates or their language grades on university transcripts by requiring job candidates to write the CRE language papers except those exempted. Exemptions are only granted on the ground of HKALE results, but not university language grades. In terms of distrust of academic credentials, the HKSAR Government is not alone. It has happened in the United States in as early as the 1990s (Spiegler 1998).

There are serious concerns (Education Bureau 2008; Wan 2011) about the quality of the sub-degree sector in the HKSAR. Some even have suggested common benchmarks for all course providers to ensure quality standard (Education Bureau 2008). Course providers are called to pay special attention to the exit standards. Although no qualified child should be left behind, there is a general consensus that colleges should adopt the "lenient entry, stringent exit" principle (Education Bureau 2008, p.58; Education Bureau 2009, p.7). Self-financing institutions welcome and follow the "lenient entry" nicely; some of

them have maximized the “special admission” allowance to admit sub-standard students. However, some do not appear to follow the “stringent exit” guidelines. They simply curve to pass and graduate sub-standard students.

Norm-referencing grading system passes and graduates relatively better students, notwithstanding they are not good enough to pass and graduate. Although many institutes have adopted outcomes-based policy in assessing and measuring students’ learning outcomes, institute management or academics still curve grades if the overall final grades do not turn out to look good. In particular, they are reluctant to fail too many students although outcomes-based assessment is in place. Failing too many students may and can be interpreted as incapability of the concerned instructor. It is very seldom that student intake is blamed. As a result, college management and academics hesitate to fail students. This in turn leads to the issue of grade inflation. Higher grades are awarded without the corresponding higher academic achievement. Grade inflation leads to credential inflation (Kariya 2011) that contributes partially to educated unemployment or underemployment (Wan 2011). Sub-standard graduates having graduated through grade inflation are simply not prepared to take the challenge in the labor market.

Grade Inflation

Inflation in our daily life means prices are continuously increasing for the same goods. In economics, it means the general price level keeps increasing; prices of goods and services on average are becoming higher and higher. Analogously grade inflation in education means grades are continuously increasing for the same academic achievement. It is a general phenomenon worldwide that traces back to 1894 at Harvard University of the United States (Kohn 2002). Grade inflation can be longitudinal or local (Kuhn, Warren, Maletta, and Branford 2011). The former is what most discussions focus on; the same academic achievement is awarded a higher and higher grade over time. The latter refers to the situation that different groups of similar students are graded higher. For instance, there are different sections of a course taught by different faculty members. Professor A

grades more leniently than Professor B. The two types of grade inflation very often coexist (Kuhn, Warren, Maletta, and Branford 2011). The discussion of grade inflation here focuses on longitudinal grade inflation.

Grade inflation has become a worldwide issue among not only colleges and universities but also high schools. To name a few, it exists among American high schools (Goodwin 2011; Walsh 2010; Woodruff and Ziomek 2004), the British General Certificate of Education (Henderson 2011; Owen 2010), Canadian high schools (Laurie 2009), American colleges and universities (Babcock 2010; Faurer and Lopez 2009; Jaschik 2010; Kohn 2002; Kuhn, Warren, Maletta, and Branford 2011; Smith and Fleisher 2011; Wongsurawat 2009), Australian higher education institutes (Sadler 2009), British tertiary education institutes (Henderson 2011), Chinese colleges and universities (Qiang and Wolff 2009), and Japanese universities (Kariya 2011).

Grade inflation in high schools provides a "solid foundation" for grade inflation in colleges and universities. In the United Kingdom, there are frequent complaints from university faculty that students are inadequately prepared for university education (Henderson 2011). However, to meet the former British Prime Minister Tony Blair's target of having 50 per cent of secondary school-leavers participating in higher education, the system has to pass sufficient number of secondary school students. This is done by lowering the standard of General Certificate of Secondary Education ("GCSE") (Henderson 2011). The Organization for Economic Co-operation and Development (2011, p.10) reports that in the United Kingdom, "evidence suggests that improvement in exam grades is out of line with independent indicators of performance, suggesting grade inflation could be a significant factor."

At the university level, in the 1960s, the top British universities awarded about 40 per cent of bachelor degrees the top two degree classifications – firsts and upper seconds.

Currently, they offer 15 per cent firsts and about 66 per cent upper seconds (Henderson 2011). The top two degree classifications are about 80 per cent, twice the percentage of the 1960s. This has not counted the substantial increase in university enrolments over the years. With the increase in the absolute amount of university enrolments, the first and upper second honor graduates are everywhere. It is unsure if students have become twice smarter or the intelligence quotient ("IQ") of the population has increased.

Intelligence quotient is normally distributed within a population (Henderson 2011; Mega Foundation n.d.). IQ is a ratio. It is obtained by 100 times mental age divided by chronological age; the mean IQ therefore in theory is 100. To be successful in earning a college degree, Mega Foundation (n.d.) suggests an IQ of 100 and above. Therefore, it is estimated that half of a population is capable to complete a degree. This perhaps can help to explain why there are students unable to complete their college degrees under the mass higher education system that provides more than 50 per cent higher education places to secondary school-leavers. If we believe in the IQ theory and apply it to the situation of the HKSAR that provides more than 60 per cent higher education places to secondary-school leavers, the unsuccessful or drop-out rate in higher education should exceed 10 per cent.

In the United States, Woodruff and Ziomek (2004) have studied American high school grades from 1991–2003. The sample sizes for all years were more than 630,000. They used the American College Testing ("ACT") as the benchmark and compared the ACT scores with high school grade point average ("GPA") in 23 high school courses. The results indicate that grade inflation existed over the 13 years. The average grade inflation varied between 0.20 and 0.26 on a 4-point scale. Superficially, a 0.20 GPA increase in the 4-point scale is 5 per cent. However, 17 out of these 23 courses in 1991 had a mean GPA of over 3.00. Therefore, an increase from the base of 3.00 with a cap at 4.00, a 0.20 GPA increase within the narrow range of 1.00 is very substantial. Yet, this has not met the expectation of the American President Obama who appealed to the American general

public in March 2010 that all American students graduated from high schools are prepared for college education and a career (Wilson 2010).

The Obama appeal is certainly good for any country. However, high school dropouts are due to different reasons. If sub-standard students are passed and promoted to college or university through grade inflation, they will be unable to handle college work. Goodwin (2011) comments that the As that students get today in the United States are not the same as their parents' As.

At the college and university level, in the United States from 1967 to 2000, GPA has increased by about 0.15 per decade. Private schools have inflated grades about 25 per cent to 30 per cent more than public schools (Hunt and Gardin 2007; Smith and Fleisher 2011). Part-time and non-tenured faculty members tend to grade more leniently (Smith and Fleisher 2011). Albeit grade inflation and coursework deflation (Crumbley, Flinn, and Reichelt 2010), the United States has on average 30 per cent of freshman drop out from their first year of college experience. The graduation rate among four-year colleges and universities is below 50 per cent (Hersh and Benjamin 2010). Students might have been "killed" by the "kindness" of grade inflation (Goodwin 2011). Students are simply not ready for college work. The U.S. Department of Education (2006, p.12) comments that "while educators and policymakers have commendably focused on getting more students into college, too little attention has been paid to helping them graduate".

Grade inflation among Canadian high schools is no exception. Laurie (2009) investigates over 20 high schools in Eastern Canada from the academic years 2001/02 to 2003/04 and 2005/06 to 2007/08. He defines grade inflation as the higher teacher-assigned grades than the provincial exam grades based on the assumption that the teacher and the provincial examination should assess students on the same curriculum. He finds that the correlation between grade inflation and provincial examination results are strongly negative and

significant. A lower grade inflation points to higher provincial exam result and vice versa. The logic is simple. If the teacher-assigned grade is low, students expect the course is going to be difficult. Students will work harder for the course, and they will get better provincial examination result. On the contrary, if the teacher-assigned grade is inflated, students might receive a wrong message that the course would not be too difficult. They might not study as hard. This is consistent with the finding of Smith and Fleisher (2011) who find a negative relationship between student's expected grade and study effort. When students expect it is easy to obtain a high grade from a course, they will not study as hard.

Qiang and Wolff (2009) allege that grade inflation among Chinese universities is out of control. For example, the norm grade distribution of a Chinese university in northern Shanghai is 40 per cent As, 30 per cent Bs, and 30 per cent Cs. The grade of D is rarely given. Grades are changed administratively if they are not allocated according to the norm.

Grade inflation per se may not be a problem in higher education if it does not cause lower quality. Practically there is no cost to academics and management to inflate grades. However, Hunt and Gardin (2007) find that among American college students, grades have been rising without evidence of higher quality; students have devoted less time than their predecessors to attending classes, working on assignments, studying, and less responsibility for their education. Crumbley, Flinn, and Reichelt (2010) find that grade inflation has caused lower learning outcomes and coursework deflation. They further report that the average classroom days have dropped from 191 days in the 1960s to 156 days in the 1990s. Babcock (2010) finds that from 1960s to 2000s, American college student grades have "improved" over the years, but student studying time has decreased dramatically. It is hard to believe that student grades are better with less effort. Kohn (2002) argues that better grades can be due to, among other reasons, better teaching method. Babcock (2010, p. 984) further points out that "easy grading actively discourages

students from rising to the challenge to do their best work". On the other hand, it has been found that tougher grading pushes students to work harder (Babcock 2010, Jaschik 2010; Smith and Fleisher 2011). Laurier (2007) appeals teachers to increase their expectations on students if teachers want their students to succeed. When students realize that teachers have high expectations on them, students work harder.

Smith and Fleisher (2011) observe a correlation between grade expectation from lenient faculty and studying time. Student studying time was 50 per cent less in classes that students expect an "A" than classes that students expect a "C". Grade inflation is not only an indicator of deteriorating higher education but also lowers the motivation of students to study harder (Dill 2005). Many of them are curved to pass after all. Kohn (2002) presents possible reasons for grade improvement instead of grade inflation. These reasons can include students submitting better assignments, better teaching method, or teachers used to mark very stringently.

As the heat of grade inflation was rising in higher education institutes internationally, Princeton University started a large-scale initiative to end it in 2004; a norm of 35 per cent A are awarded (Babcock 2010; Bruno 2007; Ding and Sarnoff 2012; Foderaro 2010; Luzer 2010). When the policy was first implemented, Princeton University sent thousands of letters to American graduate schools and employers explaining the policy (Foderaro 2010). Students have protested against it and challenged the policy vigorously. They were worried about the grade deflation policy that would lead to a lower GPA thereby affecting their application for admissions to graduate schools or jobs. Princeton University studied the impact of grade deflation on their graduates' applications for top medical schools and law schools; no impact was found (Foderaro 2010). No negative impact from grade deflation on students' post-graduation plan was found either (Ding and Sarnoff 2012).

There are different reasons for inflating grades. First, for high school grades, to ensure sufficient number of secondary school-leavers qualified for higher education, Henderson (2011) points out that in the United Kingdom to increase the number of children passing examinations and participating in higher education, examination standards are lower and grades are inflated. The former United Kingdom Prime Minister Tony Blair had an agenda to send 50 per cent of secondary school-leavers or people under the age of 28 to higher education. In the HKSAR, as discussed earlier, the government has a policy to send 60 per cent of secondary school-leavers to higher education. Higher education institutes once admitted these students have an obligation to graduate them.

Second, for economic reason, university funding depends on student enrolment (Henderson 2011; Kuhn, Warren, Maletta and Branford 2011). Under this policy, a university or a department within a university gets more funding for it has more students. Therefore, to get more funding, departments by inflating grades and making life easy for students attract students to take their lower level courses in order to meet general education or elective requirements even though these courses may not help students' future career (Smith and Fleisher 2011). Students tend to choose leniently graded courses and programs (Kuhn, Warren, Maletta and Branford 2011).

Third, faculty's teaching career depends on student evaluation (Crumbley, Flinn and Reichelt 2010; Dill 2005; Henderson 2011; Hunt and Gardin 2007; Maiuri and Leon 2012; Smith and Fleisher 2011). Part-time, adjunct, or untenured faculty members, in order to keep their job tend to make life easier for students and inflate grades so that they get better student evaluation. Crumbley, Flinn and Reichelt (2010, p.189) point out that "the increased use of SET (student evaluation of teaching) has caused higher education to become dysfunctional, resulting in a steep, slippery slide in the output quality of student learning." Faculty members deflate course work and inflate grades for better student evaluation and avoiding complaints.

The forth reason, sadly say, consumerism (Cooper 2007; Chan and Lo 2007; Faurer and Lopez 2009; Harvey and Green 1993; Harvey and Williams 2010; Henderson 2011; Kuhn, Warren, Maletta and Branford 2011; Lee and Gopinathan 2003; Qiang and Wolff 2009), institutions treat students as "customers", and student evaluation of teacher performance has been taken as "customer satisfaction" feedback. In the 1990s, in the United States, Sacks (1996, in Crumbley, Flinn and Reichelt 2010, p.189) finds that administrators and students do not care about learning or academic standards. Administrators simply want students to be satisfied, and students simply want good grades with little effort. If students are not happy with good grades, faculty members are blamed. Furthermore, students do not expect outside classroom work as a requirement. Consumerism in higher education at times makes students unable to distinguish themselves as students or consumers who treat higher education as if any other consumer goods and services. Universities are producers and sellers of education services (Chan and Lo 2007).

Smith and Fleisher (2011) list other possible reasons for grade inflation. These reasons, among others, include emphasis on graduation rate, increase use of part-time faculty members, minimizing grade complaints and grade appeals, and pressure from peers whose students perform "well" in their classes.

Conceptualization of Quality

Quality and/or quality assurance of higher education have been brought onto the table in our daily life under different environments. But what is quality of higher education in the first place? Higher education quality is conceptualized differently among different people (Blackmur 2010; Harvey and Green 1993; Harvey and Williams 2010; Mok 2007, Parri 2006; Tam 1999). It is a slippery concept (Harvery and Green 1993). Blackmur (2010) alleges that quality in tertiary education has not been adequately conceptualized. He further comments that if there is no consensus in the definition of quality education,

quality or quality assurance should not even be discussed. People are simply talking about different things.

To maintain or improve the quality of higher education, quality per se needs to be defined, and attributes to quality need to be identifiable and measurable. Having a sound quality management system (Sarbu, Ilie, Enache and Dumitriu 2009) and using relevant assessment tools are never less important. There are different definitions of higher education quality (Gibbs 2010; Harvey and Green 1993; Harvey and Williams 2010; Lomas 2001; Mok 2007; Parri 2006; Sarbu, Ilie, Enache and Dumitriu 2009) that can be summarized in the following paragraphs.

Quality as excellence. This refers to exceptional and high standard. Harvey and Green (1993) define three levels of excellence – distinctive, exceeding very high standards, and passing a set of required standards. These levels may be analogous to college grades "A", "B", and "C". Lomas (2001) uses Rolls Royce as a metaphor for quality education. Quality simply refers to excellence with superb quality. Parri (2006) sees excellence as the best.

In the context of local higher education quality, Chan (2010) suggests an "A" to be awarded to students demonstrating original thought, analytical and critical abilities, in addition to a thorough understanding of the course materials. The grade of "B" is awarded to students with analytical and critical abilities in addition to a thorough understanding of the course materials. The difference between "A" and "B" students is the original thought.

Quality as fitness for purpose. Higher education institutes have mission statements. Fitness for purpose can be testified if institutes have achieved what they state in their

mission statements (Parris 2006; Sarbu, Ilie, Enache, and Dumitriu 2009). Another interpretation of fitness for purpose views education as a service. As if buying any good or service, higher education has to fulfill a customer need (Lomas 2001). Employability is an important aspect of quality education (Hager and Holland 2006, Storen and Aamodt 2010). The rationale behind this is that the purpose of attending higher education, to many people, is employment. This is analogous to buying a physical product that serves a particular purpose and solves a particular problem. For example, a washer serves the laundry need. It is logical to believe that higher education leads to higher employability although education does not necessarily guarantee employment (Wan 2011).

Quality as transformation. This is reflected by the degree that students reshape themselves upon completion of higher education programs (Harvey and Green 1993; Parri 2006); students will change in form from one state to another (Lomas 2001). This is related to the capacity that students are able to change their way of thinking given knowledge and skills acquired through higher education. For instance, many higher education institutions in Hong Kong have a mission to train students becoming "biliteracy and trilingualism". Biliteracy refers to the ability to commensurate both the English and Chinese languages; trilingualism means students will speak supposedly fluently Cantonese, Putonghua, and English. It is doubtful if the majority of local graduates from these institutes are biliterate and trilingual.

Quality as value for money. This includes spending by institution and tuition paid by students. The source of finance of UGC-funded programs and institutions is basically tax-payers' money; the institutions and the UGC are accountable for the money spent. According to the University Grants Committee of Hong Kong (2012c), grants to UGC-funded institutions for the past five years were: HK$12.5 billion (2007/08), HK$12.8 billion (2008/09), HK$12.8 billion (2009/10), HK$14.2 billion (2010/11), and HK$16.3 billion (2011/12). Billions of dollars are spent on higher education in the HKSAR without counting tuition paid by students. These monies need to be accounted for. If higher

education is provided without quality, neither taxpayers nor students have spent their money worth. Therefore, providing high quality higher education at a cost-effective way (Parri 2006) is a norm.

Quality as perfection. This flawless, or zero error definition of quality makes highly unlikely to achieve in higher education. This concept of quality may apply better in physical products, which are produced totally in compliance with product specifications. However, producing flawless or zero-error graduates in higher education is impossible (Lomas 2001; Mok 2007, Parri 2006). Furthermore, Parri (2006) points out that it is not practical to produce perfect, but identical graduates. It is unlikely to produce perfect people in any event. The society may not want identical graduates anyway.

Quality as value-added. Except top-tier colleges and universities who can still admit top quality candidates, average schools accept average or marginal, if not sub-standard, students. Since intake to a certain extent determines output, comparing graduates' quality from a top-tier school with an average school is not reasonable. Quality of education can be assessed by measuring the value-added to students throughout their studies (Hersh and Benjamin 2010; Mok 2007).

We should be careful that these definitions are not mutually exclusive (Fornari and Pompili 2010). An excellent product can be perfect, fit for purpose and accountable for money spent. A high quality higher education program can produce superb quality graduates who have achieved what the mission statement claims; graduates can transform, upgrade themselves with knowledge and skills acquired from the program.

Regardless of how quality is conceptualized or defined, arguments have been made that quality of input affects quality of output (Harvey and Green 1993; Fornari and Pompili

2010: Lui and Suen 2005; Parri 2006; Tam 1999). In view of the current mass higher education era, only the few top tier institutions can still adopt the old practice of controlling quality by admitting top quality students; other institutions cannot. In Hong Kong, perhaps the top three universities, namely the University of Hong Kong, the Chinese University of Hong Kong, and the Hong Kong University of Science and Technology can choose to admit the top students. Other institutions cannot afford to do so. In particular, most local self-financing institutions offering programs outside the financial umbrella of the government cannot afford to refuse admissions to any student meeting the admissions requirements until the capacity is filled. Therefore, the conventional wisdom of controlling higher education quality by admitting the top quality students does not work in the current mass higher education era (Harvey and Green 1993).

Since most higher education institutes cannot compete with the top schools for the top students, there should be ways for them to control the education quality of the programs that they offer. To control education quality, as it is mentioned earlier, it is necessary to have identifiable and measurable attributes. The following section will discuss the attributes to quality higher education.

Attributes to Quality

To determine and compare what is good or bad quality education, it is necessary to have quantifiable graduate attributes. Huges and Barrie (2010, p. 325) define graduate attributes as "an articulation of the core learning outcomes of a university education". Core learning outcomes consist of a set of skills. In general, the chain of articulation of core learning outcomes goes from the broadest mission statement to the details of each course as follows: the mission of a college, objectives to achieve the mission, programs' intended learning outcomes to achieve objectives, and course intended learning outcomes to match up program intended learning outcomes. All the intended learning outcomes have to be measurable.

Hager and Holland (2006) in their book has a collection of papers from different authors exploring into graduate attributes, learning, and employability. Graduate attributes are also named graduate qualities, graduate competencies, or graduate skills. Whatever they are called, they are the employability skills. The authors list three skill types that have increasingly gained attention. Namely, they are generic skills, core skills, and basic skills. They have not given full explanation of core and basic skills. For generic skills, they have gone into deep discussion. Generic skills can be interpreted as some kind of soft, personal skills that are inter-disciplinary, transferrable across different disciplines (Winch 2006). Generic skills can be visible or non-visible. For example, body language in interpersonal communications can be seen, but analytical reasoning abilities cannot be seen.

In the list of Hager and Holland (2006, p. 2), generic skills or attributes include "logical and analytical reasoning, problem solving, and intellectual curiosity; effective communication skills, teamwork skills, and capacities to identify, access and manage knowledge and information; personal attributes such as imagination, creativity and intellectual rigor, and values such as ethical practice, persistence, integrity and tolerance." Some of these skills cannot be improved through practice. The list is by no means exhaustive and universal. Employers typically require "ability to work flexibly as part of a team, the ability to work autonomously, capacity to adapt to change, (and) ability to work creatively" (Hager and Holland, p. 4). The generic skills defined by the authors sound analogously to general education or liberal studies of other schools.

Although generic skills are different from disciplinary-specific knowledge, it is difficult to draw a clear-cut line between the two (Winch 2006). For example, a social science research course teaches students to conduct research in the social science context. However, if the skills acquired from the course are applied in a different context, the course knowledge is transferrable and therefore it is also generic. Basic language skills (English) help disciplinary skills (a course in business communication) that enhance

generic skills (communication skills). Therefore, regardless of how we categorize a skill or an attribute, many skills or attributes are inter-related.

In the United States in 2007, Public Opinion Strategies and Peter D. Hart Research Associates of the United States conducted a national survey of 800 registered voters. The survey has identified a broad range of fourteen 21st century must-learn skills. They are listed in descending order of importance as follow (Partnership for 21st Century Skills, n.d.):

1. Reading comprehension
2. Computer and technology skills
3. Critical thinking and problem-solving skills
4. Ethics and social responsibility
5. Written communications
6. Teamwork and collaboration
7. Oral communications
8. Lifelong learning and self-direction
9. Mathematics
10. Leadership
11. Creativity and innovation
12. Media literacy
13. Global awareness, and
14. Natural science

The American Management Association ("AMA") has identified skills required for workers in the 21st century. These skills include the traditional skills in reading, writing, and arithmetic (known as the 3Rs). The association also has identified the 4Cs – critical thinking, communication, collaboration, and creativity - that have become more

important in the workplace for the 21st century (American Management Association 2010).

In the HKSAR in April 2010, the EDB published a report on opinions of 961 Hong Kong employers of local sub-degree graduates of 2006 from 18 higher education institutions (Education Bureau 2010a). The sample consists of employers from the government, education, manufacturing, construction, wholesale, retail, import and export trades, transport, storage, communications, financing, insurance, real estate, business services, community services, social and personal services. The sizes of companies range from less than 50 full-time employees to more than 1,000 full-time employees. Skill aspects measured are ranked in descending order of their relative importance levels as follows:

1. Work attitude
2. Inter-personal skills
3. Chinese language proficiency
4. Analytical and problem-solving skills
5. Numerical competency
6. Technical skills required for the job
7. Information technology literacy
8. English language proficiency
9. Management skills

Local employers rank English language proficiency as relatively less important than Chinese language proficiency and other skill aspects for the sub-degree graduates although Hong Kong is a de facto international city. Contradictorily, most employers suggest that students are tested on English, Chinese and communication skills before graduation. Local employers are concerned about the ability of local sub-degree graduates in written and spoken English (Education Bureau 2010a). While local employers rank work attitude as the most important aspect of local sub-degree graduates,

ironically there is hardly any local institution that offers a course in training "work attitude".

Along with the survey from employers for the sub-degree graduates of 2006, the EDB conducted a similar survey for the eight UGC-funded full-time first degree graduates also for the year 2006 and published a similar report in April 2010 (Education Bureau 2010b). The survey has received 1,972 responses from employers with similar industry coverage and company sizes as the survey for sub-degree graduates. Employers have ranked the nine aspects of skills in descending order as follows:

1. Work attitude
2. Inter-personal skills
3. Analytical and problem-solving skills
4. English language proficiency
5. Chinese language proficiency
6. Technical skills required for the job
7. Numerical competency
8. Information technology literacy
9. Management skills

While rankings of the two most important skill aspects, work attitudes and inter-personal skills, are the same for sub-degree and first degree graduates, English language proficiency for the graduates is more important than Chinese language proficiency. Perhaps this is due to the fact that first degree and sub-degree graduates are employed to work on different levels of works.

In Australia, the Australian Government (2008) publishes a list of employability skills including communication, teamwork, problem-solving, initiative and enterprise, planning

and organizing, self-management, learning, and technology. These skills must be embedded into training packages of the National Quality Council of Australia.

Shah and Chenicheri (2011) publish a report on key attributes of graduates that Australian employers look for. A full list of the attributes has been attached in Appendix 2. The four areas of abilities included in the study are: personal abilities, interpersonal abilities, intellectual abilities, and generic and specific skills and knowledge. They have approached 880 Australian employers who were mostly human resources managers or management personnel responsible for staff recruitment. A total of 400 valid responses were received. The sample consists of employers from private, public, and non-profit organizations. Among the top 10 important attributes, 4 are from the area of personal qualities, 3 from interpersonal abilities, 2 from generic skills and knowledge, and only 1 from intellectual abilities. The top 10 relatively important attributes are ranked in descending order as follow (Shah and Chenicheri 2011, pp 3-4):

1. Communicate effectively (generic skills and knowledge)
2. Flexible and adaptable (personal abilities)
3. Commitment to ethical practice (personal abilities)
4. Willing to face and learn from errors and listen openly to feedback (personal abilities)
5. Able to organize work and manage time effectively (generic skills and knowledge)
6. Produce as good a job as possible (personal abilities)
7. Able to empathize with and work productively with people from a wide range of backgrounds (interpersonal abilities)
8. Willing to listen to different viewpoints before coming to a decision (interpersonal abilities)
9. Able to develop and contribute positively to team-based projects (interpersonal abilities)
10. Able to set and justify priorities (intellectual abilities)

Although the attributes are named differently among the four studies, the first three have similar meanings except the Australian study (Shah and Chenicheri 2011) that did not include basic language and arithmetic skills as graduate attributes. Skills of the four studies are synthesized in Table 2.2.

Table 2.2: Synthesis of Graduate Skills

American Management Association	Partnership for 21st Century Skills	Education Bureau of the HKSAR	Australian Employers - Shah and Chenicheri,
Reading	Reading comprehension	Chinese and English language proficiency	
Writing	Written communication,	Chinese and English language proficiency	
Arithmetic	Mathematics, science	Numerical competency,	
Critical Thinking	Critical thinking and problem-solving skills, lifelong learning and self-direction, media literacy, global awareness	Analytical and problem-solving abilities, technical skills required for the job, information technology literacy	Intellectual abilities
Communication	Written communication, oral communication,	Chinese and English language proficiency, inter-personal skills,	
Collaboration	Ethics and social responsibility, teamwork and collaboration, leadership,	Work attitude, management skills, inter-personal skills	Personal abilities, interpersonal abilities, generic skills
Creativity	Creativity and innovation	Analytical and problem-solving abilities	Intellectual abilities

The Conference Board of Canada (2000), prior to the Australian Government, has listed 3 major skill areas in 11 groups of employability skills for the 21st century. These skills are listed as follows:

- Fundamental skills
  - Communication
  - Information management
  - Numbers
  - Critical-thinking and problem-solving
- Personal management skills
  - Positive attitude and behavior
  - Be responsible
  - Adaptable
  - Learning
  - Work safety
- Teamwork skills
  - Work with others
  - Participate in projects and tasks

These skills dressed in different names can easily be matched with skills required by Hong Kong employers, American, and Australian employers.

Among developed economies, the Organization for Economic Co-operation and Development (OECD 2001) report, covering 16 European countries, Australia, Canada, Japan, New Zealand, and the United States, has published a list of graduate competencies for the 21st century. In addition to the basic reading, writing, and arithmetic skills, graduates need to be equipped with the following three areas of competencies: interpersonal skills, intrapersonal skills, as well as information and communication technology skills. Interpersonal skills include working with the others towards a common objective, and leadership skills. Intrapersonal skills are personal qualities that include

motivation and attitude, self-learning ability, analytical and problem-solving skills, and communication skills. The OECD (2001) report indicates that as the world is moving towards a knowledge-based economy, workers will need more and higher level skills. The workforce is "upskilling".

The OECD (2001) report finds that employers weight interpersonal and intrapersonal skills more than learned skills. In particular, employers rank initiative, motivation and communication skills as the most important competencies (OECD 2001, p. 105). Employers generally believe that job-related skills can easily be learned if new hires have good motivation and personal qualities (OECD 2001).

With a reconciliation of the competencies from the Australian government, the Conference Board of Canada, and the Organization for Economic Co-operation and Development, it is not difficult to find that most of these competencies can be mapped into Table 2, the graduate attributes.

Borrowing the terminologies of Hager and Holland (2006) and referring to the discussion of this section, graduate skills or attributes can be categorized into three major areas: basic skills, generic skills, and core skills. Skills, attributes, and competencies sometimes are used interchangeably.

Ranking of Relative Importance of Graduate Attributes

It is natural to observe different rankings of the relative importance of different skills among Americans, Australian, and Hong Kong employers. Americans view reading comprehension, one of the basic skills (the 3Rs), as the most important skill for the 21st century; language skill is not found in the Australian study; Hong Kong employers rank

sub-degree graduates Chinese language proficiency as the third important and surprisingly English language proficiency as the eighth among nine skill aspects.

American and Hong Kong employers have identified similar skills required for the 21st century although the skills are ranked differently in terms of their relative importance. These attributes are similar to the graduate competencies suggested by the Australian government (2008), the Conference Board of Canada (2000), and the OECD (2001). Therefore, the 7 skill domains of the American Management Association, the 14 skills of Partnership for 21st Century Skills, and the 9 skill aspects of the Hong Kong Education Bureau can be synthesized to provide ground for characterizing attributes to quality higher education in the HKSAR. Each skill aspect contains some measurable attributes. The 45 attribute items in 9 skill aspects adopted in the EDB surveys (see Appendix 1) are justified to be used in this study.

Conclusion

This chapter has discussed the background and recent development of the higher education sector in the HKSAR. With drastic increase in the supply of higher education places since the early 2000s especially in the self-financing sector, the HKSAR is in a post-massification or universal higher education era – accommodating more than 60 per cent of secondary school-leavers. This undoubtedly has triggered concern about the quality of our higher education and our graduates. With norm-referencing grading and grade inflation, most of our tertiary students can graduate with their diplomas. Grade inflation has the effect of lowering student's motivation to learn. It is believed to be one of the reasons contributing to the falling higher education quality in the HKSAR and elsewhere in the world. Sub-standard graduates find very difficult to get job offers. Educated unemployment, as if other developed economies, is a rising social issue in the HKSAR.

Different definitions of quality higher education have been discussed. There is still no consensus in the definition. Graduate attributes or competencies adopted by different studies contributing to quality higher education have been reviewed. Although differences exist, graduate attributes can be synthesized, benchmarking with the studies conducted by the EDB. Therefore, using the attributes of EDB studies is acceptable. In the next chapter, the theoretical background of the methodology adopted in analyzing the data collected will be discussed.

Chapter 3: Research Methodology

In Chapter 2, recent development of the higher education sector into post-massification or universal education era in the HKSAR has been discussed. The higher education policy has focused too much on quantity to meet the policy objective of the government to provide higher education places to 60 per cent of secondary school-leavers without much emphasis on maintaining quality. This has led to a possible fall in the quality. It has been argued that grade inflation is a source of falling education quality. Different definitions of quality education and attributes to quality higher education have been discussed. This chapter will discuss the theory background of the methodologies used in the study.

Research Questions

The research questions of this study are restated as follows: First, what are the quality dimensions and their respective attributes that our graduates should possess? Second, do stakeholders rank the quality attributes differently? Third, what are the rationales in terms of quality education definitions behind stakeholders' rankings of the relative importance of the attributes our graduates should possess? Fourth, how can tertiary education institutes maintain and ensure graduate quality with an increasing number of students?

Population and Sample Sizes

The population of the study includes four stakeholder groups. They are employers, academics and college administrators, college graduates, and current tertiary students. Employers include human resources managers responsible for staff recruitment. Stratified sampling method has been used with their respective minimum sizes listed in brackets:

1. Employers (50)
2. Academics and college administrators (50)
3. College graduates (50)

4. Current tertiary students (200)

The minimum sample sizes were set following the Rasch tradition that normally has a sample size of several hundred. Linacre (2011) does not mention specifically the minimum sample size for using the Rasch model, but suggests 100 persons for Principal-Components Analysis (Rasch Factor Analysis) of items. Kubinger, Rasch, and Yanagida (2009) suggest a minimum sample size of 200. In an earlier paper presented in the International Conference on Questionnaire Development, Evaluation, and Testing, Green and Frantom (2002) suggest a minimum sample size of 100 and 20 items. The minimum sample size for the current study is 350 with 46 items. Therefore, the sample size and the number of items are justified for using the Rasch model.

Questionnaire Items

Each questionnaire contains 46 attributes in 9 aspects. These aspects and attribute items were adopted from studies conducted by the Education Bureau (2010a, p.4; 2010b, p.5) except the last item that was added by the author. A synthesis of these attributes with studies in the United States, Canada, Australia, and European countries has been discussed and presented in Chapter 2. Table 2.2 provides justification of the attribute items used in the study. Respondents were asked to rate each attribute in line with the qualitatively distinctive descriptors (see Table 3.1). The questionnaire was in both English and Chinese to ensure respondents' understanding of the items and questions.

Data Collection

Primary data have been collected with the assistance of an online program my3q in which a questionnaire was uploaded onto the program on November 6, 2011. The last questionnaire was collected on February 28, 2012. In addition to online questionnaire, hard copies were given to and collected from respondents.

Respondents were requested through telephone calls, Facebook and emails to fill in the online five-item-response (very important (5), quite important (4), neutral (3), not quite important (2), not important at all (1)) Likert-scale questionnaire (see Appendix 3) modified from the one used by the Education Bureau (2000, 2006a, 2006b, 2010a, 2010b) with one additional question – the last item "relevant work experience gained as part of the study program". Therefore, a total of 46 items were included in the questionnaire. Following each aspect of attributes, respondents were asked their reasons to rate the relative importance of each group of attributes. This will help to define quality higher education following Harvey and Green (1993).

Table 3.1: Qualitative Descriptors of Likert-scale

Likert-Scale Responses		Qualitatively Distinctive Descriptors
Very Important (5)		The attribute must be included in the study program and taught as a separate course. Students must be examined in the attribute and pass it to graduate.
Quite Important (4)		The attribute must be included in the study program, and it can be embedded in any course. Students must be taught the attribute, but it may not be examined to graduate.
Neutral (3)		It does not make any difference to the quality of graduates with or without passing the attribute.
Not Quite Important (2)		The attribute may be included in the study program, but it does not improve the quality of graduates.
Not Important At All (1)		The attribute does not contribute to the quality of education. It can be removed from the study program.

Table 3.1 corresponding to the Likert-scale outcomes (5, 4, 3, 2, and 1) lists the qualitatively distinctive (Wilson 2005) descriptor of each outcome. This table was included in the questionnaire to guide respondents the qualitatively distinctive meanings of different responses.

Emails were sent to all students and colleagues on the email list of the Hong Kong Institute of Education; the Chinese University of Hong Kong-Tung Wah Group of Hospitals Community College; Tung Wah College; former colleagues currently teaching at different UGC-funded and self-financed higher education institutes. Potential employer respondents were either emailed or phoned. With the assistance of employer respondents through their contacts, more employer respondents have participated in the study. College graduates were emailed and requested through Facebook to fill in the questionnaire. Hard-copy questionnaires were also given to respondents.

As of February 28, 2012, a total of 541 questionnaires were collected. Among which 377 (70%) were done online and 164 (30%) were hard-copies. There were 11 (2%) invalid questionnaires – 5 null and 6 extreme-value questionnaires. The extreme-value questionnaires were filled in either all 1s or all 5s, and one of them either 1s or 5s. Therefore, a total of 530 (98%) questionnaires were finally used. Sample sizes of the stakeholder groups are given below:

1. Employers (59)
2. Academics and college administrators (57)
3. College graduates (75)
4. Current tertiary students (339)

My3q provides a response summary in Excel format. Data from hard-copies were also entered into My3q. Responses were coded, and invalid questionnaires were removed. The data file in Excel format was exported to Rasch Winsteps for analysis. Winsteps provides

person measures in Rasch logits values for the whole sample (N = 530), and for the 4 stakeholder groups for the analysis of the data.

The advantages of using online survey questionnaire are numerous. It is fast, efficient, inexpensive, and environmentally friendly. It can be emailed at the same time to different potential respondents simply by one click. All friends on the Facebook can view the questionnaire once it has been posted. Questionnaire can be forwarded and spread out exponentially via email and the Facebook. Unlike telephone or personal interview, online survey is less disruptive because respondents can do it anytime, anywhere, and be more honest. Furthermore, data received are readily available in Excel format that can be analyzed almost instantly and continuously with a simple step to code responses. Online questionnaire has the advantage of avoiding multiple replies from the same person because respondents' responses are recorded in terms of their internet provider (IP) address and host name. Multiple replies from the same person using the same computer can easily be spotted and removed. One can of course argue that the same person can use different computers as if there are different respondents. However, it is equally likely that if hard-copies are left with potential respondents, they can pass it to another person to fill it in for them. The same person can also fill in more than one hard-copy questionnaires pretending they are different respondents.

There are disadvantages of using online survey questionnaire. On the technical side, respondents have to have access to a computer with internet and be those using email or Facebook. Although My3q is very user-friendly, it may take some time for some people to learn how to fill in an online questionnaire. If there are many replies at the same time, it may cause server crash. As for the target respondents, it is unsure if the subject responding to the questionnaire is the intended one. However, it is equally likely to have the same problem for hard-copy questionnaire that can be left for the target respondent who may ask someone to fill in the questionnaire. Nonetheless the advantages of using online survey questionnaire outweigh the disadvantages.

Interviews of stakeholders including employers, students, college graduates, current or former academics and college administrators of tertiary education institutions have been conducted. The minimum numbers of interviewees of the stakeholder groups were set as follows:

1. Employers (2)
2. Academics and college administrators (2)
3. College graduates (2)
4. Current tertiary students (4)

A total of 63 respondents have indicated in their responses that they were willing to attend a personal interview to discuss measures to maintain and ensure graduate quality. However, eight of them did not identify themselves nor leave a contact. Therefore, there were only 55 valid respondents to choose from for the interview.

To save time potential interviewees were emailed the questions (see Appendix 4) prior to the interview. They were then followed up by either email or telephone calls. Some potential interviewees have responded to the questions in writing via email. The numbers of interviewees per stakeholder groups were: employers (2), academics and college administrators (5), college graduates (3), and current tertiary students (5).

Interviews were conducted either through the telephone or face-to-face meeting. Interviewees were asked the following questions: (1) in your view how can tertiary institutes maintain and ensure graduate quality with an increasing number of students? This is an open-end question. (2) Which of the quality dimensions and attributes do you think the most important to our graduates and why do you think so? This is a multiple-choice question followed by an open-end question. Interviewees were given the two dimensions extracted from the nine attribute aspects using SPSS factor analysis to choose

from. To answer why respondents have chosen the most important dimension and attribute aspect, they were asked to choose one of the four alternatives in relation to the different definitions of quality education. (3) What do you suggest to local tertiary education institutions how they can train their students with these dimensions and attributes? Since interviewees were given the questions ex ante, interviews were short. The interviews were not recorded, but contents were scripted.

Primary Likert-scale data collected were converted into Rasch person measures in logits and analyzed by the Rasch software Winsteps and SPSS. The coded data file in Excel format provided by My3q was exported to Winsteps. Item measures for the whole sample (N = 530), and for the 4 stakeholder groups were run for comparison. Since the EDB has targeted only employers in its surveys, this study has widened the coverage by including other stakeholders – students, college graduates, academics and college administrators. Dimensionality of the attributes has been investigated using Rasch Factor Analysis. Comparison among stakeholders' views was performed using both Rasch DIF and SPSS nonparametric Kruskal-Wallis test. The results are reported in the next chapter. This study has not only ranked the relative importance of quality attribute aspects and attribute items of local graduates among stakeholders, but also found the gap for discrepancy between the views of employers and other stakeholders that the EDB has not included in its reports. This is important for college management when it comes to design the curricular, and for students to understand the reason for taking courses outside the discipline they have chosen to study.

Problems with EDB's Study

In the EDB's reports, there is a fundamental problem with the analysis. Ordinal raw data generated from Likert-scale were calculated, summed, and compared as if interval-ratio data. It is obvious that 5 > 4 > 3 > 2 > 1, and 5:1 = 5. It is only true for interval-ratio data but not dummy data coded for Likert-scale outcomes. Coding "very important" as "5" and "not important at all" as "1" cannot be translated as "very important" is five times

more important than "not important at all". Likewise, if "very important" is coded as "4" and "not important at all" as "0", the number of times "very important" is more important than "not important at all" is infinitive. It is because the ratio of 4:0 is infinitive. Numbers assigned to Likert-scale ordinal data are dummy variables that can be any number as long as there are orders. Therefore, adding and dividing these dummy numbers as if interval-ratio data is fundamentally and conceptually incorrect. If it is "not important at all", it does not make sense to have anything five times more important. For data with interval-ratio nature, for instance, in the case of distance, five miles is five times the distance of one mile. When numbers are added, "the ratio, or at least the interval nature of the data, is being presumed. That is, the relative value of each response category across all items is treated as being the same, and the unit increases across the rating scale are given equal value" (Bond and Fox 2007, p. 102). Ordinal level Likert-scale raw data do not have this nature.

Another problem with the EDB's reports is that multidimensionality of the attributes has not been investigated. If aspects and attributes are analyzed as if they are unidimensional, that is one quality attribute item contributing to one quality aspect, the potential inter-correlations between related but not identical latent traits will be ignored (Wang 2010, p. 30). For example, among the nine aspects used in the EDB's reports, some of them can be interrelated. Language proficiency highly likely contributes to inter-personal skills and perhaps analytical and problem-solving abilities; inter-personal skills contribute to management skills, just to name a few possibilities of multidimensionality.

The Rasch Model

Rasch model (Bond and Fox 2007; Linacre 2002; Linacre 2011; Wang 2010) transforms Likert-scale ordinal data into interval-ratio data – logits. For dichotomous (two responses) items such as agree-disagree, true-false, yes-no, logits is the ratio of the probabilities of these two responses. Rasch model assumes that the response of an item depends on the ability of a person and the difficulty level of an item.

To illustrate the calculation of Rasch logits, for example, a 50 true-false-question test taken by 100 students, for person's ability measure, the transformation goes as follow. If a student scores 35 correct answers in the test, his/her score is 70%. This score becomes odds of 70 to 30. Taking the natural logarithm, ln (70/30), the person's ability measure is 0.85. If an item is scored incorrectly by 90 students, the odds are 90 to 10. Taking the natural logarithm, ln (90/10), the item difficulty measure is 2.20. The probability that a student scores correctly an item depends on his/her ability and item difficulty. When a person's ability is equal to (greater or smaller than) the item difficulty, the probability of scoring the item correctly is 0.50 (greater or smaller than 0.50). Following the same example, given a student's person ability 0.85 and a question with item difficulty 2.20, person ability is less than item difficulty. The probability for the student to score the item correctly is less than 0.50.

Taking another example, in a gallop poll concerning the policy proposal of the government, the questionnaire contains 20 approve-disapprove policy items answered by 500 respondents. In this case, person's ability can be interpreted as a pro-government index. Item difficulty can be interpreted as popularity of a policy. The logarithm transformation process goes as follows. If a person approves 15 policy items, his/her score is 15 out of 20 or 75%. This score becomes odds of 75 to 25. Logarithm transformation takes the natural logarithm of this ratio, ln (75/25); the person's ability measure (pro-government index) is 1.10. The same transformation process applies to item difficulty measure. If a policy item is disapproved by 220 (out of 500) respondents or 0.44, the odds are 44 to 56. Taking the natural logarithm, ln (44/56), the item difficulty (popularity) is – 0.24. The probability that a respondent approves a policy item depends on how much he/she likes the government and the popularity of the policy item. When a person's ability (pro-government index) is equal to the item difficulty (policy popularity), the probability of approving the item is 0.50. When the person's ability is greater (smaller) than the item difficulty, the probability of approving a policy item is greater (smaller) than 0.50.

In this kind of survey, if Person A has approved only one policy item, the score is 1 out of 20 or 5%; Person B has approved two policy items, the score is 2 out of 20 or 10%. Can we say Person B's support to the government is two times as Person A? With the transformation, their ability measures (pro-government indices) are: A (ln (5/95)) is – 2.94; and B (ln (10/90) is – 2.20. The person ability measure of B (- 2.20) is definitely not twice of A (- 2.94).

Following Wang (2010, p. 6), in general the logits of dichotomous items with responses "1" and "0" can be defined by the following mathematical equation:

Define: $\text{odds}_{ni} \equiv P_{ni1} / P_{ni0} = A_n / D_i$ (1)

Where: P_{ni1} is the probability of Person "n" to score "1" on Item "i"

P_{ni0} is the probability of Person "n" to score "0" on Item "i"

A_n is the Ability of Person "n"

D_i is the Difficulty level of Item "i"

Taking logarithm of both sides of equation (1), we have:

$\log (\text{odds}_{ni}) \equiv \log (P_{ni1} / P_{ni0}) = \log (A_n / D_i)$

$\log (\text{odds}_{ni}) \equiv \log (P_{ni1} / P_{ni0}) = \log (A_n) - \log (D_i)$

let: $\log (\text{odds}_{ni}) \equiv \text{logit}_{ni}$; $\log (A_n) \equiv \theta_n$; $\log (D_i) \equiv \delta_i$

we have: $\text{logit}_{ni} = \theta_n - \delta_i$ (2)

But, $\log (P_{ni1} / P_{ni0}) = \theta_n - \delta_i$

For P_{ni1} and P_{ni0}, taking exponential of both sides, we have

$(P_{ni1} / P_{ni0}) = \exp (\theta_n - \delta_i)$

But, $P_{ni1} + P_{ni0} = 1$, the probability of score "1" and "0" combined is 1 (100%), the above equation can be rewritten as:

$P_{ni1} / (1 - P_{ni1}) = \exp(\theta_n - \delta_i)$, through several steps, we have:

$$P_{ni1} = \exp(\theta_n - \delta_i) / (1 + \exp(\theta_n - \delta_i)) \quad (3)$$

and

$$P_{ni0} = 1 / (1 + \exp(\theta_n - \delta_i)) \quad (4)$$

Following the 50-true-false-question test example, if a student has very much above average ability 3.0 but scored incorrectly an item with below average difficulty level – 1.0. The teacher should discuss with the student his/her problem. The chance of scoring the below average difficulty level for this above average ability student is, applying Equation (4):

$$P_{ni0} = 1 / (1 + \exp(\theta_n - \delta_i)) = 1 / (1 + \exp(3.0 - - 1.0)) = 0.02.$$

For a student having an ability of 3.0, the chance of scoring an item with difficulty level minus 1.0 is 0.02 (or 2 per cent). In terms of teaching and learning, the teacher should therefore talk with the student and find out the problem whether the student was careless or the student actually did not know the relatively easy item.

Applying Equation (3) in the gallop poll example, given a respondent's person measure (pro-government index) 1.5 and an item measure (policy popularity) 1.2. The probability that the respondent will approve this policy item is:

$$P_{ni1} = \exp(1.5 - 1.2) / (1 + \exp(1.5 - 1.2)) = 0.57$$

Raw scores of attributes (ordinal data) are transformed into log odds (interval-ratio data) so that summation and comparison can be performed. This is done through rescaling or normalizing Likert-scale data with mean = 0 logit. Positive logits value means above the mean, i.e. if a person measure has positive logits, the person has above average ability; if an item has positive logits, the item has above average difficulty. Negative logits value means below the mean.

In this study, the responses include very important (5), quite important (4), neutral (3), not quite important (2), and not important at all (1). If the score on an item was high, the Rasch model would have rated this as an easy item, and the item measure in logits value would be low. Therefore, the lower the logits value in the item measure, the more important is the item.

Rasch model transforms a variable, non-linear or ordinal, construct into an invariant (linear) construct where the unit of measurement is the logit. It provides a linearly calibrated scale for measurement (Phillipson and Tse 2007, p. 175) as if a ruler to measure the length, height, and width of an object. The Rasch model is a log-linear model (Linacre 2011). The transformation of data through normalizing Likert-scale data is analogous to standardizing normal distribution data with mean = 0 and standard deviation = 1.

To measure the relative importance of quality attribute aspects and items of our graduates, a well calibrated scale can help precisely faculty members, program developers and college managers to do the measurement and assessment job.

Rasch Partial Credit Model ("PCM") has been used to check for person measures, item measures, item fit and favoritism of each attribute. The PCM model assumes that the

thresholds (from 1 to 2, from 2 to 3, from 3 to 4, from 4 to 5) among outcome levels (5, 4, 3, 2, and 1) are the same for all items (attributes), but each threshold can be different. This is reasonable with the respective qualitatively distinctive descriptors clearly stated in the questionnaire. Expanding from Equation 2, following Masters (1982), Wang (2010) and Linacre (2011), the polytomous PCM model takes the following form:

$$\text{logit}_{nij} = \theta_n - (\delta_i + \tau_{ij}) \qquad (5)$$

Where: $\text{Logit}_{nij} = \log (P_{nij} / P_{ni(j-1)})$, the logarithm of the ratio of the probability for person "n" getting item "i" score "j" and "j – 1". This is the j^{th} threshold.

θ_n = ability of person "n"

δ_i = item difficulty "i"

τ_{ij} = probability of scoring "j" and "j – 1" on item "i", i.e. the "j" step difficulty of item "i".

Rasch analysis provides item fit statistics that act as a "quality-control mechanism" (Bond and Fox, 2007, p. 35). For a test given to students with similar background and standard, misfit items should be removed from the test. However in this study, misfit items were kept because the survey was conducted for four different stakeholder groups. Variations in the responses to different items were expected. But if there are too many misfit items, 24 in this study, running a one-dimensional Rasch analysis for all the 46 items is inappropriate. Since there are two dimensions and four stakeholder groups, a total of eight separate Rasch analyses were then run.

SPSS Factor Analysis

To answer my first research question concerning the quality dimensions of local graduates, SPSS Factor Analysis (Norusis 2006) has identified around 11 dimensions

with unclear attributes for each dimension. SPSS Factor Analysis does not produce fruitful result in this sense because "a primary goal of Factor Analysis is to reduce the dimensionality of the multivariate data set while retaining sufficient dimensions to provide a good approximate representation of the original data" (Bartholomew, Steele, Moustake, and Galbraith, 2002, p. 154).

Since 11 dimensions do not reduce the dimensionality of the original 9 attribute aspects, SPSS Factor Analysis was run again on the 9 given attribute aspects. The extraction method used was Principal Component Analysis with rotation: Varimax with Kaiser Normalization. Factor rotation was used to clarify the underlying pattern of the factors/dimensions that are easier to interpret (Bartholomew, Steele, Moustake, and Galbraith, 2002, p. 157). Two dimensions were found with clear groups of attribute aspects in each dimension. One dimension contains Chinese language proficiency, English language proficiency, numerical competency, and information technology literacy. The other dimension contains analytical and problem-solving abilities, work attitude, inter-personal skills, management skills, and technical skills or major subject(s) knowledge.

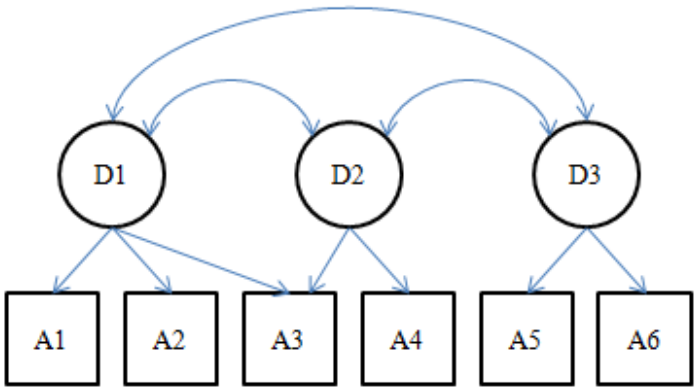
Multidimensionality

Rasch Factor Analysis (Bond and Fox 2007; Wang 2010) has identified multidimensionality of attributes. Rasch Factor Analysis is not the same as Factor Analysis in SPSS. The former is really a Principal-Components Analysis of residuals. It tries to "falsify the hypothesis that the residuals are random noise by finding the component that explains the largest possible amount of variance in the residuals" (Linacre 2011, p. 458). In Rasch Factor Analysis, the eigenvalues of the contrasts are examined. If for example, the eigenvalues of the first contrast is more than two, it has the strength of more than two items. In other words, more than two items contribute to the variances in the residuals of the contrast. It indicates between-item multidimensionality of the items. Common (SPSS) Factor Analysis identifies the loadings of

factors/dimensions, i.e. the proportion of variance explained by the factor/dimension. Rasch Factor Analysis identifies multidimensionality; SPSS Factor Analysis categorizes similar items into groups.

Multidimensionality can take the form of between-item and within-item. In between-item multidimensionality, each attribute measures a single dimension, and a set of attributes measures several dimensions. In within-item multidimensionality, an attribute may measure more than one dimension simultaneously (Wang 2010, p. 30). The conceptual framework of multidimensionality is depicted in Figure 3.1 below:

Figure 3.1: Multidimensionality



In Figure 3.1, assuming that quality of graduates comes from different quality dimensions such as D1, D2 and D3. These dimensions consist of different attributes such as A1 to A6. In this study, there are two quality dimensions with nine attribute groups. In Figure 3.1, there are 3 quality dimensions coming from 6 quality attributes. Between-item multidimensionality is shown by, for example, A1, A2, and A3 contributing to D1. Within-item multidimensionality is shown by, for example, A3 contributing to both D1 and D2.

Applying multidimensionality in this study, there are 46 attributes in 9 aspects that are reduced to 2 dimensions. The attribute items of various language skills (written, comprehension, and oral) certainly contribute to the Dimension 2, basic skills. It is reasonable to assume that they also contribute to Dimension 1, generic skills such as communication. This is within-item multidimensionality. Therefore, assuming unidimensionality, each quality attribute contributes to or explains only one quality dimension is fundamentally problematic.

To supplement multidimensionality found using Rasch Factor Analysis, correlations among the 46 attributes and the 9 attribute aspects were run using SPSS. All variables are positively-correlated with other variables. While most variables have correlation coefficient less than 0.50, some variables are correlated with a coefficient greater than 0.50. Variables are somehow substantially correlated.

Differences Among Stakeholder Groups

To answer my second research question concerning differences among stakeholders in ranking the relative importance of these dimensions and attributes, simple comparison of the attribute rankings by their logits values was done. Person-item maps (Figures 4.1 – 4.4) for each stakeholder group are reported in the next chapter, each map for a dimension. For easy comparison, the person-item maps for the four stakeholder groups are combined into one map for each dimension (Figures 4.5 – 4.6).

Rasch Differential Item Functioning (Bond and Fox 2007; Wang 2010) and SPSS nonparametric Kruskal-Wallis test were used to check if stakeholder groups' different rankings of the attribute aspects were statistically significant. The Kruskal-Wallis test only requires equal variance among populations but not normal distribution of the

populations (Norusis 2006). One-way Analysis of Variance (ANOVA) was not used because it requires samples taken from normally distributed populations. Due to the setup of the attribute items, it is expected that the distribution to be skewed to the high side, i.e. most of the items are expected to receive scores of "4" (quite important) and "5" (very important). The population having a mean of "3" and distribution symmetrically around the mean was not assumed. Therefore, the normality requirement of ANOVA is violated and ANOVA should not be used in this study.

Differentiating Item Functioning (DIF) investigates if an item is biased to any particular independent group. It examines the interaction between items and groups of respondents. The hypothesis is that "the item has the same mean difficulty among all groups" (Linacre 2011, p.364). For an item to be noticeable DIF, the difference between the mean difficulties should be at least 0.5 logits or t-statistic (for comparison between two groups) value greater than 2 or chi-square (for comparison among three or more groups) p-value less than 0.05 (Linacre 2011). The hypothesis of chi-square test is that the item has no overall DIF among the four groups. Chi-square "is the sum of the squared normalized t-statistics between groups" (Linacre 2011, p.369). The study has used significance level 0.05 for the comparison among the 4 groups. If the chi-square p-value is less than 0.05, the null hypothesis is rejected. The item is a DIF item among the groups.

With the relative importance of quality attribute(s) found significantly different among stakeholder groups, school policy-makers will have to reconcile the differences among stakeholder groups and decide how to incorporate the attribute(s) in the program curricula.

Definitions of Quality Education

To answer my third research question concerning the different definitions of quality education, the following questions were added to the questionnaire after each attribute aspect.

Which of the following reasons did you find the most important when you rated the above items (check one only)?

- It could make the graduates smarter, better, and outstanding regardless of its impact on employability?
- It could improve the overall quality of graduates regardless of its impact on employability?
- It could affect the employability of graduates?
- Graduates must have learned it regardless of its impact on employability?

Table 3.2 below provides an alignment to the definitions of quality education advocated by Harry and Green (1993) excluding quality as perfection.

Table 3.2: Alignment of Questions to Definitions of Quality

Quality Education Definitions	Questions
Quality as Exception	Did you rate the attribute because it could make the graduates smarter, better, and outstanding regardless of its impact on employability?
Quality as Transformation	Did you rate the attribute because it could improve the overall quality of graduates regardless of its impact on employability?
Quality as Fitness for Purpose	Did you rate the attribute because it could affect the employability of graduates?
Quality as Value for Money	Did you rate the attribute because you believed that graduates must have learned it regardless of its impact on employability?

Quality as perfection has been removed from the study of quality education. It is because human beings are not perfect; no one can be perfectly educated. Education cannot be made perfect in accordance with the specifications as if physical products (Mok 2007). Furthermore, it may neither be desirable nor possible to produce identically perfect graduates. People are different. So, quality as perfection only applies to physical product but not education for human beings.

Stakeholders may have different reasons for their rankings of the relative importance among the quality attributes and quality aspects. Having more and better understanding of their views in terms of quality, policy makers and college administrators will be able to better formulate policy and develop curriculum catering the needs and meeting the expectations of stakeholders.

In the follow-up interviews through email, telephone, or face-to-face, interviewees were asked a similar question concerning the definition of education quality and provided with the same four choices.

Interviews with Stakeholders

To answer my fourth research question, interviewees were asked to suggest ways to maintain and ensure graduate quality as the student number increases. Interviewees have written their suggestions and returned them by email, called to discuss the questions over the telephone, or met face-to-face to discuss the issue. Respondents unable to meet face-to-face were interviewed through telephone. Interview scripts were taken. Interviews were done in April and May 2012 with details shown in Table 3.3.

Table 3.3 Interview Schedule (April – May 2012)

	Employers	Academics	Graduates	Students
Email	one followed by telephone interview, the other one followed by face-to-face interview	three followed by face-to-face interview	one followed by face-to-face interview	five followed by face-to-face interview
Telephone	1	0	0	0
Face-to-face	1	3	1	5
Total	2	5	3	5

Upon collection of all opinions from different stakeholders, content analysis was conducted to consolidate their suggestions. Results of my study are reported in the next chapter.

Chapter 4: Research Findings

In Chapter 3, background of methodologies used in the study was discussed. This chapter reports the findings of the study. It reports the summary statistics of the sample (N = 530), followed by the four stakeholder groups – employers, academics and college administrators, college graduates, and current tertiary students. Although it is inappropriate to run the analysis for all groups together due to multidimensionality, the results for all groups (N = 530) are reported for reference and for an overview picture of the results.

The flow of the research findings is reported as follows: Summary statistics, person and item fit statistics, dimensionality of attributes, ranking of the relative importance of the attributes, the rationale behind their rankings in terms of the different education quality definitions, and suggestions by stakeholders to maintain and ensure higher education quality. The following section reports results for all groups combined.

Summary Statistics (Overall)

The data set, 530 persons and 46 attribute items, was run by WINSTEPS 3.70. The summary of 530 measured persons for the 46 items provides a mean of 192.7. The average rating per item is 4.19 out of a possible maximum of 5. On average, respondents have rated the attribute items between quite important and very important. The results are biased to the high side but within expectations because all the attribute items are important latent traits regardless of item fit diagnosised by the Rasch model.

For person and item fit statistics that are reported as mean squares in chi-square statistics divided by their degrees of freedom with an expected value of 1 (Bond and Fox, 2007), the person measure infit is 1.02; outfit 1.00; and person reliability 0.93. The infit statistic

is a weighted statistic that gives more weights to person measures closer to item measures. The outfit statistic is an unweighted measure that is more sensitive to extreme values. Researchers normally pay more attention to the infit statistic (Bond and Fox 2007). The person separation 3.51 means that with the 46 items, respondents can be separated into approximately 4 (round up from 3.51) groups. This is consistent with the four stakeholder groups designed in the survey.

The summary of 46 measured items for the 530 respondents provides a mean of 2220.2. This has undoubtedly the same average rating of 4.19 per item. The item measure infit is 1.00, outfit 1.00, and item reliability 0.96. The person infit 1.02 and item infit 1.00 are very close and equal to the expected value 1.00. The overall data are fit with high reliability although there are misfit items.

As a rule of thumb, statistically fit items fall within the range of Z-values +/- 2 (Bond and Fox, 2007). In the original item measures run by Rasch undimensional model, 20 items have Z-value equal to or greater than +/- 2.00 (see Appendix 5A); thus they are misfit and supposedly to be removed. Having removed these 20 items, 2 more items have Z-value outside the fit range of +/- 2.00; they are then removed (results not shown). Finally a total of 24 items are fit with Z-value within +/- 2.00. These items are:

1. Item 7 (Expression of Ideas in Written English),
2. Item 8 (Expression of Ideas in Oral English),
3. Item 9 (Comprehension in Written English),
4. Item 10 (Comprehension in Oral English),
5. Item 13 (Use of Standard Computer Software),
6. Item 14 (Adaptability to New Software),
7. Item 15 (Ability to Make Use of the Internet & Intranet to Facilitate Work & Business),
8. Item 16 (Locate, Gather & Organize Information Using Appropriate Technology and Information Systems),

9. Item 17 (Common Sense),
10. Item 18 (Foresight),
11. Item 21 (Creativity),
12. Item 25 (Ability to Work Independently),
13. Item 28 (Receptivity and Adaptability to New Ideas and Environment),
14. Item 29 (Professional/Business Ethics),
15. Item 30 (Inter-personal Relationship),
16. Item 32 (Negotiation and Communication Skills Including Presentation Skills),
17. Item 33 (Able to Accept and Provide Feedback in a Constructive and Considerate Manner),
18. Item 36 (Management of Staff),
19. Item 37 (Leadership),
20. Item 38 (Able to Motivate Team-members),
21. Item 41 (Ability to Handle Technical Demands at Work),
22. Item 42 (Ability to Solve Technical Problems),
23. Item 43 (Ability to Select and Use Appropriate Tools and Technology for a Task or Project), and
24. Item 44 (Able to Work to Agreed Quality Standards and Specification).

All items for Chinese Language Proficiency and Numerical Competency are misfit items. All items for English Language Proficiency and Information Technology Literacy are fit items, although they all fall into the same dimension (see explanation later in this chapter). For other aspects of attributes, there are both fit and misfit items.

Statistically significantly misfit items falling outside the plus-and-minus two z-score region are not necessarily bad items. Fit statistics are mean square errors (MNSQ) that are the squared residuals of the items (Bond and Fox 2007). According to Linacre (2011, p. 272), an MNSQ of greater than 1.5 indicates "noticeable off-variable noise", less than 0.5 indicates "overly predictable", and in the range of 0.5 to 1.5 indicates "productive of measurement". Therefore, a misfit item tested statistically significant but falling inside

the productive of measurement range (0.5, 1.5) is not a bad item. Taking a closer look at Appendix 5A of item fit statistics for all groups and all items, the 20 statistically misfit items after the first unidimensional run all have MNSQs falling within the range of 0.5 and 1.5. Therefore, in terms of MNSQ with an expected value of "1", the misfit of these 20 items is practically insignificant.

In addition to the above, misfit items are the items that have unexpected responses – very different from the mean. A misfit item can be a good and crucial item "because of its rarity in the item sample with respect to content or location" (Wilson 2005, p. 132). It may measure a different construct (Green and Frantom 2002). Masters (n.d.) claims that "item misfit is sometimes an indication that performances in an area originally conceptualized as one domain must be reported on more than one dimension." Therefore, some of these misfit items may simply indicate multidimensionality. This reinforces what has been discussed in Chapter 3 concerning multidimensionality. Treating all 46 items as one dimension can be inappropriate.

Misfit items may indicate the diverged views or rankings among stakeholders, which are within expectation. Presumably the four stakeholder groups are different. They view quality attributes differently. Therefore, there are large variations in "item difficulties" leading to item misfit. This merely reflects stakeholders' different views. The proportion of misfit items (22 out of 46) while it is high, they are kept in the analysis for two reasons. First, Chinese Language Proficiency and Numerical Competency would be removed totally from the analysis. Second, none of these statistically significant misfit items has mean square errors (MNSQ) outside the 0.5-1.5 range; they are misfit statistically but not so bad misfit practically. Unlike a college test given to a group of similar background students who have supposedly learned the same course content and materials, misfit items should be removed from a college test.

Given the high proportion of misfit items (Appendix 5A) and DIF items (see Appendix 6A, 15 DIF items out of 46), running a one-dimensional Rasch analysis on the 46 items for the whole sample may be inappropriate. Therefore, eight Rasch analyses on the four different stakeholder groups and two attribute dimensions were run and reported. The number of statistically misfit items is reduced substantially from 22 to 14 (see Appendices 5B to 5I).

When the attribute aspects were examined for all groups combined, the non-extreme items' fit statistics and reliabilities were found, and they are presented in Table 4.1 below:

Table 4.1: Infit, Outfit, and Reliability of Attribute Aspects (Overall)

Attribute Aspects	Infit	Outfit	Reliability
Chinese Language Proficiency	1.00	0.99	0.95
English Language Proficiency	0.99	0.85	0.81
Numerical Competency	0.97	1.02	0.59
Information Technology Literacy	0.98	0.95	0.90
Analytical and Problem-solving Abilities	0.99	0.98	0.97
Work Attitude	1.00	0.98	0.95
Inter-personal Skills	1.00	0.96	0.93
Management Skills	0.99	0.96	0.91
Technical Skills or Major Subject(s) required for the Job	0.99	1.00	0.96

Quality Dimensions (Overall)

To answer my first research question concerning the quality dimensions and their respective attributes that local graduates should possess, the 46 items of the whole sample were run using SPSS Factor Analysis. A total of 11 factors were approximated. However, the attributes of each factor were unclear.

Person measures in Rasch logits of the nine attribute aspects for the whole sample were then run again using SPSS Factor Analysis (extraction method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization). Rotation converged in three iterations with their communalities shown in Table 4.2.

Table 4.2: Rotated Component Communalities

	Component	
	1	2
Inter-personal Skills	0.825	0.104
Work Attitude	0.811	0.153
Management Skills	0.758	0.192
Analytical and Problem-solving Abilities	0.742	0.296
Technical Skills or Major Subject(s) Knowledge required for the Job	0.612	0.181
English Language Proficiency	0.153	0.735
Numerical Competency	0.063	0.718
Chinese Language Proficiency	0.188	0.618
Information Technology Literacy	0.383	0.583

The communality is "the proportion of the variance that is explained by the common factors" (Bartholomew, Settle, Moustaki, and Galbraith, 2002, P. 153). It is obvious from Table 4.2 that patterns are found. The patterns show two clear factors, or two dimensions. The total variance explained by the first two components (factors/dimensions) is 55.73% (printouts not reproduced). The first component has an eigenvalue of 3.81 explaining 42.31% of total variance; the second component has an eignevalue of 1.21 explaining 13.42% of total variance.

Dimension 1 includes the following attribute groups: (1) Inter-personal Skills, (2) Work Attitude, (3) Management Skills, (4) Analytical and Problem-solving Abilities, and (5) Technical Skills or Major Subject(s) Knowledge required for the job. Dimension 2 includes the following attribute groups: (1) English Language Proficiency, (2) Numerical

Competency, (3) Chinese Language Proficiency, and (4) Information Technology Literacy.

The two attribute dimensions identified are consistent with Hager and Holland (2006) who have named three skills areas: basic skills, generic skills, and core skills. As discussed in Chapter 2 with reference to Hager and Holland (2006) and Winch (2006) generic skills and core or disciplinary-specific skills at times are very difficult to be clearly distinguished. The grouping of generic and technical attribute aspects into the same dimension is therefore acceptable.

In practice, the two attribute dimensions are consistent with many higher education curricula that contain (1) basic skills, (2) generic skills, and (3) discipline knowledge. In the study, Dimension 2 includes basic skills that are important traits for both studying and working. Dimension 1 includes generic or soft skills and discipline or core knowledge. Generic skills are important to widen students' horizon in different areas and to provide students with whole-person development training. They equip students with a variety of knowledge and other soft skills including, among others, critical thinking, analytical and problem-solving, and inter-personal skills. As discussed in Chapter 2, generic skills are transferrable across disciplines. Discipline knowledge provides solid theoretical foundation to students in the discipline they have chosen to study.

The two dimensions identified are not necessarily mutually exclusive. Statistically significant correlations between attribute aspects were found in all aspects. In particular, the correlation coefficients between Analytical and Problem-solving Skills and Work Attitude, Inter-personal Skills, and Management Skills are 0.599, 0.547, and 0.54 respectively. The correlation coefficients between Work Attitude and Inter-personal Skills, and Management Skills are 0.609 and 0.511. Inter-personal Skills and Management Skills are correlated with a coefficient of 0.579. While the correlation

coefficients for other groups are below 0.50, they are all statistically significant. The correlation matrix of the attribute aspects is attached in Appendix 8.

Attribute items are not only inter-correlated, Rasch-residual-based Principal Components Analysis (or Rasch Factor Analysis) has also indicated multidimensionality among the attributes. From Table 23.0 (results not shown) of WINSTEPS 3.70, the total raw variance in observations is 65.2. Raw variance explained by measures is only 19.2 (or 29.5%). Among which, raw variance explained by persons is 8.9 (or 13.6%), and by items is 10.4 (or 15.9%). Raw unexplained variance is 46.0 (or 70.5%). Unexplained variance in 1st contrast has an eigenvalue of 4.8 (or 7.4%). This indicates that it has the strength of about 5 items, somewhat bigger than the minimum eigenvalue of 2 for a dimension (Linacre 2011, P. 459). Furthermore, less variance explained means less unidimensional (Linacre 2011, P. 460). In this study, variance explained by measures accounted for only 29.5% of total variance. This small portion of variance explained means less unidimensional, and less unidimensional means more multidimensional. The eigenvalue of 4.8 after the first contrast and 3.4 after the second contrast further support multidimensionality among the items. Therefore, if we assume each attribute only explains an aspect of attributes that only contributes to a dimension, we may end up misinterpreting the results.

The SPSS Factor Analysis (or common Factor Analysis) is different from the Rasch Factor Analysis (or Principal-Components Analysis). The former identifies the loadings on a factor, optimizes the communalities by rotation and obliqueness to extract the strongest possible factor structure. The factor loadings are the correlations with the underlying latent factors. Rasch Factor Analysis tries "to falsify the hypothesis that the residuals are random noise by finding the component that explains the largest possible amount of variance in the residuals" (Linacre 2011, P. 458).

Relative Importance of Attributes (Overall)

The item difficulty measures in the WINSTEPS reports are the respondents' rankings of the relative importance of the 46 attributes. In the Rasch model, the highest score item is considered as the easiest item that has the lowest logits. Therefore, in this study, the lower the logits means the higher the score; the higher the score means the attribute is more important. Table 4.3 depicts the five most important and five least important attributes ranked by the Rasch Partial Credit Model:

Table 4.3: The Five most/least important Attributes (N=530, Items = 46)

Ranking	Item		Logits	Attribute Aspect
1st	24	Sense of responsibility & commitment	-0.76	Work Attitude
2nd	8	Expression of ideas in oral English	-0.75	English Language Proficiency
3rd	23	Judgment	-0.61	Analytical and Problem-solving Abilities
4th	25	Ability to work independently	-0.50	Work Attitude
5th	7	Expression of ideas in written English	-0.49	English Language Proficiency
42nd	12	Application of data	0.44	Numerical Competency
43rd	14	Adaptability to new software	0.46	Information Technology Literacy
44th	39	Management of available resources and ability to seek resources and assistance	0.51	Management Skills
45th	18	Foresight	0.52	Analytical and Problem-solving Abilities
46th	44	Able to work to agreed quality standards and specification	0.59	Technical Skills for Major Subject(s) Knowledge Required for the Job

When the attribute items are grouped and represented by their respective attribute aspects, the three most important attribute aspects are Work Attitude, English Language

Proficiency, and Analytical and Problem-solving Abilities. The least important attributes fall into different attribute aspects. Quality attribute "Foresight" per se may be unimportant but Analytical and Problem-solving Abilities as an attribute group is important (see below interviews of stakeholders). This provides an insight to tertiary education institute management who should carefully consider if "Foresight" as a latent trait should be embedded into their curricula.

Having attribute items grouped into quality dimensions, the overall relative importance rankings of the three most important and three least important attributes were found and reported in Table 4.4.

Table 4.4: The Three most/least important Attributes of the Dimensions

Ranking	Dimension 1	Dimension 2
1st	Sense of responsibility and commitment	Expressions of ideas in oral English
2nd	Judgment	Expressions of ideas in written English
3rd	Ability to work independently	Comprehension in oral English
28th/14th	Management of available resources and ability to seek resources and assistance	Comprehension of data
29th/15th	Foresight	Application of data
30th/16th	Able to agreed quality standards and specification	Adaptability to new software

In view of the results, the sample has ranked, for Dimension 1, Work Attitude, and Analytical and Problem-solving Abilities as the three most important attribute aspects; Management Skills, Analytical and Problem-solving Abilities, and Technical Skills or Major Subject(s) Knowledge required for the Job as the least important. For Dimension 2, the sample has ranked different attributes from the same English Language Proficiency aspect as the three most important attributes; Numerical Competency and Information Technology Literacy as the least important basic skills. Appendix 7A provides a full list

of the comparative rankings among different stakeholder groups. Appendices 7B and 7C provide a full list of the comparative rankings among different stakeholder groups by dimensions.

Definition of Quality (Overall)

For the definition of quality, respondents were requested to choose a reason behind their ratings of the attribute aspects. There were 9 attribute aspects and 530 respondents in the study. A total of 4,770 responses to the definition of quality were collected. Breakdown of the responses are summarized in Table 4.5.

Table 4.5: Summary of Responses to Quality Definitions

Definition of Quality	Number of Responses
Quality as Exception	965
Quality as Transformation	1,400
Quality as Fitness for Purpose	1,483
Quality as Value for Money	922

Quality as Fitness for Purpose has received the most responses; it is marginally more than Quality as Transformation. The former is closely related to employability of graduates. In many people's mind, the ultimate purpose of attending education, in particular tertiary education is employment. Quality as Transformation improves the overall quality of graduates. This also affects employability of graduates. Employers' views are reported in the following section.

Statistics of Employers

The sample size of employers as a stakeholder group is 59 including managers responsible for staff recruitment. They come from different industries such as banking, the government, secondary school principals and higher education human resources manager, electronics, environment protection, fashion, finance, health care, hospitality,

information technology, media, manufacturing, paramedical, printing, professional firm, property management, retail and sales, social services, and sports.

The summary of 59 measured employers for the 46 items provides a mean of 194.8. The average rating per item is 4.23 out of a possible maximum of 5. On average, respondents have rated the attribute items between quite important and very important.

The person measure infit is 1.01; outfit 1.00; and person reliability 0.91. The person separation 3.10 means that with the 46 items, respondents can be separated into approximately 3 (round down from 3.10) groups. This indicates that employers have different views on the relative importance of attribute items. It is reasonable for this because employers coming from different industries look for different graduate attributes.

The item measure infit is 1.00; outfit 1.00; and item reliability 0.90. The item separation 2.97 means that with the 59 respondents, items can be separated into approximately 3 groups (round up from 2.97). This is consistent with the quality dimensions reported earlier – basic skills, generic skills, and discipline knowledge.

The item fit statistics of both attribute dimensions have been reported in Appendices 5B and 5C. Item 3 (Z-score = 2.1, MNSQ = 1.38), item 8 (Z-score = -2.54, MNSQ = 0.66), item 10 (Z-score = -2.06, MNSQ = 0.72), item 45 (Z-score = 2.34, MNSQ = 1.48), and item 46 (Z-score = 2.81, MNSQ = 1.56) are misfit items with statistical significance in terms of Z-score but only item 46 has marginal practical significance with MNSQ equals 1.56. Other misfit items have MNSQs falling between the productive of measurement range (see discussion in Chapter 3). These misfit items are not necessarily bad items.

The person infit 1.01 and item infit 1.00 are very close and equal to the expected value of 1. The overall data are fit with high reliability.

Rasch Factor Analysis has found the total raw variance in observations is 65.5. Raw variance explained by measures is only 19.5 (or 29.7%). Among which, raw variance explained by persons is 7.5 (or 11.4%), and by items is 12 (or 18.3%). Raw unexplained variance is 46.0 (or 70.3%). Unexplained variance in first contrast has an eigenvalue of 8.1 (or 12.3% of total raw variance). This indicates that it has the strength of about 8 items. Unexplained variance in second contrast is 4.9 (or 7.5%), in third contrast 3.6 (or 5.5%). The total unexplained variance after the first 2 contrasts is 19.8% that is greater than variance explained by persons or by items. Multidimensionality for the items is further supported.

Relative Importance of Attributes (Employers)

As for the relative importance rankings of the 46 attributes, Table 4.6 depicts employers' rankings of the five most important and five least important attribute items. For the relative importance ranking of the 46 quality attributes, categorizing in 9 attribute aspects, employers have clear and focus attributes. Work Attitude and English Language Proficiency are the most important; Management Skills and Technical Skills for Major Subject(s) Knowledge Required for the Job are the least important. This is probably because employers do not expect fresh graduates to possess management skills. For technical knowledge, graduates will learn it by doing it.

Having attribute items grouped into quality dimensions, Employers' rankings of the relative importance of the three most important and three least important attributes are shown in Table 4.7.

Table 4.6: The Five most/least important Attributes (Employers)

Ranking	Item		Logits	Attribute Aspect
1st	24	Sense of responsibility and commitment	-1.46	Work Attitude
2nd	7	Expression of ideas in written English	-1.32	English Language Proficiency
3rd	9	Comprehension in written English	-1.20	English Language Proficiency
4th	8	Expression of ideas in oral English	-1.17	English Language Proficiency
5th	10	Comprehension in oral English	-1.17	English Language Proficiency
42nd	39	Management of available resources and ability to seek resources and assistance	1.07	Management Skills
43rd	37	Leadership	1.12	Management Skills
44th	42	Ability to solve technical problems	1.13	Technical Skills for Major Subject(s) Knowledge Required for the Job
45th	38	Able to motivate team members	1.23	Management Skills
46th	43	Ability to select and use appropriate tools and technology for a task or project	1.39	Technical skills for Major Subject(s) Knowledge Required for the Job

Table 4.7: The Three Most/Least Important Attributes of the Dimensions

Ranking	Dimension 1	Dimension 2
1st	Sense of responsibility and commitment	Expression of ideas in written English
2nd	Inter-personal relationship	Comprehension in written English
3rd	Common sense	Expression of ideas in oral English
28th/14th	Ability to solve technical problems	Expression of ideas in Putonghua
29th/15th	Able to motivate team-members	Comprehension in Putonghua (oral)
30th/16th	Ability to select and use appropriate tools and technology for a task or project	Application of data

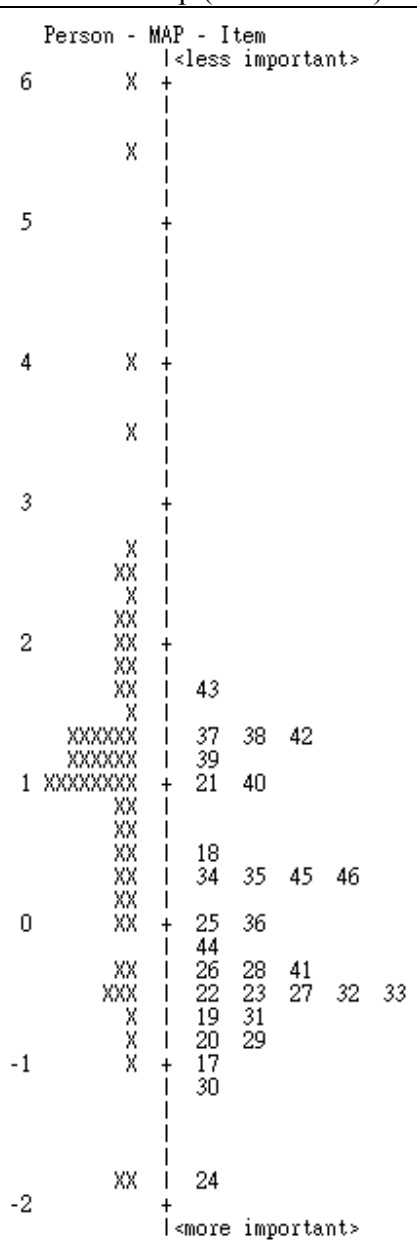
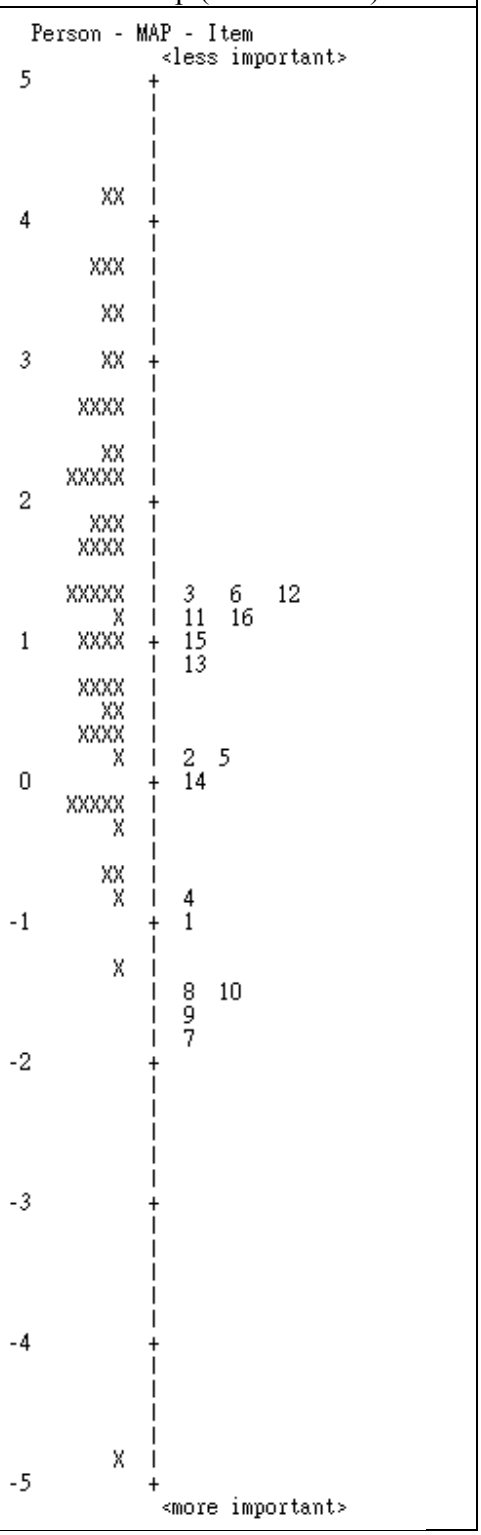
In view of the results, Employers group has ranked English Language Proficiency as the most important attribute aspect; Chinese Language Proficiency and Numerical Competency as the least important under Dimension 2, basic skills. For Dimension 1, they have ranked Work Attitude, Inter-personal Skills, and Analytical and Problem-solving Abilities as the most important attribute aspects; Technical Skills or Major Subject(s) Knowledge required for the Job and Management Skills as the least important.

Full rankings by Employers of the relative importance for different attributes of the two dimensions are presented in Figure 4.1. For the distribution of Dimension 1 among Employers, it is obvious that there are 6 outliners. Among which, 4 of them have person (ability) measures above 3 logits. It means that they have high scores in the answers to the questionnaire. That means they have rated most attribute items very important. The two employers whose logits are less than -1 have low scores meaning they have rated items less important. Other respondents are distributed quite "normal" with a mean measure of around 1 logits.

For the items measures, item 24 "Sense of responsibility and commitment" has the lowest logits below -1. It is the "easiest" item in the Rasch analysis. It means that the item is scored the highest among respondents. This is translated as the most important (many people have rated this item "5", very important) item. It makes sense for employers to rate this graduate attribute as the most important trait.

For the distribution of Dimension 2 among Employers, there is one extreme outliner having person measure close to -5, while all others fall in the range of around slightly below -1 and slightly above 4, with a mean person measure of above +1 logits. It is clear from Figure 4.1 that items 7, 9, 8, 10 (all English items) have the lowest logits. They have received the highest scores in the study. That means they have been rated as the most important attribute items.

Figure 4.1: Person-Item Maps of Employers

Employers Item Map (Dimension 1)	Employers Item Map (Dimension 2)
	

Definition of Quality (Employers)

There are 9 attribute groups and 59 employer respondents in the study. A total of 531 responses to the definition of quality were collected. Breakdown of the responses are summarized in Table 4.8:

Table 4.8: Summary of Responses to Quality Definitions (Employers)

Definition of Quality	Number of Responses
Quality as Exception	138
Quality as Transformation	119
Quality as Fitness for Purpose	194
Quality as Value for Money	80

Quality as Fitness for Purpose has received the most responses. The results make sense for the employers who tend to focus more on whether an attribute helps employability. Other stakeholder groups may have a different focus. In the next section, results of Academics and college administrators' views are reported.

Statistics of Academics and College Administrators

The sample size of Academics and College Administrators as a stakeholder group is 57. Academics are teachers of tertiary education institutes; and college administrators include, among others, department heads, program managers and administrators. They come from different tertiary institutes including the Chinese University of Hong Kong, the Hong Kong University of Science and Technology, the City University of Hong Kong, the Hong Kong Polytechnic University, Baptist University, Lingnan University, the Hong Kong Institute of Education, the Open University of Hong Kong, Shue Yan University, the Chinese University of Hong Kong-Tung Wah Group of Hospitals Community College, and Tung Wah College.

The summary of 57 measured persons for the 46 items provides a mean of 194.1. The average rating per item is 4.22 out of a possible maximum of 5. On average, respondents have rated the attribute items between quite important and very important.

The person measure infit is 1.00; outfit 0.97; and person reliability 0.94. The person separation 3.99 means that with the 46 items, respondents can be separated into approximately 4 (round up from 3.99) groups. This indicates that academics and college administrators have different views on the relative importance of attribute items. This makes sense because academics of different disciplines may require different latent traits from students.

The item measure infit is 0.99; outfit 0.97; and item reliability 0.88. The item separation 2.66 means that with the 57 respondents, items can be separated into approximately 3 groups (round up from 2.66). This is consistent with the quality dimensions reported earlier – basic skills, generic skills, and discipline knowledge.

The item fit statistics of both attribute dimensions have been reported in Appendices 5D and 5E. There is only one statistically misfit item in this stakeholder group, Item 28 (Z-score = -2.71, MNSQ = 0.6) but practically insignificant with MNSQ within the 0.5-1.5 range. Therefore, it is not a bad item. The person infit 1.00 and item infit 0.99 are equal to or very close to the expected value. The overall data are fit with high reliability.

Rasch Factor Analysis has found the total raw variance in observations is 79.3. Raw variance explained by measures is 33.3 (or 42.0%). This is very much higher than employers group. The raw variance explained by persons is 17.3 (or 21.9%), and by items is 15.9 (or 20.1%). Raw unexplained variance is 46.0 (or 58.0%). Unexplained variance in first contrast has an eigenvalue of 5.1 (or 6.5% of total raw variance). This indicates

that it has the strength of about 5 items. Unexplained variance in second contrast is 4.7 (or 6.0%), in third contrast 3.4 (or 4.3%). This again indicates multidimensionality among items.

Relative Importance of Attributes (Academics and College Administrators)

As for the relative importance rankings of the 46 attributes, academics and college administrators' rankings of the five most important and five least important attributes are shown in Table 4.9. For the relative importance ranking of the 46 quality attributes, categorizing in 9 attribute aspects, Academics and College Administrators have clear and focus attributes. Analytical and Problem-solving Abilities and English Language Proficiency are the most important attribute aspects; Management Skills and Numerical Competency are the least important. This is probably because they do not expect fresh graduates to possess management skills. It is surprising to find the low rating of academics and college administrators on Numerical Competency.

Having attribute items grouped into quality dimensions, the relative importance rankings of the three most important and three least important attributes for the Academics and College Administrators group are shown in Table 4.10.

In view of the results, the Academics and College Administrators group has ranked Analytical and Problem-solving Abilities as the most important attribute aspect; Management Skills as the least important for Dimension 1. For Dimension 2, the three most important attributes are English-related making English Language Proficiency the most important attribute aspect; Information Technology Literacy and Numerical Competency are the least important basic skills. The group has relatively clear and more focus rankings of the attributes.

Table 4.9:The Five Most/Least Important Attributes

(Academics & College Administrators)

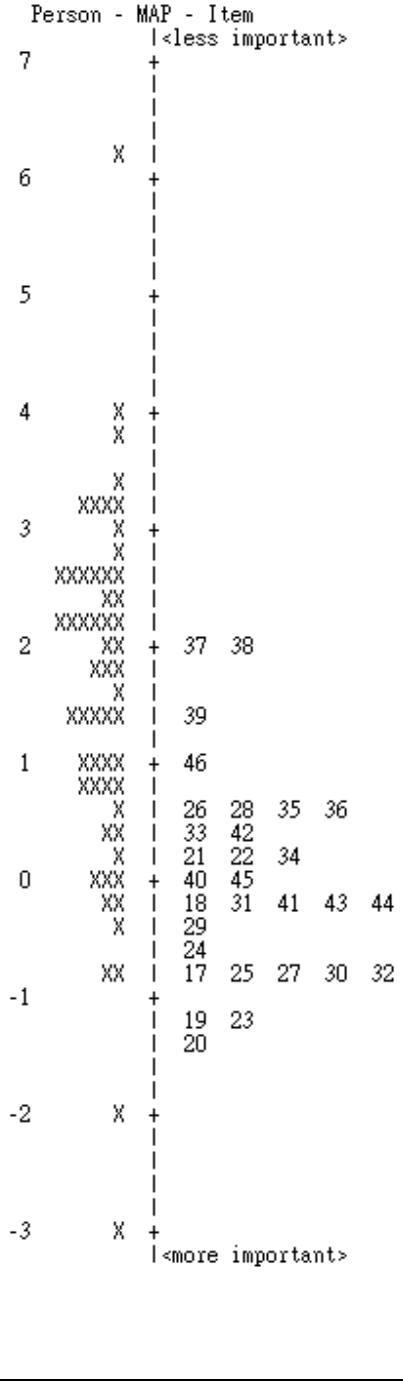
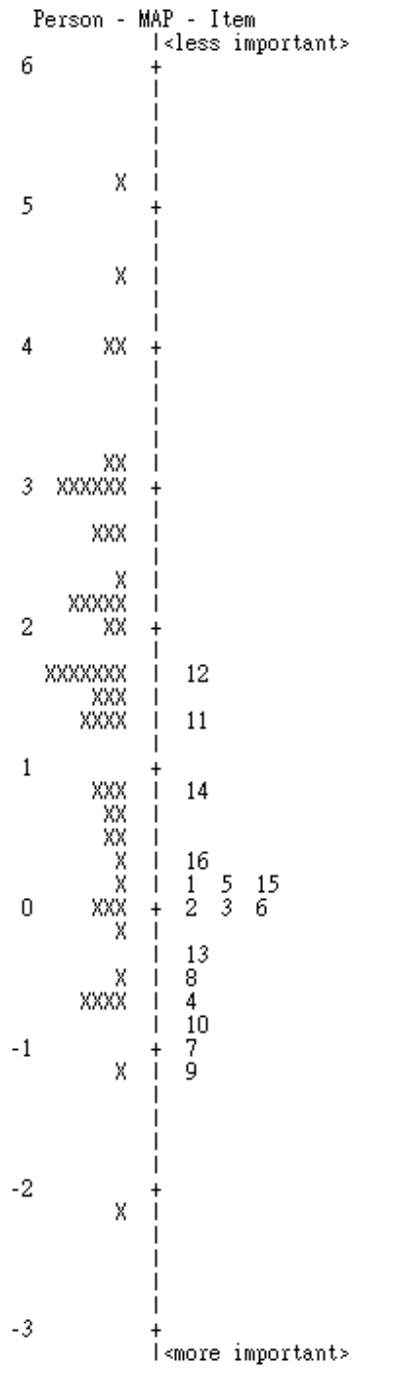
Ranking	Item		Logits	Attribute Aspect
1st	20	Problem-solving ability	-1.17	Analytical and Problem-solving Abilities
2nd	19	Analytical mind	-1.13	Analytical and Problem-solving Abilities
3rd	9	Comprehension in written English	-1.09	English Language Proficiency
4th	7	Expression of ideas in written English	-1.00	English Language Proficiency
5th	23	Judgment	-0.98	Analytical and Problem-solving Abilities
42nd	39	Management of available resources and ability to seek resources and assistance	1.18	Management Skills
43rd	11	Comprehension of data	1.23	Numerical Competency
44th	12	Application of data	1.45	Numerical Competency
45th	37	Leadership	1.74	Management Skills
46th	38	Able to motivate team-members	1.82	Management Skills

Table 4.10: The Three Most/Least Important Attributes of the Dimensions

Ranking	Dimension 1	Dimension 2
1st	Problem-solving abilities	Comprehension in written English
2nd	Analytical mind	Expression of ideas in written English
3rd	Judgment	Comprehension in oral English
28th/14th	Management of available resources and ability to seek resources and assistance	Adaptability to new software
29th/15th	Leadership	Comprehension of data
30th/16th	Able to motivate team-members	Application of data

Full rankings by Academics and College Administrators of the relative importance for different attributes of the two dimensions are presented in Figure 4.2.

Figure 4.2: Person-Item Maps of Academics and College Administrators

Academics & College Administrators Item Map (Dimension 1)	Academics & College Administrators Item Map (Dimension 2)
	

For the distribution of Dimension 1 among Academics and College Administrators, it is obvious that there are 3 outliners. Among which, 1 of them has person (ability) measure above 6 logits. It means that the respondent has high scores in the answers to the questionnaire. That means he/she has rated most attribute items very important by giving most items very high score. The two academics or college administrators whose logits are less than -1 have low scores; they have rated items less important. Other respondents are distributed quite "normal" with a mean measure of around 1.5 logits.

For the item measure, item 20 "Problem-solving Abilities" has the lowest logits below -1. It is the "easiest" item in the Rasch analysis. This is translated as the most important item. It makes sense for academics to rate this graduate attribute the most important trait because problem-solving ability is part of the college training in addition to learning textbook materials.

For the distribution of Dimension 2 among Academics and College Administrators, the person distribution is rather spread out implying diverse views from respondents concerning the relative importance of attribute items in this dimension. Most respondents fall between -1 logits and slightly above +3 logits. Six respondents are outside this range.

It is clear from Figure 4.2 that items 9, 7, 10 (all English items) have the lowest logits. They have received the highest scores in the study. That means these items have been rated as the most important attribute items.

Definition of Quality (Academics and College Administrators)

There were 9 attribute aspects and 57 academic and college administrator respondents in the study. A total of 513 responses to the definition of quality were collected. Breakdown of the responses are summarized in Table 4.11.

Table 4.11: Summary of Responses to Quality Definitions

Definition of Quality	Number of Responses
Quality as Exception	96
Quality as Transformation	133
Quality as Fitness for Purpose	193
Quality as Value for Money	91

Quality as Fitness for Purpose has received the most responses. The results make sense for the academics and college administrators especially for the latter. College administrators are concerned about the employment rate and the incomes of graduates. In the following section, views of college graduates are reported.

Statistics of College Graduates

The sample size of College Graduates as a stakeholder group is 75. College graduates hold a minimum of a bachelor degree and do not fall into the other three groups. The summary of 75 measured persons for the 46 items provides a mean of 195.3. The average rating per item is 4.25 out of a possible maximum of 5. On average, respondents have rated the attribute items between quite important and very important.

The person measure infit is 1.04; outfit 1.03; and person reliability 0.92. The person separation 3.44 means that with the 46 items, respondents can be separated into approximately 3 (round down from 3.44) groups. This indicates that college graduates have different views on the relative importance of attribute items. This perhaps reveals the different disciplines they are in.

The item measure infit is 1.01; outfit 1.03; and item reliability 0.82. The item separation 2.13 means that with the 75 respondents, items can be separated into approximately 2

groups (round down from 2.13). This is consistent with the two quality dimensions reported earlier.

The item fit statistics of both attribute dimensions have been reported in Appendices 5F and 5G. Item 17 (Z-score = 2.46, MNSQ = 1.40), item 40 (Z-score = 2.88, MNSQ = 1.57), and item 46 (Z-score = 2.57, MNSQ = 1.49) are misfit items with statistical significance in terms of Z-score but only item 40 has marginal practical significance with MNSQ equals 1.57. Other misfit items have MNSQ falling within the range of 0.5-1.5. Therefore, there is no practical significance in data misfit. These misfit items are not necessarily bad items. The person infit 1.04 and item infit 1.01 are very close to the expected value. The overall data are fit with high reliability.

Rasch Factor Analysis has found the total raw variance in observations is 68.2. Raw variance explained by measures is 22.2 (or 32.5%). Among which, raw variance explained by persons is 10.6 (or 15.6%), and by items is 11.6 (or 17.0%). Raw unexplained variance is 46.0 (or 67.5%). Unexplained variance in first contrast has an eigenvalue of 5.0 (or 7.4% of total raw variance). This indicates the strength of 5 items. Unexplained variance in second contrast is 4.7 (or 6.9%), in third contrast 3.6 (or 5.3%). This again indicates multidimensionality among items.

Relative Importance of Attributes (College Graduates)

As for the relative importance rankings of the 46 attributes, college graduates have the following five most important and five least important items depicted in Table 4.12. For the relative importance ranking of the 46 quality attributes, consolidating into 9 attribute groups, college graduates do not have very clear and focus attribute aspects. Analytical and Problem-solving Abilities, Work Attitude, and English Language Proficiency are the most important; the least important attributes fall into four different attribute aspects. It is interesting to find that problem-solving ability in the Analytical and Problem-solving

Abilities group is rated as the most important attribute, but creativity in the same group is rated as the least important. This perhaps suggests that "creativity" should not be categorized in the same attribute aspect.

Table 4.12: The Five Most/Least Important Attributes (College Graduates)

Ranking	Item		Logits	Attribute Aspect
1st	20	Problem-solving ability	-0.69	Analytical and Problem-solving Abilities
2nd	29	Professional/business ethics	-0.60	Work Attitude
3rd	27	Initiative and drive	-0.55	Work Attitude
4th	19	Analytical mind	-0.54	Analytical and Problem-solving Abilities
5th	8	Expression of idea in oral English	-0.51	English Language Proficiency
42nd	46	Relevant work experience gained as part of the study program	0.76	Technical Skills or Major Subject(s) Knowledge Required for the Job
43rd	39	Management of available resources and ability to seek resources and assistance	0.96	Management Skills
44th	11	Comprehension of data	1.02	Numerical Competency
45th	12	Application of data	1.32	Numerical Competency
46th	21	Creativity	1.49	Analytical and Problem-solving Abilities

Having attribute items grouped into quality dimensions, the relative importance rankings of the three most important and three least important attributes for the College Graduates group are shown in Table 4.13. In view of the results, College Graduates group has ranked English Language Proficiency and Chinese Language Proficiency as the most important attribute aspects; Information Technology Literacy and Numerical Competency are the least important under Dimension 2, basic skills. For Dimension 1, they have

ranked Work Attitude, and Analytical and Problem-solving Abilities as the most important attribute aspects; Technical Skills or Major Subject(s) Knowledge required for the Job, Management Skills, and Analytical and Problem-solving Abilities are the least important.

Table 4.13: The Three Most/Least Important Attributes of the Dimensions (Graduates)

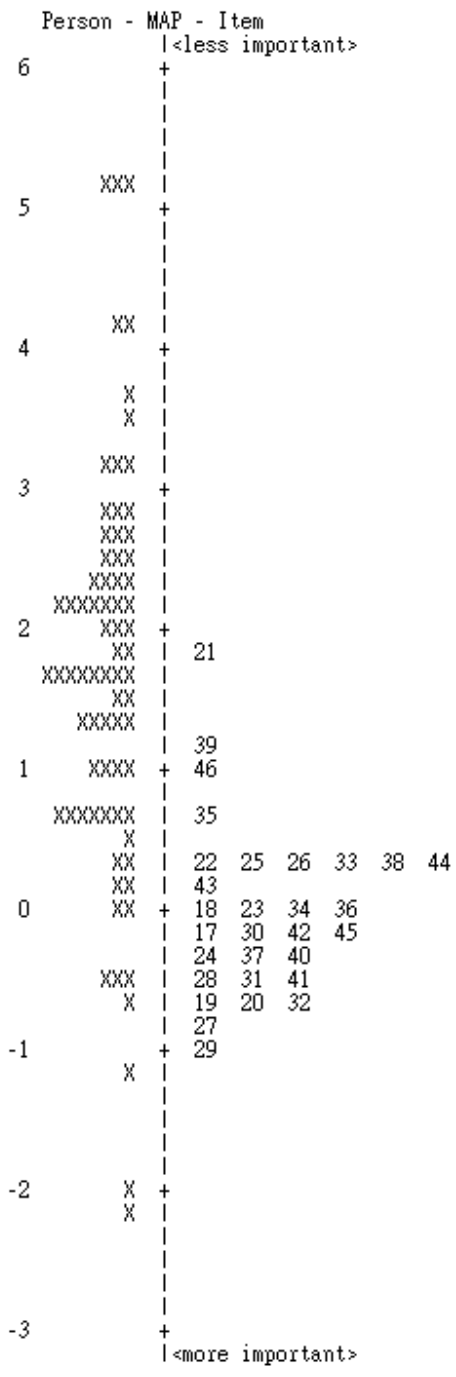
Ranking	Dimension 1	Dimension 2
1st	Professional/business ethics	Expressions of ideas in oral English
2nd	Initiative and drive	Comprehension in Cantonese (oral)
3rd	Analytical mind	Comprehension in oral English
28th/14th	Relevant work experience gained as part of the study program	Adaptability to new software
29th/15th	Management of available resources and ability to seek resources and assistance	Comprehension of data
30th/16th	Creativity	Application of data

Full rankings of the relative importance by College Graduates for different attributes of the two dimensions are presented in Figure 4.3. For the distribution of Dimension 1 among College Graduates, there are 5 outliners. Among which, 3 of them have person (ability) measure above 5 logits. It means that the respondents have high scores in the answers to the questionnaire. That means they have rated most attribute items very important by giving most items very high score. The 2 college graduates whose logits are -2 and below have low scores meaning they have rated items less important. Other respondents are distributed quite "normal" between slightly below -1 logits and slightly above +4 logits, with a mean measure of around 1.5 logits.

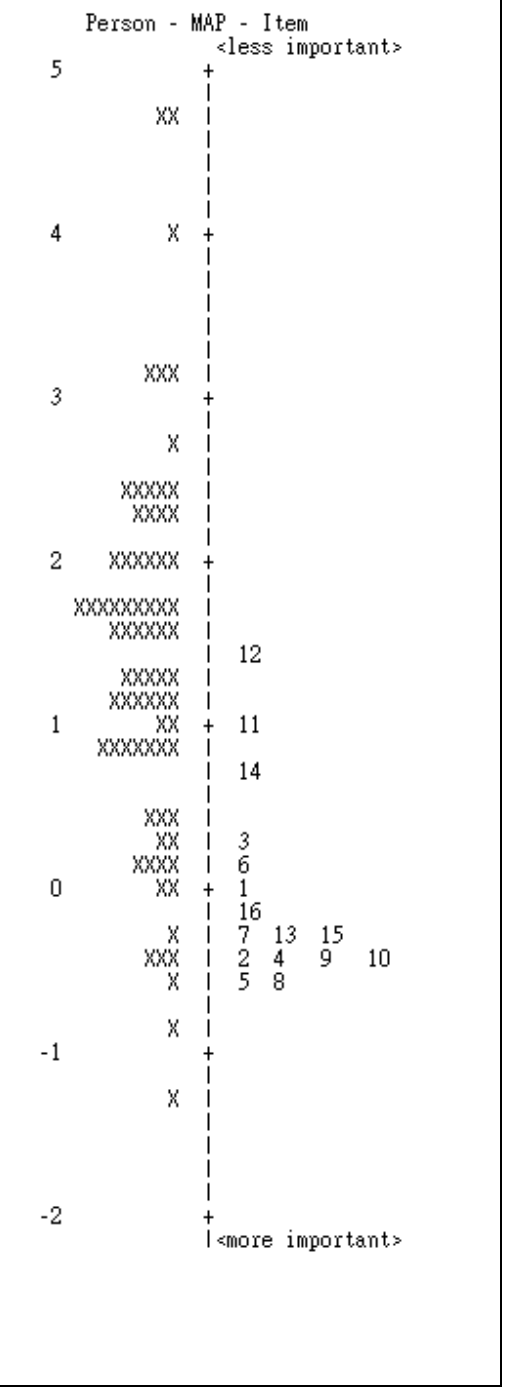
For the item measure, item 29 "Professional/business ethics" has the lowest logits at around -1. It is the "easiest" item in the Rasch analysis. This is actually the most important item.

Figure 4.3: Person-Item Maps of College Graduates

College Graduates
Item Map (Dimension 1)



College Graduates
Item Map (Dimension 2)



For the distribution of Dimension 2 among College Graduates, the person distribution is rather "normal" between around -1 logits and slightly above 3 logits with a mean of around +1.5 logits. There are 3 respondents at +4 and above logits.

It is clear from Figure 4.3 that items 5 (comprehension in oral Cantonese) and 8 (expression of ideas in oral English) have the lowest logits. They have the lowest item difficulty, and they have received the highest scores in the study. That means they have been rated as the most important attribute items.

Definition of Quality (College Graduates)

There are 9 attribute aspects and 75 college graduate respondents in the study. A total of 675 responses to the definition of quality were collected. Breakdown of the responses are summarized in Table 4.14.

Table 4.14: Summary of Responses to Quality Definitions (College Graduates)

Definition of Quality	Number of Responses
Quality as Exception	118
Quality as Transformation	210
Quality as Fitness for Purpose	203
Quality as Value for Money	144

Quality as Transformation has received the most responses, marginally more than Quality as Fitness for Purpose. In the next section, the views of Tertiary student are reported.

Statistics of Tertiary Students

The sample size of Tertiary Students as a stakeholder group is 339. This group includes students attending post-secondary institutions. From their email addresses and other known sources, some of them are identified as students from the Hong Kong Polytechnic

University, the City University of Hong Kong, the Hong Kong Baptist University, Lingnan University, the Hong Kong Institute of Education, the Chinese University of Hong Kong-Tung Wah Group of Hospitals Community College, Tung Wah College, the Hong Kong Polytechnic University School of Professional Education and Executive Development (SPEED), and top-up degree programs offered in Hong Kong from overseas universities.

The summary of 339 measured persons for the 46 items provides a mean of 191.5. The average rating per item is 4.16 out of a possible maximum of 5. On average, respondents have rated the attribute items between quite important and very important.

The person measure infit is 1.02; outfit 1.00; and person reliability 0.93. The person separation 3.55 means that with the 46 items, respondents can be separated into approximately 4 (round up from 3.55) groups. This indicates that tertiary students have different views on the relative importance of attribute items.

The item measure infit is 1.00; outfit 1.00; and item reliability 0.94. The item separation 3.91 means that with the 339 respondents, items can be separated into approximately 4 groups (round up from 3.91).

The item fit statistics of both attribute dimensions have been reported in Appendices 5H and 5I. Item 2 (Z-score = 2.36, MNSQ = 1.23), item 21 (Z-score = 2.70, MNSQ = 1.22), item 23 (Z-score = -2.28, MNSQ = 0.85), item 27 (Z-score = -2.34, MNSQ = 0.83), item 34 (Z-score = -2.23, MNSQ = 0.83), item 35 (Z-score = -2.11, MNSQ = 0.84), item 40 (Z-score = 3.7, MNSQ = 1.31), and item 46 (Z-score = 6.07, MNSQ = 1.54) are misfit items with statistical significance in terms of Z-score but only item 46 has marginal practical significance with MNSQ equals 1.54. These misfit items are not necessarily bad

items. The person infit 1.02 and item infit 1.00 are very close or equal to the expected value. The overall data are fit with high reliability.

Rasch Factor Analysis has found the total raw variance in observations is 64.7. Raw variance explained by measures is 18.7 (or 28.9%). Among which, raw variance explained by persons is 8.3 (or 12.9%), and by items is 10.4 (or 16.1%). Raw unexplained variance is 46.0 (or 71.1%). Unexplained variance in first contrast has an eigenvalue of 4.7 (or 7.3% of total raw variance). This indicates the strength of about 5 items. Unexplained variance in second contrast is 3.2 (or 4.9%), in third contrast 3.0 (or 4.7%). Multidimensionality again is existed.

Relative Importance of Attributes (Tertiary Students)

As for the relative importance rankings of the 46 attributes, tertiary students have the five most important and five least important ratings shown in Table 4.15. For the relative importance ranking of the 46 quality attributes, categorizing in 9 attribute aspects, tertiary students do not have very clear, focused attributes as the Employers group. English Language Proficiency, Work Attitude, and Analytical and Problem-solving Abilities are the most important; the least important attributes fall into four different attribute aspects. It is interesting to find that the two attribute groups Analytical and Problem-solving Abilities and Work Attitude have attributes that are rated both the most important and the least important. Tertiary students may not quite understand the logic of both analytical mind and problem-solving ability that lead to judgment or decision.

Having attribute items grouped into quality dimensions, the relative importance rankings of the three most important and three least important attributes for the Tertiary Students group are shown in Table 4.16.

Table 4.15: The Five Most/Least Important Attributes (Tertiary Students)

Ranking	Item		Logits	Attribute Aspect
1st	8	Expression of ideas in oral English	-0.73	English Language Proficiency
2nd	24	Sense of responsibility and commitment	-0.68	Work Attitude
3rd	10	Comprehension in oral English	-0.67	English Language Proficiency
4th	19	Analytical mind	-0.55	Analytical and Problem-solving Abilities
5th	20	Problem-solving ability	-0.48	Analytical and Problem-solving Abilities
42nd	23	Judgment	0.43	Analytical and Problem-solving Abilities
43rd	39	Management of available resources and ability to seek resources and assistance	0.45	Management Skills
44th	12	Application of data	0.46	Numerical Competency
45th	25	Ability to work independently	0.75	Work Attitude
46th	37	Leadership	0.81	Management Skills

Table 4.16: The Three Most/Least Important Attributes of the Dimensions

Ranking	Dimension 1	Dimension 2
1st	Sense of responsibility and commitment	Expression of ideas in oral English
2nd	Analytical mind	Comprehension in oral English
3rd	Problem-solving ability	Expression of ideas in written English
28th/14th	Judgment	Comprehension of data
29th/15th	Ability to work independently	Adaptability to new software
30th/16th	Leadership	Application of data

In view of the results, Tertiary Students group has ranked the three most important attributes in Work Attitude, and Analytical and Problem-solving Abilities attribute aspects; the three least important attributes in Analytical and Problem-solving Abilities, Work Attitude, and Management Skills. Students have such rankings probably because they do not expect to make decisions on their own, and they should be guided or coached in the workplace when they first enter the labor market. Students do not expect to possess leadership skills under Dimension 1 as fresh graduates. For Dimension 2, they have ranked English Language Proficiency as the most important attribute group, Numerical Competency and Information Technology Literacy as the least important.

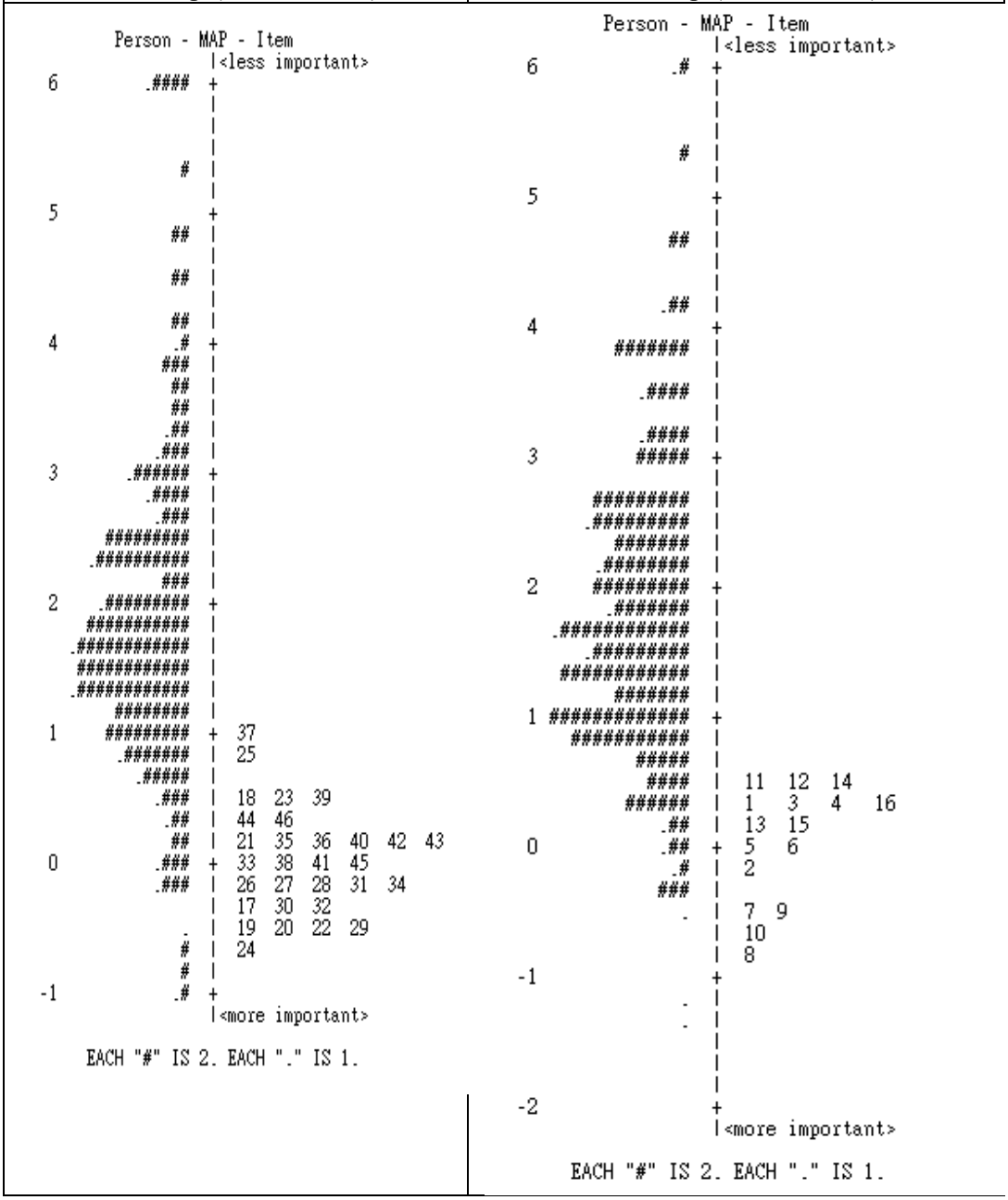
Rankings of the relative importance of different attributes of the two dimensions are presented in Figure 4.4. For the distribution of Dimension 1 among Tertiary Students, there are 11 outliners. They have person (ability) measure above 5 logits. It means that the respondents have high scores in the answers to the questionnaire. That means they have rated most attribute items very important by giving most items very high score. Other respondents are distributed quite "normal" between -1 logits and slightly below +5 logits, with a mean measure of slightly below +2 logits.

For the item measure, item 24 "Sense of responsibility and commitment" has the lowest logits, same as the Employers group. It is the "easiest" item in the Rasch analysis. This is translated as the most important item.

For the distribution of Dimension 2 among Tertiary Students, the person distribution is rather "normal" between around -0.5 logits and slightly above 4 logits with a mean of slightly below +2 logits. There are 9 respondents above the range and 2 below.

Figure 4.4: Person-Item Maps of Tertiary Students

Tertiary Students Item Map (Dimension 1)	Tertiary Students Item Map (Dimension 2)



It is clear from Figure 4.4 that items 8, 10, 7 and 9 (all English items) have the lowest logits, same as the Employers group. They have received the highest scores in the study. That means they have been rated as the most important attribute items.

In view of the item maps, Employers and Tertiary Students groups have rated the same graduate attributes as most important for both dimensions. Person measures always spread over a wider range than item measures. This reflects big variations in respondent views. Item measures have a narrower range because most of them have been rated between "quite important" and "very important", which is within expectation. If an item is rated as "not important at all", the item should not be included in the questionnaire.

Definition of Quality (Tertiary Students)

There were 9 attribute groups and 339 tertiary student respondents in the study. A total of 3,051 responses to the definition of quality were collected. Breakdown of the responses are summarized in Table 4.17.

Table 4.17: Summary of Responses to Quality Definitions (Tertiary Students)

Definition of Quality	Number of Responses
Quality as Exception	570
Quality as Transformation	1,021
Quality as Fitness for Purpose	810
Quality as Value for Money	650

Quality as Transformation has received the most responses, the related response to this definition is: "it could improve the overall quality of graduates regardless of its impact on employability". Students could have thought that employment is not their immediate concern. Their concern could be that having higher overall quality, they would be doing better in the examinations. A comparison of stakeholders' different rankings is reported in the following section.

Comparison of Stakeholders' Rankings of Attributes

To compare if differences are significant among stakeholder groups in the rankings of the relative importance of attributes, Rasch Differential Item Functioning (DIF) has been performed. The hypothesis for DIF between two groups is that the attribute's importance is the same between the two groups. Whether an attribute is a DIF item depends on the DIF effect size (the difference between the DIF measures of the two groups) and the t-statistic, usually at the 0.05 significance level. For multiple groups, the hypothesis is that the attribute's importance is the same across all groups. For multiple-group comparison, four stakeholder groups in the study, the chi-square statistic at the 0.05 significance level is taken. The purpose of DIF is to identify whether an item has been ranked significantly differently among stakeholder groups, although differences are expected.

For multiple comparisons, WINSTEPS Table 30.2 was examined, consolidated and numbers rearranged as in Appendix 6A. At the 0.05 significance level, the following 15 attribute items have been identified as DIF items:

1. Item 1, Expression of ideas in written Chinese
2. Item 2, Expression of ideas in Cantonese (oral)
3. Item 4, Comprehension in written Chinese
4. Item 5, Comprehension in Cantonese (oral)
5. Item 7, Expression of ideas in written English
6. Item 11, Comprehension of data
7. Item 17, Common sense
8. Item 24, Sense of responsibility and commitment
9. Item 29, Professional/business ethics
10. Item 34, Able to manage and resolve conflict when appropriate
11. Item 40, Technical or major subject(s) knowledge
12. Item 41, Ability to handle technical demands in work
13. Item 42, Ability to solve technical problems

14. Item 45, Aware of occupational health and safety practices and procedures, and act in accordance with these
15. Item 46, Relevant work experience gained as part of the study program

The differences between groups are shown in Appendix 6A by the effect sizes of items' DIF measures. That is the difference in DIF measures between two groups. DIF measure "is the difficulty of this item for this class (stakeholder group), with all else held constant" (Linacre 2011, p.366). Applying the definition to Appendix 6A, DIF measure of an attribute is the importance level of the attribute for the stakeholder group, holding all other things constant.

For item 9 "Comprehension in Written English", although the effect size between Group 2 (Academics and College Administrators) and Group 4 (Tertiary Students) is -0.63, which is greater than the DIF cut-off effect size 0.50 (Linacre 2011), the chi-square statistic has a p-value 0.0832, greater than 0.05. The difference between the two groups does not make it statistically significant among all groups. Therefore, it is not a DIF item. Similar situation applies to item 19 "Analytical mind", item 33 "Able to accept and provide feedback in a constructive and considerate manner", and item 43 "Ability to select and use appropriate tools and technology for a task or project". These items are DIF between individual groups but the difference does not make it statistically significantly different across all groups according to their respective chi-square p-values. On the contrary, for item 46, "Relevant work experience gained as part of the study program", there is no effect size between two groups greater than 0.50, but the chi-square statistic has a p-value 0.0403 that is smaller than 0.05. The attribute is a DIF item with statistical significance, but the DIF effect size is practically insignificant.

To further investigate DIF items, the two dimensions were run separately. The number of DIF items has reduced from 15 (running all items together) to 12 as shown in Appendix 6B (for Dimension 2) and Appendix 6C (for Dimension 1). Attributes 34, 45, and 46 are

no longer DIF items. DIF items in Dimension 2, basic skills, the 4 Chinese DIF items and the 2 English DIF items remain.

Rasch DIF analysis was further run for the 9 attribute aspects (results not shown here) separately, and the number of DIF items has further decreased to 10 items. However, for Dimension 2, the 4 Chinese DIF items and the 2 English DIF items remain DIF items. Dimension 1 DIF items have reduced to 4. They are attribute items 17, 29, 30 and 34. But item 30 "Inter-personal relationship" was not a DIF item in the first round of DIF analysis for all the items and in the second round of DIF analysis for the two dimensions. It has become a DIF item when the aspect groups were analyzed separately.

As for the rankings of the relative importance of all items by the whole sample and by different stakeholder groups, a full comparison of stakeholders' different rankings of the attributes is attached in Appendix 7A. Table 4.18 summarizes stakeholders' different rankings of the five most important and five least important attributes with their respective attribute aspects in ***bold italic***.

For the overall sample (N = 530), Work Attitude, English Language Proficiency, and Analytical and Problem-solving Abilities have been ranked as the three most important attribute aspects. However, when the rankings of stakeholder groups are separately examined, Employers (n = 57) have ranked Work Attitude as the most important attribute aspect, and English Language Proficiency the second important. Academics and College Administrators have different views. They have ranked Analytical and Problem-solving Abilities, and English Language Proficiency as the two most important attribute aspects. College Graduates and Tertiary Students groups have ranked the five most important attribute items from three attribute aspects. Namely, they are Analytical and Problem-solving Abilities, English Language Proficiency, and Work Attitude.

Table 4.18: Stakeholder Rankings of Attributes (in their respective aspects)

Ranking		Overall	Employers	Academics	Graduates	Students
1st	Item	Sense of responsibility and commitment	Sense of responsibility and commitment	Problem-solving ability	Problem-solving ability	Express in oral English
	Aspect	***Work Attitude***	***Work Attitude***	***Analytical***	***Analytical***	***English***
2nd	Item	Express in oral English	Express in written English	Analytical mind	Ethics	Sense of responsibility and commitment
	Aspect	***English***	***English***	***Analytical***	***Work Attitude***	***Work Attitude***
3rd	Item	Judgment	Comprehend in written English	Comprehend in written English	Initiative and drive	Comprehend in oral English
	Aspect	***Analytical***	***English***	***English***	***Work Attitude***	***English***
4th	Item	Work independently	Express in oral English	Express in written English	Analytical mind	Analytical mind
	Aspect	Work Attitude	English	English	Analytical	Analytical
5th	Item	Express in written English	Comprehend in oral English	Judgment	Express in oral English	Problem-solving ability
	Aspect	***English***	***English***	***Analytical***	***English***	***Analytical***
42nd	Item	Application of data	Management of resources	Management of resources	Relevant work experience gained	Judgment
	Aspect	***Numerical***	***Management Skills***	***Management Skills***	***Technical Skills***	***Analytical***
43rd	Item	Adaptability to new software	Leadership	Comprehend of data	Management of resources	Management of resources
	Aspect	***IT Literacy***	***Management Skills***	***Numerical***	***Management Skills***	***Management Skills***
44th	Item	Management of resources	Solve technical problems	Application of data	Comprehend of data	Application of data
	Aspect	***Management Skills***	***Technical Skills***	***Numerical***	***Numerical***	***Numerical***
45th	Item	Foresight	Motivate team-members	Leadership	Application of data	Work independently
	Aspect	***Analytical***	***Management Skills***	***Management Skills***	***Numerical***	***Work Attitude***
46th	Item	Work on agreed quality standards	Use appropriate tools and technology for a task	Motivate team-members	Creativity	Leadership
	Aspect	***Technical Skills***	***Technical Skills***	***Management Skills***	***Analytical***	***Management Skills***

Talking about attribute aspects without clearly and correctly defined the attribute items may not be too meaningful. Some of the attribute items perhaps are incorrectly classified

into their attribute aspects. It can be confusing, for example, that in the overall ranking, item 18 Foresight (in the Analytical and Problem-solving Abilities aspect) has been ranked the 45th, the second least important. If we say, in the overall ranking, Analytical and Problem-solving Abilities has been ranked as the 3rd most important (item 23 Judgment), it can be very confusing. Graduates have ranked item 21 Creativity (in the Analytical and Problem-solving aspect) as the least important attribute; students have ranked item 23 Judgment (also in the Analytical and Problem-solving Abilities aspect) as the 42nd important, relatively unimportant. Foresight and judgment require critical and problem-solving abilities. However, creativity has been ranked everywhere relatively unimportant. Respondents might have misinterpreted creativity in the context of art. When it comes to problem-solving, creativity can mean new and different way to solve problem. Researchers may need to reword creativity in the future should the same attribute item be included in a questionnaire similar to this.

There are similarities among stakeholder groups for the five most important attribute items that are from the same attribute aspects. Particular attention should be paid to item 23 Judgment. Academics and College Administrators have ranked Judgment as the 5th important, relatively very important, but Students have ranked it the 42nd, relatively unimportant. It is understandable why academics rank judgment as very important because making sensible and reasonable judgment is part of education. However, students might not understand this. Academics will need to explain this to students so that the latter understands expectations of the former.

Among the 20 total rankings of the 4 stakeholder groups for the 5 most important attributes, English Language Proficiency as an attribute aspect has received 9 votes, Analytical and Problem-solving Abilities 7 votes, and Work Attitude 4 votes. Although this is not perfectly match with the "Overall" (all groups together) column, the results are similar with the same three attribute aspects being ranked the most important.

Among the 20 total rankings for the 5 least important attributes, Management Skills has received 9 votes, Numerical Competency 5 votes, Technical Skills or Major Subject(s) Knowledge Required for the Job 3 votes, Analytical and Problem-solving Abilities 2 votes, and Work Attitude 1 vote. The two least important votes on Analytical and Problem-solving Abilities were casted by the College Graduates group in Creativity and Tertiary Students in Judgment. The least important vote on Work Attitude was casted by Tertiary Students who have ranked Ability to Work Independently as very unimportant. This is probably because students expect that they will be guided or coached when they first enter the work force. Therefore, being able to work independently is not so important.

It is apparent that there are diverged views among stakeholders on the relative importance of the attribute items and the attribute aspects. SPSS nonparametric Kruskal-Wallis Test examines if the distribution of ordinal variables is the same across all groups (Norusis 2006). This is an alternative to ANOVA that is not used in this study. It is because ANOVA requires normal distribution of the population. The distribution of this study is expected to be biased on the high side. Items are ranked on average between quite important (4) and very important (5). Normal distribution of the population was neither assumed nor expected. The normality condition for ANOVA would be violated. The Kruskal-Wallis Test has a condition that all samples have equal variance (Norusis 2006). Normality is not a condition for the Kruskal-Wallis Test. The hypothesis is that the stakeholder groups have ranked all attribute aspects the same.

For the equal variance condition, Levene's Test for Equality of Variances has been conducted. None of the differences in the attribute aspects' variances is statistically significant. The equal variance assumption therefore is met.

The results (SPSS outputs not shown) show that Chinese Language Proficiency has a p-value of 0.035; English Language Proficiency has a p-value of 0.038, and Numerical

Competency has a p-value of 0.003. Other attribute groups have p-values over 0.05. Analytical and Problem-solving Abilities has a p-value of 0.054. Therefore, we can conclude that differences among the stakeholder groups are statistically significant at the 0.05 level for Chinese Language Proficiency, English Language Proficiency, and Numerical Competency. The differences across the four stakeholder groups for other attribute aspects are not statistically significant at the 0.05 level. This is consistent with the DIF analysis where four Chinese items, two English items, and one Numerical Competency item are DIF items. All Chinese and Numerical Competency items are misfit items. As discussed earlier, misfit items are not necessarily bad items, especially those misfit items having MNSQ within the 0.5-1.5 range. They are simply statistically significantly different from the expected value, but in terms of MNSQ the differences are not practically significant. They are different stakeholder groups after all, and stakeholder groups indeed have different views towards these basic skills.

Figures 4.1 to 4.4 depict the Rasch person-item maps for the two dimensions of each stakeholder group. Figures 4.5 and 4.6 provide an overall picture comparing the relative importance rankings of attributes among the four stakeholder groups for each dimension. Positions of items look slightly different between the two sets of figures because Figures 4.1 to 4.4 are generated by the Rasch program. Figures 4.5 and 4.6 are produced manually with a different scale. Detailed corresponding item measures of Figures 4.5 and 4.6 are reported in Appendices 7B and 7C. The item measures for all items or the two dimensions combined are reported in Appendix 7A listed by the order of their importance, i.e. the most important item first.

As we can see from the figures, the distributions of persons and items are different among stakeholder groups, which is within expectation. A summary analysis of Person and Item measures supplementing information of Figure 4.5 is shown in Table 4.19.

In Table 4.19, the numbers in brackets represent their respective values if the extremists are excluded. For the Person measures of students, there are 4 extremists measuring at 7.21 logits that are 1.23 logits from the second highest logits group. For Academics and College Administrators group, the extremist is 2.13 logits away from the second highest logits respondent.

Table 4.19: Comparing Person-Item Measures – Dimension 1

	Person Measures Dimension 1				Item Measures Dimension 1			
	Employers	Academics	Graduates	Students	Employers	Academics	Graduates	Students
High	6.81	6.19 (4.06)	5.23	7.21 (5.98)	1.59	2.04	1.87	0.95
Low	-1.89	-2.96	-2.16	-1.01	-1.76	-1.49	-0.99	-0.74
Range	8.70	9.15 (7.02)	7.39	8.22 (6.99)	3.35	3.53	2.86	1.69
Mean	1.12	1.55 (1.47)	1.67	1.94 (1.87)	0.00	0.00	0.00	0.00
Stdev	1.49	1.54 (1.42)	1.46	1.38 (1.26)	0.85	0.87	0.62	0.42

With extremists included in the Person measure analysis of Dimension 1, Academics and College Administrators group has the largest range (9.15 logits) and the largest standard deviation (1.54 logits) indicating differences within the group are the largest. Students have the largest mean Person measure (1.94 logits). In the Rasch model, higher person measures mean students have higher ability that is reflected by their higher average scores. In the context of this study, students have ranked the attributes relatively more important than the other stakeholder groups. Higher scores do not mean higher ability. Employers have the lowest mean (1.12 logits) implying that they have ranked the attributes, on average, not as important as what students have ranked them.

Figure 4.5: Person/Item Maps for Stakeholder Groups (Dimension 1)

Persons					Items			
Students	Graduates	Academics	Employers		Employers	Academics	Graduates	Students
xxxx				7				
			x	6.5				
		x		6				
xxxxx			x	5.5				
xx	xxx			5				
xxxx				4.5				
xxxxxxxx	xx	x	x	4				
xxxxxxxxxxxx	xx	x		3.5				
xxxoooo	xxx	xxxxx	x	3				
xxxxoooooo	xxxxxx	xxxxxxxx	x	2.5				
oooooooo	xxxxxxxxxxxxx	xxxxxxxx	xxxxxxx	2		38		
xxxxoooooooooooooo	xxxxxxxxxxxxxx	xxxxxx	xxxxx	1.5	43	37	21	
xoooooooooo	xxxxxxx	xxxxxx	xxxxxxxxxxxxxxx	1	37, 38, 42, 39, 21	39	39	
oooooooo	xxxxxxxxx	xxxxxxxx	xxxxxxxx	0.5	40, 18	46, 35, 28, 36, 26	46, 35	37, 25, 23, 39, 18
xxxxooo	xxxxxxx	xxxx	xxxxxxx	0	34, 35, 45, 46	42, 33, 34, 21, 22	25, 44, 26, 22, 33, 38, 43, 23	44, 46, 36, 35, 43, 40, 21, 42, 41, 45, 33
xxxxxxxxxx	x	xxxxx	xxxxxx	-0.5	25,36, 44, 26, 28, 41, 22, 23	45, 40, 31, 43, 41, 18, 44, 29	36, 34, 18, 17, 42, 45, 30, 40, 37, 24, 31, 41, 28	38, 34, 26, 27, 31, 28, 32, 17, 30, 29, 22
xxxxx	xxx	xx	xxx	-1	27, 32, 33, 19, 31, 20, 29, 17	24, 27, 30, 17, 32, 25	32, 20, 19, 27, 29	20, 19, 24
xx	x			-1.5	30	23, 19, 20		
		x	xx	-2	24			
	xx			-2.5				
		x		-3				

X = 1 person,
o = 5 persons

For positive logits: 0 includes 0.00 to 0.49; 0.50 includes 0.50 to 0.99, and so forth. For negative logits: -0.5 includes -0.01 to -0.50; -1.00 includes -0.51 to -1.00, and so forth.

Figure 4.6: Person/Item Maps for Stakeholder Groups (Dimension 2)

Persons					Items			
Students	Graduates	Academics	Employers		Employers	Academics	Graduates	Students
xxx				6.5				
				6.0				
				5.5				
xx		x		5.0				
xxxx	xx			4.5				
xxxxx		x	xx	4.0				
xxxxoo	x	xx	xxx	3.5				
xxxooo	xxx	xx	xx	3.0				
xxooooooooo	x	xxxxxxxxx	xxxxxx	2.5				
xoooooo	xxxxxxxxx	xxxxxx	xxxxxxx	2.0				
xxooooooooooooooo	xxxxxxxxxxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxx	1.5		12		
xxxxoooooooooooo	xxxxxxxxxxx	xxxx	xxxxxx	1.0	6, 12, 3, 16, 11	11	12, 11	
ooooooooo	xxxxxxxxxxxx	xxxxxxx	xxxxxxxxxx	0.5	15, 13	14	14	
xxoooo	xxxxxx	xx	xxxxx	0.0	2, 5, 14	16, 5, 15, 1, 2, 3	3, 6	12, 14, 11, 3, 4, 1, 16, 15, 13
xxxxo	xxxxxx	xxxx	xxxxxx	-0.5		6, 13	1, 16, 15, 13, 7, 2, 4, 9, 10	5, 6, 2, 9, 7
x	xx	xxxxx	xxx	-1.0	4, 1	8, 4, 10	5, 8	10, 8
xx	x	x	x	-1.5		7, 9		
				-2.0	8, 10, 9, 7			
		x		-2.5				
				-3.0				
				:				
			x	-5.0				

X = 1 person,
o = 5 persons

For positive logits: 0 includes 0.00 to 0.49; 0.50 includes 0.50 to 0.99, and so forth. For negative logits: -0.5 includes -0.01 to -0.50; -1.00 includes -0.51 to -1.00, and so forth.

With extremists excluded in the Person measure analysis of Dimension 1, Employers group has the largest range (8.70 logits) and the largest standard deviation (1.49 logits) indicating differences within the group are the largest. As we can see from Figure 4.5 the combined Person-Item map for Dimension 1, the Person measures of Employers group has the widest spread indicating diverse views among employers who may require different graduate attributes for different industries and different types of jobs. Students still have the largest mean Person measure (1.87 logits), and employers have the lowest mean (1.12 logits).

For Item measures, the mean measure has been set at "0" when Rasch analysis was run. Therefore, all item measures have a "0" mean. In school tests, Item measures reflect item difficulty levels that are determined by how items are scored. If an item is scored highly by many students, the item is said to be easy, and the Item measure in logits is low. In the context of this study, a high score for an item means respondents have ranked it with high importance, and it is an easy item.

Academics and College Administrators group has the largest range (3.53 logits) and the largest standard deviation (0.87 logits). This implies they have more variations and diverged views in the rankings of the items. The Employers group has item mean (3.35 logits) and standard deviation (0.85 logits) that are very close to the Academics and College Administrators group. The Students group has the lowest range (1.69 logits) and the lowest standard deviation (0.42 logits) implying they have less variation and less diverged views in the rankings of the items. This is clearly seen in Figure 4.5. Distribution of items for the Students group are more clustered around the mean, while for the Employers group and Academics and College Administrator group have more widely spread-out of the items.

For Dimension 2, a summary analysis of Person and Item measures supplementing information of Figure 4.6 is shown in Table 4.20.

Table 4.20: Comparing Person-Item Measures – Dimension 2

	Person Measures Dimension 2				Item Measures Dimension 2			
	Employers	Academics	Graduates	Students	Employers	Academics	Graduates	Students
High	4.22	5.21	4.76	6.65 (5.39)	1.36	1.59	1.36	0.47
Low	-4.76 (-1.38)	-2.15	-1.24	-1.34	-1.80	-1.12	-0.52	-0.80
Range	8.98 (5.60)	7.36	6.00	7.99 (6.73)	3.16	2.71	1.88	1.27
Mean	1.32 (1.43)	1.53	1.38	1.82 (1.78)	0.00	0.00	0.00	0.00
Stdev	1.55 (1.33)	1.46	1.16	1.21 (1.12)	1.20	0.78	0.59	0.41

As with the analysis for Dimension 1, the numbers in brackets represent their respective values if the extremists are excluded. For the Person measures of students, there are 3 extremists measuring at 6.65 logits that are 1.26 logits away from the second highest logits group. For Employers group, the lowest Person measure (-4.76 logits) is 3.38 logits away from the others.

With extremists included in the Person measure analysis of Dimension 2, Employers group has the largest range (8.98 logits) and the largest standard deviation (1.55 logits)

indicating differences within the group are the largest. Students have the largest mean Person measure (1.82 logits) meaning they have ranked the Dimension 2 attributes relatively more important than the other stakeholder groups. Employers have the lowest mean (1.32 logits) implying that they have ranked the attributes, on average, not as important as what students have ranked them.

With extremists excluded in the Person measure analysis of Dimension 2, Academic and College Administrator group has the largest range (7.36 logits) and the largest standard deviation (1.46 logits) indicating differences within the group are the largest. As we can see from Figure 4.6 the combined Person-Item map for Dimension 2, the Person measures of the Academics and College Administrators group has the widest spread indicating that they have the most diverse views among the members of this stakeholder group. Students still have the largest mean Person measure (1.78 logits), and graduates have the lowest mean (1.38 logits).

For Item measures, Employers group has the largest range (3.16 logits) and the largest standard deviation (1.20 logits). This implies they have more differentiations of the items. The Students group has the lowest range (1.27 logits) and the lowest standard deviation (0.41 logits) implying they have the least differentiation of the items. This is also shown in Figure 4.6. Distribution of items for the Students group are more clustered around the mean, while the Employers group and Academics and College Administrator group have more widely spread-out of the items.

Due to the differences of stakeholder groups, their different rankings in the relative importance of graduate attributes have been expected and confirmed. In the next section, interview results will be reported to support quantitative findings of the study.

Interview Results

In the questionnaire, respondents were asked if they would be willing to attend an interview to further discuss the questions. Respondents who had indicated "yes" in the questionnaire were emailed a set of questions (see Appendix 4). A total of 15 replies were received. They were followed up by email, telephone call, or face-to-face discussion. Among the 15 interviewees, there were 2 employers, 5 academics or college administrators, 3 graduates, and 5 tertiary students. Findings of these interviews are reported below.

Employers

For the two employers interviewed, one owns a marketing consulting firm, and the other is a manager of a finance company. They both involve in recruitment and training new employees. They have suggested that in order for tertiary institutes to maintain and ensure graduate quality with an increasing number of students, students should be graded outcomes-based. Institutes must not curve grades especially when there is big variation in student intake. Curving grades for a group of big variation students not only gives students false message but also false hope. Another suggestion made was smaller classes that allow teachers more attention to each student.

In terms of the two quality dimensions and the nine attribute aspects, both of them have chosen Dimension 1 as more important than Dimension 2, and Work Attitude is the most important attribute aspect. They said that from the standpoint of employers, it is useless for anyone having extraordinary knowledge but bad work attitude.

For the reason behind their choices of Dimension 1 in terms of the definition of education quality, one has chosen quality as fitness for purpose, and the other one has chosen quality as value for money. For having chosen Work Attitude as the most important attribute aspect, one has chosen quality as fitness for purpose, and the other one has chosen quality as transformation. The respondent said that once students were transformed into better overall quality, employment should not be a problem for them upon graduation. Therefore, fitness for purpose or employability of graduates becomes the ultimate rationale behind the definition of quality education for employers.

For the fourth question concerning how local tertiary education institutions can train students with these important quality dimensions and attributes, they have suggested that students could be trained through internship, mentoring, youth exchange programs and the alike. Furthermore, consultation and coaching should help students set their personal target and career path. With the correct value and work attitude, they should be able to learn continuously throughout their life. Employment will not be a problem.

Academics and College Administrators

For the five academics and college administrators interviewed, they have either taught or currently teaching at both UGC-funded and self-financed tertiary institutions. In order for tertiary institutions to maintain and ensure graduate quality with an increasing number of students, they have suggested the following:

- To employ a rigorous quality assurance system and to adopt outcomes-based assessment scheme. Academic staff should also be well aware of the program intended learning outcomes and the corresponding course intended learning outcomes. A well-designed assessment scheme must be aligned with the intended

learning outcomes. Graduates' skills, knowledge and attributes should be reflected in their academic performance.

- To ascertain the resources in terms of teaching hours and learning facilities unless new and more effective teaching and learning methodologies are developed.
- To monitor student progress closely and make realistic make-up measures for sub-standard students.
- To keep stringent exit requirements.
- To make teachers the gate-keepers with support from the management to ensure quality.
- To set language as an admission requirement, to provide extra help to students who have sub-standard language ability, and to require students at least one written assignment in every course wherever deemed appropriate.

For the relative importance of the dimensions, three of them have chosen Dimension 2 as more important; two of them have chosen Dimension 1. For the attribute aspects, two have chosen English Language Proficiency as the most important attribute aspect; three have chosen Analytical and Problem-solving Abilities. Their conclusion was that with the English language skill, and high analytical and problem-solving abilities, students should be able to succeed whether in studies or at work.

For the reason behind their choices of the more important dimension in terms of the definition of education quality, one has chosen quality as exception; one has chosen quality as transformation; two have chosen quality as fitness for purpose; and one has chosen quality as value for money. For the choices of the most important attribute aspect, one has chosen quality as exception; one has chosen quality as transformation; two for quality as fitness for purpose; and one for quality as value for money. It is obvious that there are diverse views concerning the definition of quality education among the interviewees. A consensus in the definition of quality education has not been arrived.

For the fourth question concerning how local tertiary education institutions can train students with these important quality dimensions and attributes, they have made the following suggestions:

- More intensive training workshops in English should be provided to local students.
- More problem-based exercises and/or scenario-based assignments should be embedded in coursework.
- The attributes should be integrated into the core curriculum.
- Case studies, current and international issues could be brought into class discussion to train students' analytical skills and problem-solving ability.
- Students should be encouraged to have a life-long learning plan. They should succeed their plan by seeking financial and other means of support from the government with English language development as a mandatory subject.

In general, they believe that once students have acquired the analytical and problem-solving abilities together with high language competency, in particular English, students will not have too much problem in future studies or work. In the next section, the interview results of college graduates are reported.

College Graduates

In order for tertiary institutions to maintain and ensure graduate quality with an increasing number of students, the three college graduates interviewed have made the following suggestions:

- Tertiary institutes must not lower their admission standard to get more students. They should make sure applicants have what it takes to take part in tertiary education before admitting them.
- Tertiary institutes should hire more qualified employees, for both academic and administration, to handle students' learning and study plan. Besides knowledge education, students should be trained as moral and ethical people.
- Tertiary institutes should provide high standard and sufficient number of lecturers, enhance good learning environment, and boost interaction between lecturers and students.

For the relative importance of the dimensions, all of them have chosen Dimension 1 as more important than Dimension 2. For the attribute aspects, one has chosen Work Attitude as the most important; two have chosen Analytical and Problem-solving Abilities. They generally believe that both dimensions are important. Given one had to be chosen, they have chosen Dimension 1 that concerns more about capabilities of solving problems at work. With good work attitude, one will learn to become better including acquiring analytical skills and problem-solving ability.

For the reason behind their choices of Dimension 1 in terms of the definition of education quality, their views were diverged. One has chosen quality as transformation. The other one has chosen quality as fitness for purpose. The third respondent has chosen quality as value for money. For the rationale behind their choices of the most important attribute aspect, one has chosen quality as transformation; two have chosen quality as value for money. The reason provided by one of the interviewees was that work attitude could only be found after one had worked for a while. Therefore, work attitude per se cannot affect employability. It is the attributes of Dimension 1 that affect employability.

For the fourth question concerning how local tertiary education institutions can train students with these important dimensions and attributes, they have made the following suggestions:

- Teachers should set themselves as models to students in terms of work attitude. If teachers work and teach enthusiastically, students will learn the right work attitude.
- Teachers should ensure students' standard in the attributes of Dimension 2, basic skills that are the basic tools to acquire the attributes of Dimension 1.
- Students should be encouraged to think more logically and realistically.
- The government should allocate enough resources to hire high standard and sufficient number of teachers, to enhance good teaching and learning.

In general, they believe that once students have acquired the analytical and problem-solving abilities together with good work attitude, students will not have too much problem to find a job. In the next section, the views of tertiary students are reported.

Tertiary Students

In order for tertiary institutions to maintain and ensure graduate quality with an increasing number of students, the five tertiary students interviewed have made the following suggestions:

- Students should be assessed continuously, with coursework and final examination.
- Students should be assessed criteria-based/outcomes-based.
- Standard should be aligned with public professional examinations. For example, English courses should be aligned with IELTS (International English Language

Testing System) or TOEFL (Test of English as a Foreign Language). Accounting courses should be aligned with the HKIAAT (Hong Kong Institute of Accredited Accounting Technicians) or ACCA (Association of Chartered Certified Accountants).

- Government should consider providing guidelines to standardize quality of tertiary education.
- External examination reviewers could be employed to monitor standard.
- Language ability should be strengthened. Students should be trained bi-literacy (Chinese Language and English Language) and trilingual (Cantonese, Mandarin, and English).

For the relative importance of the dimensions, all of them have chosen Dimension 1 as more important. For the attribute aspects, one has chosen Work Attitude as the most important attribute aspect; three have chosen Analytical and Problem-solving Abilities; one has chosen Technical Skills or Major Subject(s) Knowledge required for the Job.

For the reason behind their choices of Dimension 1 in terms of the definition of education quality, two have chosen quality as fitness for purpose; three have chosen quality as value for money. For the rationale behind their choices of the most important attribute aspect, again, two have chosen quality as fitness for purpose; three have chosen quality as value for money.

For the fourth question concerning how local tertiary education institutions can train students with these important dimension and attributes, they have made the following suggestions:

- Class discussions and group projects should be incorporated in coursework and graded as continuous assessment.
- Students should be placed in internships or as work trainees to gain work experience prior to graduation.
- Case studies should be brought into class discussion.
- Students should take national education.
- A well-structured program should be developed to train students' attitude.
- Students must not be spoiled.

A student interviewee said that many problems in Hong Kong, including the declining education quality was because youngster students were too spoiled. Their attitude must be adjusted.

This chapter has reported an analysis of the data collected. The first research question concerning characterizing quality dimension of local graduates has been resolved. The 46 attribute items in 9 attribute aspects have been factored into 2 dimensions. The second research question concerning the rankings of the relative importance among the stakeholder groups has been answered. It is not surprising to see different stakeholder groups have different views in the relative importance of the attributes. For the third research question concerning the definitions of quality education, there is no consensus yet. However, "fitness for purpose" seems to have gained the most support. Respondents having chosen "quality as transformation" believe this will help seek employment. In the next chapter there are further discussions of these findings, and a concluding remark will be made.

Chapter 5: Discussion and Conclusion

In the last chapter, results of data collected have been reported and analyzed. Graduate attributes or competencies identified by different literatures or government bodies (American Management Association 2010; Australian Government 2008; Education Bureau 2010a; Education Bureau 2010b; Partnership For 21st Century Skills n.d.; Organization for Economic Co-operation and Development 2001; Shah and Chenicheri 2011; The Conference Board of Canada 2000) are slightly different but in general include basic skills such as language, arithmetic, and information technology. Other generic skills include critical thinking, analytical and problem-solving, inter-personal, team work, self-learning, ethics, work attitude, motivation, and technical/subject knowledge. Americans and Australians require a global perspective.

It is reasonable to find countries demanding different graduate attributes or competencies. Apparently foreign countries do not require Chinese language ability as a graduate attribute although the Chinese language is becoming more and more popular internationally. Some graduate attributes can be country-specific; some are industry-specific or discipline-specific.

Due to the history of the HKSAR and its nature as an international city, English language has been ranked more important than Chinese language except for sub-degree graduates (Education Bureau 2010a). It is probably because presumably Chinese people in the HKSAR should know the Chinese language. Other countries may require a foreign language that they find necessary and useful. For example, in the southern states of the United States where there are many Spanish-speaking immigrants from Mexico, they may require Spanish in addition to English; in the United Kingdom, they may require a

European second language; in Canada, the official languages are English and French, but in some regions such as the Greater Vancouver area, Chinese may be more important than French.

Using the nine attribute aspects of the EDB (Education Bureau 2010a, Education Bureau 2010b) as the benchmark and combining the English and Chinese language proficiency as one "Language" attribute, a reconciliation of the graduate attributes and competencies identified or suggested by different literatures is listed in Table 5.1.

Table 5.1: Comparison of Graduate Attributes/Competencies among Countries

	Education Bureau (HKSAR) (2010)	Partnership for the 21st Century Skills (n.d.)	American Management Association (2010)	Australian Government (2008)	Shan and Chenicheri (2011)	Conference Board of Canada (2000)	Organization for Economic Cooperation and Development (2001)
1	Language	✓	✓				✓
2	Numerical	✓	✓			✓	✓
3	Information Technology	✓		✓	✓	✓	✓
4	Analytical & Problem-solving	✓	✓	✓	✓	✓	✓
5	Work Attitude	✓		✓	✓	✓	✓
6	Interpersonal	✓	✓	✓	✓	✓	✓
7	Management	✓		✓	✓	✓	
8	Technical				✓	✓	
Attributes/competencies not included in the Education Bureau studies (HKSAR)							
9	Global Awareness	✓			✓		
10	Natural Science	✓					
11	Self-learning	✓		✓	✓	✓	

Some of the attributes are consolidated. For example, critical thinking is included in analytical thinking and problem-solving skills; teamwork is grouped with interpersonal skills; motivation in work attitude. Since in the EDB surveys, creativity is included in analytical thinking and problem-solving skills, creativity from other literatures therefore is grouped in this category. Applying the terminologies of Hager and Holland (2006), the first three attributes are basic skills. The rest are generic and disciplinary-specific attributes or skills.

Attribute aspects included in the EDB's studies are similar to graduate attribute studies in other countries. However, it is skeptical that the EDB has not included any attribute concerning global perspective as suggested by American's Partnership for the 21st Century Skills (n.d.) and Australian's Shan and Chenicheri (2011), although the HKSAR is a de facto international city. Future local research may want to include global awareness and perspective.

While a lot of developed economies in the world are encouraging their citizen lifelong learning, the EDB studies have not included any graduate attribute in self-learning ability for lifelong learning. Possible reasons for this could be, first, the targets of the studies were employers who might not concern too much about on-going learning or studying of their employees. Second, interviewees comment that given graduates' language, arithmetic, analytical and problem-solving abilities, they should not have problem in further studies and/or looking for work.

Both Australian studies require Australian graduates to have self-learning skill, but neither of them has included language and numeric skills for their graduates. It can be difficult for graduates to pursue further studies without adequate language skills, and in some programs, arithmetic skills.

Although no study appears to be comprehensive, American's Partnership For 21st Century Skills (n.d.) seems to cover the most, except technical skills. The Organization for Economic Co-operation and Development ("OECD") study does not include technical skill either. The OECD (2001) reports that technical and work skills are not as important as other attributes. It is because graduates with the right attitude and motivation learn work skills easily through on-the-job training. Relative importance rankings of this study indicate that technical skills are less important; this is consistent with the view of Americans and Europeans. Most of these studies were conducted through collecting data from employers. They appear to implicitly define quality of higher education as "fitness for purpose", and the purpose of higher education is employment. Hager and Holland (2006) have made the connection between graduate attributes and "employ-ability" skills.

For my first research question concerning the quality dimensions and their respective attributes that our graduates should possess, the nine attribute aspects were factored into two dimensions using SPSS factor analysis. A higher education quality hierarchy has been shown in Table 2.1. One dimension consists of generic skills and disciplinary-specific knowledge. The other dimension includes basic skills such as language, arithmetic, and computer literacy.

According to Hager and Holland (2006), basic skills can be improved through practice, but generic skills may not be improved through practice. Basic skill courses are compulsory and almost universal. For example, language and mathematic courses are required in most, if not all, undergraduate programs. Generic skill courses vary among institutions, and very often students are given the choice to choose among generic skill

courses that are also named general education courses. Discipline-specific courses are certainly different among majors.

The two dimensions are consistent with the curriculum of many bachelor degree programs in the HKSAR and elsewhere in the world. Undergraduate programs require students to study the basic skills in languages, mathematics, and computer skills. Some institutes classify these courses as general education courses. These basic skills build a foundation for students to develop other skills such as critical thinking that is essential for the development of analytical and problem-solving abilities; inter-personal skills; and technical knowledge of the chosen major of studies.

As far as multidimensionality is concerned, Mathematics, for example contributes to basic skills. Mathematic deduction models also can help analyze and solve problems. Linear programming in algebra and optimization in calculus help solve cost minimization and profit maximization problems at work. Therefore, mathematics contributes to both basic skills (Dimension 2) and analytical and problem-solving abilities (Dimension 1). This is within-item multidimensionality.

The two dimensions are not mutually exclusive as if definitions of quality can be coexisted (Fornari and Pompili 2010). Multidimensionality, strong and significant correlations are found between attribute aspects. It is not surprising to find, for example, inter-personal skill is positively correlated with work attitude ($r = 0.609$), and management skills ($r = 0.579$). Any study that takes the attributes as unidimensional may overlook the complicacy and inter-relationship, inter-dependence of the attributes (Wang 2010).

The second research question concerns stakeholders' rankings of the relative importance of the quality dimensions and attributes? The EDB studies have found an unconvincing result that local employers rank English language proficiency as relatively less important for the sub-degree graduates although Hong Kong has been an international trade city since the British colonized her in 1842. Contradictorily, most employers suggest that sub-degree students are tested on English, Chinese and communication skills before graduation; they are concerned about the ability of local sub-degree graduates in writing and speaking English (Education Bureau 2010a). If they had rated English not as important, why would they have suggested sub-degree students to be tested on English prior to graduation?

A limitation of this study is that the sample size of the employers group is not as large as the studies conducted by the EDB. Requests were made for the EDB data for this study but in vain. This suggests future studies in this area for the employers may be more industry-specific and assistance may be sought from the related trade association.

In Dimension 2, all items of the Chinese language proficiency (Appendix 1, items 1 to 6) and numerical competency (Appendix 1, items 11 and 12) are statistically misfit items. As discussed in previous chapters, misfit items are not necessarily bad items. These misfit items are actually not so bad practically in terms of the mean square errors. If we look at the relative importance rankings of these misfit items, we will find that the rankings among stakeholders for the Chinese language proficiency are very different, and there is no pattern. Items reflecting Chinese language proficiency are ranked all over the places. Four of the six Chinese language proficiency items are DIF items (Appendices 6A & 6B). This reflects the diverse views across stakeholder groups concerning the relative importance of Chinese language proficiency. For example, Employers group has ranked item 1 "Expression of ideas in written Chinese" as the 7th

important item (Appendix 7A), while Tertiary Students group has ranked it the 32nd important item. The two groups view the importance of Chinese very differently. It is not difficult to understand because employers in the HKSAR have to deal with a lot of clients or counterparties from the mainland, while tertiary students handle most college materials in English. The language used in most higher education institutes in the HKSAR is predominately English. Chinese language in higher education in Hong Kong is not as important. Students can complete higher education in Hong Kong without Chinese but not without English. Incidentally, both the Academics and College Administrators and College Graduates groups have ranked "Expression of ideas in written Chinese" as the 27th important. Whether it is ranked as the 27th or 32nd, in the minds of these groups, the item is relatively unimportant.

The implication of this result is that other stakeholder groups, in particular academics and students, need to understand what the employers need. Students have to be aware of that employers require expression of ideas in written Chinese. Accordingly, academics have to incorporate such skills accordingly in academic programs. As a result, students will become more "employ-ability" (Hager and Holland, 2006) so that the problem of educated unemployment (Wan 2011) can be reduced.

For English language proficiency items, all stakeholder groups have ranked them as relatively more important. For numerical competency attributes, stakeholders have given them very low importance rankings. This helps to explain why the average quantitative courses standard is not good. The HKSAR is not alone; low arithmetic standard among college students in the United States (Hersh and Benjamin 2010) and the United Kingdom (Henderson 2011) is a general phenomenon.

Results of this study indicate that employers rank English as more important than Chinese for local graduates. The finding is consistent with the EDB study for local bachelor degree graduates (Education Bureau 2010b) but not for sub-degree holders. This can be due to different work assignments. It is possible that sub-degree graduates are assigned to lower level tasks that do not require too much English.

Employers rank work attitude as the most important aspect of local graduates. This is consistent with the OECD (2001) report. Ironically, there is hardly any local institution that offers a course named "work attitude". Instead, institutes offer internship or practicum programs to equip students with some work experience prior to graduation. Whether work attitude per se is trained or can be trained is unclear. Having work experience does not guarantee positive work attitude.

The implication of this result is that college management should consider offering at least one course that specifically trains students on work attitude. College management will have to develop appropriate assessment rubrics (see Table 5.3) for the course.

Categorizing the attribute items in their respective attribute aspects, a comparison of the top and bottom five rankings among stakeholder groups has been presented in Table 4.18. It is obvious from the survey result that stakeholder groups have different views in the relative importance of different attributes, and this is within reasonable expectation. One size does not and cannot fit all. As the Organization for Co-operation and Economic Development (OCED 2001, p. 100) points out that there is very little agreement on which graduate competencies (attributes) make the difference. However, among the first five most important attributes, they all fall into the three attribute aspects: work attitude, English, and analytical and problem-solving skills.

College graduates and current tertiary students have also ranked the three aspects as the most important. Their selections include all that the other two stakeholder groups have chosen. Employers have missed out analytical and problem-solving abilities, while academics and college administrators have not chosen work attitude in the first five most important attributes. In the interview with employers, they said that they did not expect too much from new graduates. Analytical and problem-solving abilities may not be so important when new graduates first enter the job market. They simply have to follow instructions and get their assigned tasks done. As long as they have the right attitude, most tasks assigned to them can be done. For academics and college administrators, they said that they did not expect much from the graduates either. They claimed that graduates with English language proficiency, and analytical and problem-solving abilities, graduates would be able to handle future studies or work.

The following quotations from students are from Kember (2010, p.176): "I think those courses learned in the first year were unnecessary. It seems that they are not that relevant…..". "This programme is too broad in some sense. We have to work with a wide range of topics or aspects. I think it is necessary to narrow the scope into certain specific streams that we can develop further". Although the quotations from students are rather general, the quotations imply students' discontent of their curricular. Associate degrees in Hong Kong are offered following EDB's guidelines that require about 60 per cent of the programs to be general education courses and 40 per cent disciplinary courses. General education courses include basic and generic skill courses.

It is not surprising to find differences in the relative importance rankings of different skills between Americans and Hong Kong people. Americans view reading comprehension, one of the basic skills (the 3Rs), as the most important skill for the 21st

century. It is of course understandable why Americans do not rank oral English as more important. This study finds, for all groups, expressions of ideas in oral English as more important, then written English. Employers have viewed written English as more important than comprehension of ideas in written and oral English. This is very close to the American result. Academics and college administrators have ranked comprehension in written English as more important than other English skills. This is similar to the ranking of Americans. The difference between Employers group and the Academic and College Administrators group can be due to their different situations and expectations from graduates. Employers may require staff to correspond a lot in written English, while academics require students to do a lot of readings and certainly some writing too.

While there are differences among stakeholder groups' rankings in the relative importance of different attribute groups, among the 20 votes from the 4 stakeholder groups for the top 5 important attributes, English language proficiency items have received 9 votes, analytical and problem-solving abilities items 7 votes, and work attitude items 4 votes. There are more English attribute items that have been ranked more important. Therefore, these items deserve more training. In any case, college students need more training in these top important attribute aspects, and college administrators should give more thoughts in these when they design their program curricular.

The implication of the findings for the second research question is that we cannot have a common solution for all stakeholder groups due to their different views. However, stakeholder groups have to understand one another. Students need to be very clear what they plan to do after graduation. If they need to look for employment, they will have to acquire skills that employers require.

To answer the third research question for the definition of quality education behind stakeholders' rankings of the relative importance of different graduate attributes, the data of this study indicate that quality as fitness for purpose has the most counts (1,483 counts out of a maximum possible of 4,770). It is marginally more than quality as transformation (1.480 out of 4,770). Quality as exception has 965 counts and quality as value for money 922.

Interviewees who have chosen quality as transformation allege that if graduates can reshape, transform themselves applying what they have learned from their college education, they should be able to find jobs. That is fitness for purpose. The first two definitions of quality education have gained about the same votes, much higher than the last two. This is consistent with the findings of Lomas (2001) who has received responses from 108 senior managers of British higher education institutes from the end of 1999 to early 2000. In the study of Loma (2001), British employers have defined quality of higher education as fitness for purpose. This is also consistent with the definition offered by the Quality Assurance Committee of Hong Kong and elsewhere (Holland and Hager 2006).

Interviewees do not expect higher education can or will train local graduates as exceptional people under this massification or post-massification higher education era. Hong Kong theoretically has universal higher education that it provides higher education places to over 60 per cent of the age group, exceeding the 50 per cent threshold to be classified as universal higher education (Kember 2010, Wan 2011). This echoes the views of literatures concerning the possible fall in the or already falling quality of higher education (Brown 2010; Chow 2004; Crumbley, Flinn, and Reichelt 2010; Dill 2005; Education Bureau 2008; Hassim et al 2004; Henderson 2011; Hersh and Benjamin 2010; Hong Kong Lawyer 1997; Li 2010; Lomas 2001; Lui and Suen 2005; Organisation for

Economic Co-operation and Development 2011; Sadler 2009; Tam 1999; U.S. Department of Education 2006; Wan 2011; Wilson 2010; Zhou and Xie 2006).

As the case in Hong Kong, with a huge increase in the post-secondary participation rate over the last decade, the same percentage of students awarded "A" grade under the norm-referenced system means a substantial increase in the absolute number of "A" awarded. The first-year first-degree places were increased from about 2 per cent (less than 2,000 places) of the 17-20-year-old cohort in the 1970s to 18 per cent (more than 14,000 places) in 1994/95 (University Grants Committee 1996) and over 18 per cent with more than 16,000 places in 2009/10 (University Grants Committee 2010b). With this massive expansion in the numbers, students who could have earned lower grades in the former elitism education system can be graded "A" in this universal education era. It is because the same percentage of a much larger student population needs to be graded "A" under the norm-referenced system. Ten percent of "A" in the 1970s means less than 200 As; the same percentage of "A" for 2009/10 means more than 1,600 As, that is more than 80 per cent of the intakes in the 1970s. Students, who could have failed a course, now pass it because they are relatively better than the others. The bottom 20 per cent of students in the 1970s could have been curved to become B students on today's standard.

A recent grade change case went public at a local tertiary institute (Hong Kong Professional Teachers' Union 2012). The instructor had graded a substantial percentage of the class failed, but grades were administratively changed to pass without the instructor's consent. Quality or quality assurance in higher education is at a crossroad. Assessing, assuring and improving education quality have gained increasing concern and attention from the general public.

To tackle this problem, higher education institutions and academics are moving towards outcomes-based teaching and learning – a paradigm shift in pedagogy from the traditional teacher-centered to student-centered; students are assessed standard-referenced. Instead of what teachers have taught, it is what students have learned. Outcomes-based teaching and learning require a set of pre-determined program and course intended learning outcomes. Each learning outcome must contain measurable items and assessment criteria or standards that provide ground for assessing and grading student performance. By doing so, quality of higher education should at least be maintained, if not improved.

Defining higher education quality as excellence nowadays seems to be out of the context except for world-class top-tier schools. Quality of intakes affects quality of graduates (Harvey and Green 1993; Fornari and Pompili 2010: Lui and Suen 2005; Parri 2006; Tam 1999). Only top-tier colleges are able to admit top students. Average colleges take average students. Interviewees believe that as long as higher education institutions can train students in their language skills, analytical and problem-solving abilities coupled with good attitude, graduates should be able to find jobs. The purpose of higher education is fulfilled. Hager and Holland (2006) link graduate attributes closely with employability. That is quality as fitness for purpose.

While there are differences in the definition of higher education, the rationale behind those choosing "quality as transformation" is employability that is the same as "quality as fitness for purpose". The implication for the finding is that college administrators must consider graduates' employability when the former plans program curricular. They must not bias for "value for money".

The fourth research question concerns suggestions to tertiary education institutes how to maintain and ensure graduate quality with an increasing number of students. There were actually different quality assurance measures in place. To safeguard and promote higher education quality among the publicly-funded institutions for bachelor degree and above programs, the UGC has taken various measures to monitor and ensure higher education quality in Hong Kong such as the management review for the academic year 1998-1999, the teaching and learning quality process reviews for the academic years 1995-1997 and 2001-2003, the performance and role-related funding scheme in 2004 (Quality Assurance Council n.d. p. 5), and established the Quality Assurance Council ("QAC") in April 2007 under the UGC. The QAC has published an audit manual for UGC-funded institutes to follow in ensuring quality.

The QAC advises, promotes and audits quality of higher education in Hong Kong. It defines quality of higher education as "fitness for purpose". In the audit process, QAC checks the quality of institutions with their mission statement. Fitness for purpose in this study is defined in association with employability, which is in a narrower sense but more practical because most, if not all, bachelor degrees are terminal awards. Graduates enter the labor market after graduation. Who is willing to spend four years for a college degree without job prospect at all?

For self-financing, self-accredited sub-degree programs offered by the extension arm of the eight UGC-funded institutions, quality is monitored by the Joint Quality Review Committee (JQRC) organized by the heads of the eight institutions. Therefore, the quality of higher education in Hong Kong should be ensured.

For teaching and learning, interviewees suggest that students can be trained through working on internships, mentoring and youth exchange program, more intensive English training, problem-based and scenario-based case studies, current and international issues to be brought into class discussion. Students should be trained to think logically and realistically and possess the right work attitude. The bottom line is that students should not be spoiled.

For assessment as a crucial part of quality assurance, outcome-based and standard-referencing are suggested. There should be continuous assessment with different tools for a course throughout a semester as well as final examination. Course work continuous assessment serves a formative assessment for learning. Students learn more with feedback and comments on their works from teachers. Final examination serves as a summative assessment of learning. It concludes what students have learned from a course throughout the semester.

As for the intake of students, institutions must not lower the admission requirements. It is a normal practice for institutions to admit some students without meeting the minimum academic requirement with a quota. A typical example is to admit mature students with some years of relevant work experience. To ensure these students to be able to catch up with college work, they should be provided sufficient support to make up the academic deficiency once they are enrolled in a program.

To maintain and improve higher education quality in Hong Kong, we need good quality management system and good gatekeepers. Institutions need to develop a quality culture (Harvey and Green 1993) that involves everyone, including academic and non-academic staff, in the institutions. Aligning with the “lenient entry stringent exit” policy of the

HKSAR Government (Education Bureau 2008, p.58; Education Bureau 2009, p.7), college administrators must attend to the exit requirements and standards. Norm-referenced system that used to work well in the former ivory tower university system no longer works. Harvey and Green (1993) point out that the convention wisdom in an elite system of controlling higher education quality was to control and limit admissions to top quality students. With the substantial increase in a much higher participation rate, only the top tier universities are able to admit the top quality students; others have to admit average or even sub-standard students.

Colleges certainly need to educate students and graduate them. However, teaching professionals and college administrators must not be scared by giving a clear signal to students where they are standing and not giving students a wrong message (Smith and Fleisher 2011). In an interview with an academic, he revealed that in the early years of his career in teaching higher education, he tended to give students higher grades making them happier with the hope in return to get better student evaluations of his teaching. He does not do this anymore. It is true that the easiest and happiest grade to record, or to give students is an "A", if they have earned it. However, student grades must reflect the genuine standards; grades should mean different levels of academic achievement (Sadler 2009).

Some college teachers and administrators worry that tough grading scares students away leading to a high dropout rate and a low application rate. This may be true; Bar, Kadiyali and Zussman (2009) find substantial increase in student enrolment in leniently graded courses. Some college teachers and administrators simply want to avoid troubles such as complaints from students (Maiuri and Leon 2012; Smith and Fleisher 2011), especially when student teacher evaluation is used as a mean to assess teacher's promotion and pay-rise (Kuhn, Warren, Maletta, and Branford 2011; Smith and Fleisher 2011). Adjunct

faculty tends to be more lenient in grading (Smith and Fleisher 2011). Therefore, they always try to curve to pass and graduate students even though some of them have not met the standards. As a matter of fact, the opposite occurs because if students see that the institution is serious about keeping quality, they work harder in their studies. Smith and Fleisher (2011, p. 37) allege that "higher faculty expectations will be echoed in an improvement of student learning outcomes." Curving to pass students to avoid failing sub-standard students will only convey a wrong message to students that they have already met the standard threshold. Graduating sub-standard students contributes partially to another issue – educated unemployment.

Educated unemployment (Wan 2011) occurs when graduate skills do not match labor market required skills. However, "educated" unemployment can also occur when sub-standard students are graduated through lower exit requirements or grade inflation. As a result, these "graduates" are simply not as competent in the up-skilling labor market (OECD 2001) and therefore they are unable to secure jobs. Furthermore, educated unemployment can occur when the supply of graduates increases substantially while in the labor market the demand for graduates does not increase at the same rate. Graduates can fall into the opportunity trap (Brown 2003, 2007, Kariya 2011).

Brown (2003, 2007) points out that mass higher education has led to opportunity trap in developed economies leading to tension between capitalism and democracy. Although this is not a topic included in this study, it is worth to touch-base on it because Hong Kong is having a similar social issue. Opportunity trap occurs when people see the world evolving towards a more knowledge-based economy where more opportunities exist for higher-skilled jobs. People expect to secure these jobs after having attained a higher level of education. They spend the time, money, and effort to get higher academic credentials. However, they are unable to get the kind of jobs they have planned for. Even

worse, without a decent paid job, they are unable to repay the student loan. Gradually a negative sentiment among these unsatisfied graduates develops. The reality is that when everyone gets a college degree, a degree holder does not have the advantage in the job market over the others. But if anyone does not, he/she is in a disadvantageous position. Therefore, people are pressured to work for a college degree.

Educated unemployment and opportunity trap are not new among developed economies with mass or even universal higher education. For example, in the United Kingdom, the unemployment rate for new graduates was 18.9% in the final quarter of 2011 (Office for National Statistics 2012, p.5). Furthermore, graduates taking up lower skilled jobs increased from 26.7 per cent in 2001 to around 35.9 per cent in 2011 (Office for National Statistics 2012, p.1).

While educated unemployment has become a social issue among developed economies and some graduates are willing to take up non-graduate jobs, employers are having difficulty in looking for workers to fill lower skill level jobs especially in food-catering and construction, etc. In Hong Kong, the government helps employers to look for blue-collar or lower-skill workers by organizing different job fairs. Yet, employers have difficulty in getting sufficient people to fill the vacancies. In July 2012, EDB has organized a job fair in two sites with approximately 50 employers offering 2,000 jobs, but there were only 7 applicants (Oriental Daily July 2012). Australia has had similar problem that there is a shortage of blue-collar workers because people prefer to pursue a college degree instead of going for vocational training (Kember 2010). Once people hold a college degree, many of them are reluctant to join the blue-collar workforce that does not require a degree.

In the HKSAR in 2007, sub-degree holders had the highest unemployment rate at 18.55% for the 1980-1989 birth cohorts (Wu 2010). Sub-degree includes associate degree and higher diploma programs. The 1980-1989 birth cohorts are among the first cohorts to attend associate degree programs that began to grow rapidly since the early 2000s. Comparing with the birth cohort of 1970-1979, the unemployment rate for sub-degree holders was 2.88%, the lowest among the four different education attainment levels: lower secondary or below, upper secondary, associate/sub-degree, and college degree or above. There was basically no associate degree program in the HKSAR before the year 2000. Most of the sub-degree programs that the birth cohort of 1970-1979 attended to were diploma, or higher diploma trade skills type of programs. A case perhaps can be made that the unemployment rate of sub-degree holders has increased substantially along with the drastic increase in associate degree graduates since the early 2000s.

Beginning from the academic year 2012/13, bachelor degree programs in Hong Kong will be changed from 3 years to 4 years. This change will lead to an increase of 33% student enrolment, or around 15,000 students, among the 8 UGC-funded universities. The increase in enrolment in this double-cohort year 2012/13 in private, self-financing programs will be enormous with the two cohorts entering the higher education system at the same time. The two cohorts are the HKDSE (Form 6) graduates and the HKALE (Form 7) graduates. Maintaining the quality of higher education becomes a big challenge for academics and college administrators.

There is no doubt that the average years of education among Hong Kong citizens has increased, and the number of degree holders has increased dramatically in the past decade. However, the average quality of local degrees has unavoidably lowered comparing with their counterpart years ago. While the top students remain top quality

graduates, quality of average graduates might have been curved down. This will lead to credential inflation particularly for associate degree holders (Chan 2012). Credential inflation has already occurred in other developed economies such as Japan (Kariya 2011) and Canada (Mclean and Rollwagen 2010). Credential inflation occurs in two ways. First, the same job requires higher education credential. Second, the same education credential gets a lower level job. Entry level clerical jobs in Hong Kong used to take secondary/high school-leavers, but it is very difficult for candidates without a post-secondary qualification to get the same entry level white-collar job. Hong Kong is not alone. As discussed earlier, the number of graduates in the United Kingdom taking up non-graduate jobs is increasing.

There are discontented local graduates who are unable to find jobs. Whether this is directly related to the quality of their education training or their degrees deserve further investigation so that policy-makers will understand the root of the issue and tackle the problem accordingly. Chan (2012) points out that with an increasing top-up degree places for sub-degree graduates, credential inflation may extend to degree holders. It appears that the concerns of academics (Brown 2010; Crumbley, Flinn, and Reichelt 2010; Dill 2005; Henderson 2011; Li 2010; Lomas 2001; Lui and Suen 2005; Sadler 2009; Tam 1999; Wan 2011; Zhou and Xie 2006) about falling higher education quality due to massification are appropriate. We cannot deny that the substantial increase in college degree holders in Hong Kong has decreased the value of a degree.

Hong Kong, as if other developed economies such as Japan, Taiwan, and the United States, is really at a crossroad. The trade-off for more high school-leavers participating in higher education is threatening the quality. It is unethical to limit the higher education places by setting a high admission level. All students wishing to pursue higher education should be given a chance; no child is left behind. Therefore, maintaining and ensuring

higher education quality rely very much on the management of higher education institutes. Academics simply follow the guidelines.

While there is hardly any literature against providing sufficient higher education places to accommodate high school-leavers who wish to pursue further education, massification or universal higher education has diluted the value of a college degree and detriment the social status of graduates (Wan 2011). It also puts the under-privileged, people without a college degree, in a more disadvantageous situation. Graduates are competing non-graduate jobs with workers without a degree. Education is meant to provide more social mobility towards more social equality. However, the expansion of higher education places has not helped to change social inequality (Brown 2003, 2007).

Income distribution has become more uneven in recent years. Income inequality is getting more and more serious in Hong Kong. This is against the original intention of expanding higher education places. It just does not turn out to be what it has been planned. Universal higher education has not worked to reduce income inequality in Japan either (Kariya 2011). Even worse, it has made those without going to college stuck at the lower hierarchy of the social spectrum. Some of their jobs are competed away by graduates. People without a college degree get hit the hardest (Kariya 2011).

The implications from the above discussion are of two levels. At the institution level, to maintain quality of higher education, college administrators have to adopt outcomes-based and criteria-referencing in assessing and grading students. They must be stringent in keeping the exit requirements for graduation. At the government level, policy-makers, not only in Hong Kong but also countries where there is universal higher education, may need to review their higher education policy. Universal higher education may not be a

solution to income inequality and social mobility. Countries need to train sufficient trade-skill workers to work on jobs that do not require a degree. It is not necessary for every worker to hold a degree.

In the HKSAR, the higher education sector consists of the eight UGC-funded institutions offering various levels of degree programs. Other publicly-funded or self-financed institutions offer various degree and sub-degree programs. The 8 UGC-funded institutions admit the top 18 per cent of secondary school-leavers, and the balance goes to mostly self-financed programs. Intakes determine to a certain extend output, graduate quality. The public perceives that graduates from the eight UGC-funded institutes are superior. Furthermore, there are tiers among the eight institutes. The University of Hong Kong, the Chinese University of Hong Kong, and the Hong Kong University of Science and Technology are perceived as the first tier institutions among the eight. Needless to say, qualifications from self-financed programs are considered as inferior to the eight (Kember 2010) because most of the students enrolled in self-financed programs are those unable to obtain a place from the eight due to their lower HKALE (the old system ended in 2012) or HKDSE (the new system began in 2012) results.

There are other issues with the higher education quality in the HKSAR, in particular among self-financed institutes. In a UGC (2009) paper for the Hong Kong Higher Education Review Group, it lists several factors that affect higher education teaching and learning quality. These factors include contract-term teaching staff; faculty members teaching courses outside their specialty areas; publication at times is valued more than teaching; over-reliance of student evaluation on teacher's performance; and over-emphasis on multi-media teaching.

Non-tenure contract-term teaching staff do not have a sense of belonging. They do not have job security either. The turnover of teaching staff among higher education institutes in Hong Kong has been tremendous. This certainly affects teaching and learning quality with new teaching staff in every academic year, in some institutes, every academic term.

Faculty members teaching courses outside their specialized areas are common especially in privately-funded institutions. In order to maintain sufficient full-time faculty members for accreditation purpose, full-time faculty members have to teach a certain amount of hours to have their pays financially justified. Therefore, for institutes without a lot of students, full-time faculty members teach courses outside their areas.

Publication is a factor for different world college and university rankings. To be rated higher, colleges and universities consider publication as a factor for promotion and contract renewal for non-tenure academics. Therefore, academics are pressured to publish. This undoubtedly takes away time from teaching staff thereby affecting the quality of their teaching.

Students' evaluation on teacher performance has been criticized severely among academics (see Chapter 2). Very often, in particular for adjunct faculty and newly recruited teaching staff, they try to accommodate students by making life easier for them, hoping to get a better student evaluation so that they can stay. In a recent discussion with an American educator concerning quality assurance in Hong Kong and the United States, he revealed that he had failed two students and he was at another job six months later. He was however reluctant to confirm any connection between the two incidents.

While e-learning is becoming more popular in education, over-emphasis on multi-media teaching may not be so overwhelming. There are certainly advantages and disadvantages of using the latest technology in teaching and learning. There are online tests, for example, provided by publishers. Students can work on online tests anytime, anywhere. However, there is no guarantee that students work on the tests themselves. What is the implication here for assessment? Faculty members at the same time have to spend time on learning to use different media and different cheating tricks. This can also affect teaching quality.

To ensure credentials not inflated, quality of graduates must be maintained, if not improved. To maintain quality, a set of criteria or standards must be adopted to gauge and assess student achievements. Outcome-based, criteria-referencing must be used to grade and graduate students. Norm-referencing to grade relatively better students and graduate them does not seem to work under the massification or universal higher education era in Hong Kong. Grade inflation harms students but not encourage them to study harder; it does not do any good to students in terms of learning. Students should be assessed and graded what they have learned and achieved, but not whom they have beaten (Kohn 2002).

Conclusion

This study has identified two quality dimensions of local graduates and their respective attributes. Among the nine attribute groups, work attitude, English language proficiency, and analytical and problem-solving abilities are ranked the three most important attribute aspects. Divergence in the relative importance rankings of the attributes among stakeholder groups is inevitable. Same rankings for all attribute items across the four stakeholder groups should not be expected. They are all different individuals. One size does not and cannot fit all. What is important is that college management must

incorporate these attributes in the program curricula. As the need arises, college management should explain to students what employers look for.

With the attributes incorporated into study programs, the next question is how to monitor and ensure students have acquired these attributes at graduation. English language proficiency is relative easy. Local universities and colleges can benchmark the English proficiency level of their students with IELTS (International English Language Testing System) or TOEFL (Test of English as a Foreign Language) that are widely recognized. In particular, in Hong Kong, candidates for government degree post are exempted from the Common Recruitment Exam ("CRE") English test if they have attained a minimum IELTS score of 6.5 or "C" or better in the former HKALE. Local universities either require or encourage graduates to sit for the IELTS.

For Analytical and Problem-solving abilities, it is difficult to benchmark these attributes. As such, clearly defined rubrics must be in place to gauge students' performance in these areas. Table 5.2 lists suggested rubrics to measure analytical and problem-solving abilities applicable to a long case study or a capstone project.

Table 5.2 Rubrics for Analytical and Problem-solving abilities

	Level 4 (A)	Level 3 (B)	Level 2 (C)	Level 1 (D)
Common Sense	Solution made with full consideration of the common values and benefits of stakeholders, and in full compliance with the law	Solution made with some consideration of stakeholders' common values and benefits, and in full compliance with the law	Solution made without consideration of stakeholders' common values and benefits, but in full compliance with the law	Solution made without consideration of stakeholders' common values and benefits, and little consideration of the law

Foresight	Solution includes analysis of all stakeholders' possible reaction and suggests contingency plan	Solution includes analysis of all stakeholders' possible reaction without suggestion of contingency plan	Solution includes analysis of some stakeholders' possible reaction without suggestion of contingency plan	Solution does not consider possible reactions of stakeholders
Analytical mind	Analysis of situation is based on full evidence (data) and relevant theory	Analysis of situation is based either full evidence (data) or relevant theory but not both	Analysis of situation is based on either some evidence (data) or irrelevant theory but not both	Analysis of situation is not based on any evidence (data) nor supported by any theory
Problem-solving ability	Solution is supported by full evidence and relevant theory, and accepted by all stakeholders	Solution is supported by full evidence and relevant theory, and accepted by most stakeholders (over 50%)	Solution is neither supported by full evidence nor relevant theory, but accepted by most stakeholders (over 50%)	Solution is neither supported by full evidence nor relevant theory, and little support by stakeholders (below 50%)
Creativity	Solution is original (or old with added new elements) and accepted by all stakeholders	Solution is original (or old with added new elements) and accepted by most stakeholders	Solution is old with newly added elements and accepted by all or most stakeholders	Solution is old with newly added new elements but not accepted by most stakeholders
Ability to implement solution and act on opportunities for improvement	Implement solution as scheduled and ask for feedback for improvement regularly	Implement solution as scheduled and ask for feedback for improvement when the need arises (e.g. discontent is heard)	Implement solution as scheduled but no feedback for improvement is sought	Neither solution is implement on schedule nor feedback for improvement is sought
Judgment	Decision is based on facts, relevant laws, and values of stakeholders	Decision is based on facts and relevant laws	Decision is based on either facts or relevant laws	Decision is neither based on facts nor relevant laws

A similar rubric table is suggested for Work Attitude as depicted in Table 5.3 as follow.

Table 5.3 Rubrics for Work Attitude

	Level 4 (A)	Level 3 (B)	Level 2 (C)	Level 1 (D)
Sense of responsibility and commitment	Proactively find out details of responsibility, ask for clarification, and find ways to accomplish task	Follow details of responsibility provided, and find ways to accomplish task	Follow details of responsibility provided and follow instructions to accomplish task	Take responsibility given without partial knowledge of the details and follow instructions to accomplish task
Ability to work independently	Work independently without supervision and guidance	Work independently with minimal supervision and guidance	Work independently with a lot of supervision and guidance	Work dependently with continuous coaching by a supervisor
Perseverance	Consistently work towards planned ways to accomplish task. If task is not accomplish per scheduled, proactively find new ways to accomplish task till it is completed	Consistently work towards planned ways to accomplish task till it is completed	Consistently work towards planned ways to accomplish task, but intend to quit if task not completed per schedule	Consistently work towards planned ways to accomplish task, but quit if task not completed per schedule
Initiative and drive	Proactively seek better new ways and work with others to accomplish task	Follow instructions and work with others to accomplish task	Follow instructions or work with others to accomplish task but not both	Neither follow instructions nor work with others to accomplish task
Receptivity and adaptability to new ideas and environment	Adapt to new ideas and environment quickly, ask for clarification wherever in doubt	Adapt to new ideas and environment without asking for clarification even in doubt	Adapt to new ideas and environment with resistance, not ask for clarification even in doubt	Refuse to adapt to new ideas and environment
Professional or business ethics	Follow professional or business ethics for oneself and others in line with common values of the society	Follow professional or business ethics for oneself (but not others) in line with common values of the society	Follow professional or business ethics for others (but not oneself) in line with the common values of the society	Does not follow professional or business ethics of the profession

Assessors, whether they are employers or academics, need to review the rubrics regularly to ensure the descriptors appropriately measure the concerned attributes. As the higher education world is moving towards outcomes-based (or criteria-based) assessment, academics need to carefully assess, grade, and monitor student performance based on the pre-designed rubrics.

Although there is no consensus in the definition of quality higher education, it appears that most respondents believe the ultimate purpose of higher education is employment – fitness for purpose. The differences in the quality higher education definitions can be due to their different concerns. Employers concern about if graduates can produce; if the productivity of graduates can justify the salary that employers pay. Academics and college administrators concern about if students can handle college work, graduate on time, and find a job after graduation. College graduates are mostly working. They concern about their career development. Tertiary students are still at school. Their biggest concern is that if they will graduate on time. Therefore, it is reasonable to expect stakeholder groups take different perspectives in the definition of higher education quality.

There are three interesting things found in this study. First, work attitude is ranked very important among other attribute groups. However, there is hardly any, if any, college or university that offers a course teaching students work attitude. Second, it is surprising to find that technical and discipline-specific knowledge is relatively less important, but it is consistent with the findings of the OECD (2001). Program designers will really have to revisit their current program structures, whether some discipline-specific course(s) should be removed from the program. Third, at the government policy level, universal higher education is meant to increase social mobility and reduce income inequality. However, it does not seem to work.

The findings in this study are by no means conclusive and terminal. Future research in quality graduate attributes can be industry-specific for higher education programs meant to train labor force for a knowledge-based economy such as the HKSAR and other countries as well. Apparently attributes required for business graduates are different from computer graduates; literature graduates are different from natural science graduates.

Industry-specific data can be collected with the assistance of associations of different industries. For example, if attributes of accounting graduates are needed, researcher can seek assistance from the Hong Kong Institute of Certified Public Accountants for data from its members; tourism graduate attributes from the Travel Industry Council of Hong Kong; retail graduate attributes from the Retail Management Association of Hong Kong; just to name a few. Research findings should be given to these associations and their members for reference.

Policy-makers and college administrators, not only in Hong Kong but also other countries especially other Asian countries (region) such as Singapore, Malaysia, Korea, and Taiwan that have a lot of similarities with Hong Kong, will need to continuously investigate through stakeholders attributes to quality higher education as the world evolves towards a more knowledge-based, more competitive global village. Policy-makers of colleges and universities should infuse the attributes in academic programs, set clear learning outcomes, and assess them with standards. No qualified child should be left behind; no sub-standard students should be graduated. Exit requirements have to be kept and monitored closely for each graduate. As Smith (2011, p. 6) points out for the United States that "quality-assured mass higher education is the norm". This is equally applicable to the situation of the HKSAR.

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Appendix 1: The 9 Skill Aspects and 45 Attributes

(reproduced from Education Bureau 2010, Table 2.4)

ATTRIBUTES

A. CHINESE LANGUAGE PROFICIENCY

Expression of ideas in

1 Written Chinese
2 Cantonese
3 Putonghua

Comprehension in

4 Written Chinese
5 Cantonese
6 Putonghua

B. ENGLISH LANGUAGE PROFICIENCY

Expression of ideas in

7 Written English
8 Oral English

Comprehension in

9 Written English
10 Oral English

C. NUMERICAL COMPETENCY

11 Comprehension of data
12 Application of data

D. INFORMATION TECHNOLOGY LITERACY

13 Use of standard computer software
14 Adaptability to new software
15 Ability to make use of the Internet & Intranet to facilitate work & business
16 Locate, gather & organize information using appropriate technology and information systems

E. ANALYTICAL AND PROBLEM-SOLVING ABILITIES

17 Common Sense
18 Foresight
19 Analytical mind
20 Problem-solving ability
21 Creativity
22 Ability to implement solution and act on opportunities for improvement
23 Judgment

ATTRIBUTES

F. WORK ATTITUDE

24 Sense of responsibility and commitment
25 Ability to work independently
26 Perseverance
27 Initiative and drive
28 Receptivity and adaptability to new ideas and environment
29 Professional/business ethics

G. INTER-PERSONAL SKILLS

30 Inter-personal relationship
31 Team work
32 Negotiation and communication skills
33 Able to accept and provide feedback in a constructive and considerate manner
34 Able to manage and resolve conflict when appropriate

H. MANAGEMENT SKILLS

35 Organization of work
36 Management of staff
37 Leadership
38 Able to motivate team-members
39 Management of available resources and ability to seek resources and assistance

I. TECHNICAL SKILLS REQUIRED FOR THE JOB

40 Technical knowledge
41 Ability to handle technical demands in work
42 Ability to solve technical problems
43 Ability to select and use appropriate tools and technology for a task or project
44 Able to work to agreed quality standards and specification
45 Aware of occupational health and safety practices and procedures, and act in accordance with these
46 Relevant work experience gained as part of the study program

Appendix 2: The 4 Skill Domains and 44 Attributes

(reproduced from Shah and Chenicheri, 2011)

	A. The Personal Abilities of Graduates
1	Being willing to face and learn from errors and listen openly to feedback
2	Understanding personal strengths & limitations
3	Being confident to take calculated risks and take on new projects
4	Being able to remain calm under pressure or when things go wrong
5	Having the ability to defer judgement and not to jump in too quickly to resolve a problem
6	A willingness to persevere when things are not working out as anticipated
7	Wanting to produce as good a job as possible
8	Being willing to take responsibility for projects, including how they turn out
9	Having an ability to make a hard decision
10	A willingness to pitch in and undertake menial tasks when needed
11	Having a sense of humour and being able to keep work in perspective
12	A commitment to ethical practice
13	A commitment to sustainable practice
14	Being flexible and adaptable
	B. The Interpersonal Abilities of Graduates
15	The ability to empathise with and work productively with people from a wide range of backgrounds
16	A willingness to listen to different points of view before coming to a decision
17	Being able to develop and use networks of colleagues to help solve key workplace problems
18	Understanding how the different groups that make up the organization operate and how much influence they
19	Being able to work with senior staff without being intimidated
20	Being able to give constructive feedback to work colleagues and others without engaging in personal blame
21	Being able to motivate others to achieve great things
22	Being able to develop and contribute positively to team-based projects
23	Having an international perspective
	C. The Intellectual Abilities of Graduates
24	Knowing that there is never a fixed set of steps for solving workplace problems or carrying out a project
25	Being able to identify from a mass of detail the core issue in any situation
26	The ability to use previous experience to figure out what is going on when a current situation takes an
27	Being able to diagnose what is really causing a problem and then to test this out in action
28	An ability to trace out and assess the consequences of alternative courses of action and, from this, pick the
29	Being able to readjust a plan of action in the light of what happens as it is implemented
30	Being able to see how apparently unconnected activities are linked and make up an overall picture
31	Being able to set and justify priorities
32	An ability to recognize patterns in a complex situation
33	Being an independent thinker
34	Being creative and enterprising
	D. Generic and Specific Skills & Knowledge of Graduates
35	Having a high level of current technical expertise relevant to current work requirement
36	Understanding the role of risk management and litigation in current professional work
37	Understanding how organizations operate
38	Being able to use IT effectively to communicate and perform key work functions
39	Being able to manage ongoing professional learning and development
40	An ability to chair and participate constructively in meetings
41	Being able to communicate effectively
42	Knowing how to manage projects into successful implementation
43	An ability to help others learn in the workplace
44	Being able to organize work and manage time effectively

Appendix 3: Survey Questionnaire

(Modified from Questionnaire used by the Education Bureau (2010))

SURVEY ON OPINIONS ON MAJOR ASPECTS OF GRADUATE QUALITY

(本地大學畢業生特性質量意見調查)

I am conducting a study in stakeholders' opinion on the relative importance of quality attributes that Hong Kong graduates should possess. The result will provide an insight to higher education institutes what should be included in their curricula to nurture higher quality graduates.

本人正進行一項對香港本地大學畢業生應具備品質特性的相對重要性的意見研究。研究結果將提供高等教育機構參考, 應在其課程中包括甚麼品質特性來培育更高質量的畢業生。

Part I: Please indicate your views on the relative importance of the skills and knowledge for local graduates of tertiary institutions by circling the box on a 5-point scale with reference to the qualitative distinctively meaning on the right hand side of the following table (請依照以下對每質量選項的描述，選擇你認爲每一特性對香港大學畢業生的相對重要性) .

Very Important (非常重要) (5)		The attribute must be included in the study program and taught separately as a compulsory course. Students must be examined in the attribute and pass it to graduate. (此特性項目必須被包括在課程之內，並且作爲一獨立必修學科，學生必須通過考試合格，才可以畢業).
Quite Important (頗重要) (4)		The attribute must be included in the study program, and it can be embedded in different courses. Students must be taught the attribute, but it may not be examined to graduate. (此特性項目必須被包括在課程之內，但是可以放在任何科目之內，學生必須學習這特性項目，但不必要通過考試合格才可畢業).
Neutral (一般) (3)		It does not make any difference to graduates with or without learned the attribute. (這特性項目對大學畢業生的質素沒有影響).

Not Quite Important (不太重要) (2)		The attribute may be included in the curriculum, but it does not improve the quality of graduates. (這特性項目或許可以被包括在課程之內，但是這特性項目不會改善大學畢業生的質素).
Not Important At All (完全不重要) (1)		The attribute does not contribute to the quality of graduates. It can be removed from study program. (這特性項目不會改善大學畢業生的質素,可以將它從課程內移除) .

ATTRIBUTES (特性)

A. CHINESE LANGUAGE PROFICIENCY (中國語文熟練程度)

Expression of ideas in (表達主意／意見能力)

1	Written Chinese (中文書寫能力)	5	4	3	2	1
2	Cantonese (oral) (廣東話口語能力)	5	4	3	2	1
3	Putonghua (oral) (普通話口語能力)	5	4	3	2	1

Comprehension in (理解能力)

4	Written Chinese (中文書寫閱讀理解能力)	5	4	3	2	1
5	Cantonese (oral) (聽廣東話口語理解能力)	5	4	3	2	1
6	Putonghua (oral) (聽普通話口語理解能力)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

B. ENGLISH LANGUAGE PROFICIENCY(英國語文熟練程度)

Expression of ideas in (表達主意／意見能力)

7	Written English (英文書寫能力)	5	4	3	2	1
8	Oral English (英文口語能力)	5	4	3	2	1

Comprehension in (理解能力)

9	Written English (英文書寫閱讀理解能力)	5	4	3	2	1
10	Oral English (聽英文口語理解能力)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

C. NUMERICAL COMPETENCY (運用數字的能力)

11	Comprehension of data (對數據的理解)	5	4	3	2	1
12	Application of data (對數據的應用)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact

on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

D. INFORMATION TECHNOLOGY LITERACY (資訊科技的認識)

13	Use of standard computer software (使用標準的電腦軟件)	5	4	3	2	1
14	Adaptability to new software (對新電腦軟件的適應能力)	5	4	3	2	1
15	Ability to make use of the Internet & Intranet to facilitate work & business (使用互聯網和內聯網去促進工作和業務的能力)	5	4	3	2	1
16	Locate, gather & organize information using appropriate technology and information systems (使用適當的科技和資訊系統來找出，整合和組織資料)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

E. ANALYTICAL AND PROBLEM-SOLVING ABILITIES (分析和解決問題的能力)

17	Common Sense (普通常識)	5	4	3	2	1

18	Foresight (前瞻能力)	5	4	3	2	1
19	Analytical mind (分析思維)	5	4	3	2	1
20	Problem-solving ability (解決問題的能力)	5	4	3	2	1
21	Creativity (創意)	5	4	3	2	1
22	Ability to implement solution and act on opportunities for improvement (執行解決問題方法和掌握改良機會的能力)	5	4	3	2	1
23	Judgment (判斷能力)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

F. WORK ATTITUDE (工作態度)

24	Sense of responsibility and commitment (對工作的責任感和承諾/投入）	5	4	3	2	1
25	Ability to work independently (獨立工作的能力)	5	4	3	2	1
26	Perseverance (對工作的堅持不懈)	5	4	3	2	1
27	Initiative and drive (對工作的主動性和驅動力)	5	4	3	2	1
28	Receptivity and adaptability to new ideas and environment (對新思維和環境的接收和適應能力)	5	4	3	2	1
29	Professional/business ethics (專業和業務道德操守)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以

下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

G. INTER-PERSONAL SKILLS (人與人之間的溝通技巧)

30	Inter-personal relationship (人際關係)	5	4	3	2	1
31	Team work (團隊精神)	5	4	3	2	1
32	Negotiation and communication skills including presentation skills (談判和溝通技巧包括表達技巧)	5	4	3	2	1
33	Able to accept and provide feedback in a constructive and considerate manner (有建設性和體諒地接受和提供意見)	5	4	3	2	1
34	Able to manage and resolve conflict when appropriate (擁有恰當地處理和解決衝突的能力)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

H. MANAGEMENT SKILLS (管理技巧)

35	Organization of work (組織工作)	5	4	3	2	1
36	Management of staff (管理員工)	5	4	3	2	1
37	Leadership (領導才能)	5	4	3	2	1
38	Able to motivate team-members (推動隊友的能力)	5	4	3	2	1
39	Management of available resources and ability to seek resources and assistance (管理現成資源，尋找資源和尋找協助的能力)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

I. TECHNICAL SKILLS OR MAJOR SUBJECT(S) KNOWLEDGE REQUIRED FOR THE JOB (工作要求的專業技術或主修學科的知識)

40	Technical or major subject(s) knowledge (專業或主修學科的知識)	5	4	3	2	1
41	Ability to handle technical demands in work (在工作上處理專業需求的能力)	5	4	3	2	1
42	Ability to solve technical problems (解決專業問題的能力)	5	4	3	2	1
43	Ability to select and use appropriate tools and technology for a task or project (擁有選擇和使用恰當的工具或科技來應付特別工作的能力)	5	4	3	2	1

44	Able to work to agreed quality standards and specification (能夠根據協定的品質標準和詳情來工作)	5	4	3	2	1
45	Aware of occupational health and safety practices and procedures, and act in accordance with these (對工業健康及安全有認知，並根據其程序做事)	5	4	3	2	1
46	Relevant work experience gained as part of the study program (在學其間已取得相關工作經驗)	5	4	3	2	1

Which of the following reasons did you find the most important when you rated the above items (check one only)? 在你選擇以上選項時，你是根據以下那一個原因？

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

Part II: Information of the Respondent (回答人的個人資料)

Please put a tick in the appropriate box:

1. Have you answered this questionnaire as a(an) (你以以下的那一身份回答這問卷調查) ?
   - □ Tertiary Student (專上學院／大學學生)
   - □ College Graduate (大學畢業生)
   - □ Academic (專上學院／大學教師)
   - □ College Administrator (專上學院／大學行政人員)
   - □ Employer/Recruiter (僱主／主管級，人事部負責招聘員工的僱員)

2. Your gender (性別):
   □ Male (男) □ Female (女)

3. Your age (年齡):

□ 25 and below (25 歲 或以下) □ 26 – 35 (26 歲至 35 歲)
□ 36 – 45 (36 歲至 45 歲) □ 46 – 55 (46 歲至 55 歲)
□ 56 – 65 (56 歲至 65 歲) □ 66 and above(66 歲 或以上)

4. Your education (教育程度) :
   □ Form 5 or equivalent (中五或同等學歷)
   □ Form 7 or equivalent (中七或同等學歷)
   □ Associate Degree/Higher Diploma or equivalent (副學士/高級文憑或同等學歷)
   □ Bachelor's Degree (學士學位)
   □ Post graduate Diploma (學士學位后文憑)
   □ Master's Degree (碩士學位)
   □ Doctorate Degree (博士學位)

5. If you have chosen as an employer/recruiter in Question 1, which industry are you in? Otherwise, skip this question. (假如你在問題一的選擇是僱主／主管級，人事部負責招聘員工的僱員，你屬於那行業? 否則不用填寫.)
   Please specify (請註明行業): _____

6. Will you be willing to attend an interview with the researcher to discuss the possible fall in the graduate quality due to substantial increase in the number of students? (你是否願意出席參與由這研究員安排的一個關於大學畢業生的質素有可能下降問題的訪問/面談?)
   □ Yes. Please provide contact details. You will be contacted within two months to set up a mutually convenient time for the interview (是！請提供聯繫詳情。我們將會在二個月內與你聯絡安排有關訪問/面談).
   Name in Full (姓名，請全寫): _____
   Phone Number (電話號碼):_____
   □ No (否)

- End of Questionnaire. Thank you! –
- 問卷調查完成. 謝謝! -

Appendix 4: Interview Invitation

Dear Friends and Colleagues,

In late 2011 or early 2012, you have filled in for my research a questionnaire concerning quality attributes of local graduates. I must thank you for your time to fill in it. More importantly, you have indicated your willingness to attend a personal interview to discuss further the issue. I understand that I have indicated in the questionnaire that you would be in touch within two months for such interview. I apologize for the delay of the interview. To save your time, I have enclosed some questions for you if you can spend your valuable time to answer them and return via this email. I definitely will be glad to meet up with you and discuss in more depth about quality attributes of our graduates, as well as how to ensure and maintain their quality.

Please help to answer the following questions:

1. Are you (a) a tertiary student; (b) a college graduate; (c) an academic or a college administrator; (d) an employer?

2. In your view how can tertiary institutes maintain and ensure graduate quality with an increasing number of students?

3. Which of the quality dimensions and attributes do you think the most important to our graduates and why do you think so?

Dimension 2 (Basic Skills) includes the following 4 attributes	Dimension 1 (Personal quality and subject knowledge) includes the following 5 attributes
Chinese Language Proficiency (中國語文熟練程度)	Analytical and Problem-solving abilities (分析和解決問題的能力)
English Language Proficiency (英國語文熟練程度)	Work Attitude (工作態度)
Numerical competency /Mathematics (運用數字的能力)	Inter-personal Skills (人與人之間的溝通技巧)
Information Technology Literacy (資訊科技的認識)	Management Skills (管理技巧)
	Technical Skills or Major Subject(s) knowledge required for the job (工作要求的專業技術或主修學科的知識)

When you answer which of the dimensions (Dimension 1 or Dimension 2) is more important, your answer is based on:

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

When you answer which of the nine attributes is the most important, your answer is based on:

☐ It could make the graduates smarter, better, and outstanding regardless of its impact on employability (這特性能令大學畢業生更醒目，更好，更突出，姑勿論其對就業有沒有幫助).

☐ It could improve the overall quality of graduates regardless of its impact on employability (這特性能令大學畢業生的整體質素提升，姑勿論其對就業有沒有幫助).

☐ It could affect the employability of graduates (這特性能影響大學畢業生的就業能力).

☐ Graduates must have learned it regardless of its impact on employability (大學畢業生必須學習這特性，姑勿論其對就業有沒有幫助).

4. What do you suggest to local tertiary education institutions how they can train their students with these dimensions and attributes?

Appendix 5A: Item Fit Statistics (All Groups, All Items)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
1	0.3	1.14	2.16	1.24	3.39
2	0.04	1.32	4.25	1.39	4.87
3	0.29	1.26	3.94	1.26	3.91
4	0.28	1.09	1.4	1.21	2.9
5	-0.29	1.2	2.9	1.2	2.6
6	-0.01	1.14	2.17	1.14	2.12
7	-0.49	1.07	1.03	1.26	3.08
8	-0.75	0.98	-0.34	0.98	-0.24
9	-0.32	1.02	0.26	1.07	0.91
10	-0.47	0.97	-0.47	0.95	-0.67
11	0.34	1.17	2.54	1.19	2.94
12	0.44	1.21	3.14	1.24	3.63
13	0.21	1	0.09	1.02	0.32
14	0.46	1.04	0.66	1.05	0.74
15	0.33	1.04	0.59	1.05	0.75
16	0.29	1	0.08	1.03	0.48
17	-0.34	0.97	-0.52	1.01	0.1
18	0.52	0.88	-1.94	0.88	-2.02
19	-0.36	0.88	-2	0.87	-2.01
20	-0.38	0.86	-2.04	0.86	-1.74
21	0.12	1.02	0.28	1.01	0.23
22	-0.49	0.88	-2.11	0.84	-2.64
23	-0.61	0.81	-3.36	0.77	-3.61
24	-0.76	0.85	-2.47	0.79	-2.66
25	-0.5	0.9	-1.76	0.89	-1.77
26	-0.24	0.84	-2.88	0.8	-3.31
27	-0.05	0.81	-3.31	0.76	-3.88
28	-0.08	0.92	-1.45	0.88	-1.88
29	-0.23	0.97	-0.36	0.93	-0.85
30	-0.34	0.94	-0.85	0.91	-1.36
31	-0.28	0.87	-2.21	0.84	-2.58
32	-0.03	0.89	-1.79	0.86	-2.22
33	0.04	0.91	-1.43	0.88	-1.91
34	-0.11	0.85	-2.49	0.82	-3.02
35	0.13	0.83	-3.03	0.82	-3.13
36	0.43	1.01	0.18	1	0.09
37	0.17	0.95	-0.75	0.95	-0.77
38	0.07	0.95	-0.84	0.93	-1.06
39	0.51	0.9	-1.67	0.88	-2
40	-0.18	1.24	3.48	1.34	4.67
41	0.3	0.95	-0.89	0.94	-0.99
42	0.43	0.99	-0.06	0.99	-0.16
43	0.43	0.95	-0.77	0.94	-0.92
44	0.59	0.96	-0.7	0.96	-0.66
45	0.26	1.16	2.38	1.15	2.34
46	0.35	1.33	4.99	1.36	5.34

Appendix 5B: Item Fit Statistics (Employers Group, Dimension 2)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
1	-0.94	0.84	-0.93	0.82	-0.69
2	0.18	1.17	0.97	1.2	0.83
3	1.31	1.38	2.1	1.33	1.37
4	-0.87	0.76	-1.51	0.75	-1.12
5	0.14	0.9	-0.52	0.93	-0.22
6	1.36	1.25	1.42	1.21	0.93
7	-1.8	0.7	-1.96	0.58	-1.49
8	-1.56	0.66	-2.54	0.6	-1.92
9	-1.6	0.73	-1.93	1.06	0.31
10	-1.56	0.72	-2.06	0.66	-1.59
11	1.09	1.05	0.34	1.04	0.24
12	1.36	0.98	-0.08	0.93	-0.22
13	0.83	1.17	1.03	1.19	0.86
14	0.04	1.2	1.18	1.19	1.1
15	0.92	0.81	-1.14	0.78	-1.07
16	1.11	1.35	1.85	2.32	4.56

Appendix 5C: Item Fit Statistics (Employers Group, Dimension 1)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
17	-0.93	1.08	0.45	1.13	0.45
18	0.54	0.73	-1.74	0.7	-1.63
19	-0.61	0.9	-0.56	0.88	-0.43
20	-0.77	0.95	-0.21	0.97	0.01
21	1	1.03	0.24	1.02	0.18
22	-0.47	1.09	0.59	1.04	0.24
23	-0.5	1.03	0.23	1.06	0.31
24	-1.76	0.98	0	0.84	-0.22
25	-0.04	0.87	-0.75	0.84	-0.65
26	-0.3	0.88	-0.71	0.83	-0.71
27	-0.54	0.8	-1.27	0.75	-1.09
28	-0.32	0.9	-0.61	0.87	-0.59
29	-0.87	1.25	1.25	1.3	0.87
30	-1.15	0.94	-0.39	0.92	-0.3
31	-0.63	0.93	-0.42	0.9	-0.39
32	-0.55	0.86	-0.89	0.83	-0.8
33	-0.54	0.78	-1.42	0.73	-1.19
34	0.37	0.75	-1.6	0.72	-1.48
35	0.27	0.89	-0.57	0.87	-0.61
36	-0.08	0.84	-0.91	0.81	-1.03
37	1.26	0.8	-1.09	0.78	-1.19
38	1.38	0.75	-1.5	0.73	-1.53
39	1.2	0.94	-0.26	0.93	-0.27
40	0.94	1.29	1.56	1.6	2.74
41	-0.3	1.18	0.99	1.15	0.79
42	1.27	1.14	0.86	1.1	0.58
43	1.59	1.11	0.61	1.12	0.66
44	-0.16	1.22	1	1.32	1.32
45	0.39	1.48	2.34	1.47	2.23
46	0.3	1.56	2.81	1.72	3.19

Appendix 5D: Item Fit Statistics

(Academics and College Administrators Group, Dimension 2)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
1	0.09	1.15	0.88	1.11	0.54
2	0.07	1.16	0.89	1.14	0.76
3	0.07	1.06	0.4	1.04	0.27
4	-0.7	1.14	0.71	1.04	0.23
5	0.21	1.26	1.39	1.21	1.09
6	-0.03	0.79	-1.16	0.77	-1.28
7	-1.04	0.62	-1.76	0.46	-1.23
8	-0.52	0.87	-0.73	0.81	-0.79
9	-1.12	0.71	-1.1	0.54	-1.1
10	-0.85	0.89	-0.43	0.81	-0.73
11	1.35	1.16	0.97	1.18	1.01
12	1.59	1.13	0.77	1.11	0.67
13	-0.39	0.85	-0.8	0.83	-0.8
14	0.8	0.83	-0.93	0.82	-1
15	0.17	1.02	0.19	1.14	0.76
16	0.31	1.1	0.58	1	0.05

Appendix 5E: Item Fit Statistics

(Academics and College Administrators Group, Dimension 1)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
17	-0.85	1.14	0.73	1.14	0.58
18	-0.17	0.81	-1.1	0.78	-1.17
19	-1.24	1.01	0.09	0.95	-0.03
20	-1.49	0.95	-0.15	1.04	0.24
21	0.22	1.07	0.42	1.01	0.12
22	0.18	0.89	-0.57	0.85	-0.56
23	-1.23	0.82	-0.82	0.74	-0.75
24	-0.53	0.77	-0.99	0.76	-0.4
25	-0.87	0.85	-0.75	0.85	-0.55
26	0.52	0.8	-1.23	0.76	-1.12
27	-0.75	0.69	-1.77	0.61	-1.51
28	0.67	0.6	-2.71	0.57	-2.33
29	-0.45	1.05	0.3	1.25	0.67
30	-0.85	0.87	-0.83	0.85	-0.6
31	-0.15	0.81	-1.13	0.8	-0.83
32	-0.87	0.73	-1.48	0.71	-1.2
33	0.31	1.09	0.57	1.07	0.36
34	0.26	0.87	-0.73	0.87	-0.54
35	0.7	0.98	-0.08	0.95	-0.16
36	0.54	1.12	0.65	1.1	0.52
37	1.94	1.18	0.96	1.25	1.15
38	2.04	0.96	-0.14	0.93	-0.25
39	1.33	1.03	0.2	0.98	-0.02
40	-0.04	1.44	1.85	1.63	2.22
41	-0.17	0.96	-0.14	0.97	-0.12
42	0.36	1.16	0.85	1.13	0.67
43	-0.16	1.18	0.94	1.14	0.74
44	-0.24	1.02	0.17	1.03	0.23
45	-0.01	1.29	1.48	1.29	1.39
46	0.98	1.35	1.79	1.3	1.49

Appendix 5F: Item Fit Statistics (College Graduates Group, Dimension 2)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
1	-0.04	1.13	0.76	1.06	0.37
2	-0.37	1.07	0.45	1.07	0.39
3	0.35	0.96	-0.18	0.94	-0.29
4	-0.41	0.98	-0.06	0.87	-0.52
5	-0.51	0.92	-0.33	0.89	-0.42
6	0.19	0.86	-0.73	0.8	-1.02
7	-0.3	1.02	0.2	1.21	0.78
8	-0.52	0.9	-0.6	0.78	-0.96
9	-0.43	1.01	0.12	0.91	-0.23
10	-0.45	0.85	-0.82	0.67	-1.23
11	1.05	1.14	0.94	1.13	0.87
12	1.36	1.15	0.98	1.11	0.76
13	-0.28	0.88	-0.51	0.87	-0.64
14	0.77	1.16	0.97	1.2	1.12
15	-0.25	0.96	-0.1	0.98	-0.02
16	-0.15	0.97	-0.11	1.07	0.48

Appendix 5G: Item Fit Statistics (College Graduates Group, Dimension 1)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
17	-0.08	1.4	2.46	1.53	2.26
18	-0.06	0.97	-0.09	0.97	-0.08
19	-0.74	1.06	0.42	1.22	1.07
20	-0.69	0.73	-1.96	0.64	-1.58
21	1.87	1.05	0.39	0.99	-0.02
22	0.33	0.84	-1.07	0.78	-1.2
23	0.03	0.77	-1.63	0.69	-1.49
24	-0.37	0.9	-0.56	0.76	-0.78
25	0.4	0.77	-1.64	0.79	-1.19
26	0.33	0.87	-0.88	0.83	-0.87
27	-0.76	0.78	-1.38	0.72	-1.4
28	-0.5	0.92	-0.49	0.96	-0.18
29	-0.99	1.44	1.84	1.07	0.31
30	-0.18	0.96	-0.21	0.9	-0.45
31	-0.42	0.82	-1.38	0.79	-1.14
32	-0.65	0.93	-0.41	1.14	0.77
33	0.26	0.98	-0.1	0.95	-0.22
34	-0.02	0.92	-0.51	0.86	-0.76
35	0.66	0.85	-0.98	0.81	-1.12
36	-0.01	1.28	1.53	1.27	1.47
37	-0.34	1.1	0.63	1.12	0.71
38	0.25	0.82	-1.11	0.79	-1.26
39	1.24	0.8	-1.18	0.79	-1.17
40	-0.33	1.57	2.88	1.57	2.77
41	-0.46	1.07	0.5	1.04	0.3
42	-0.13	0.97	-0.15	0.98	-0.07
43	0.16	0.89	-0.55	0.9	-0.46
44	0.37	0.89	-0.59	0.89	-0.58
45	-0.15	1.38	2.03	1.34	1.81
46	0.97	1.49	2.57	1.89	4.06

Appendix 5H: Item Fit Statistics (Tertiary Students Group, Dimension 2)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
1	0.26	1.06	0.79	1.06	0.73
2	-0.18	1.23	2.36	1.23	2.39
3	0.3	1.12	1.56	1.12	1.52
4	0.26	0.92	-1.02	0.93	-0.83
5	-0.07	1.01	0.21	0.97	-0.31
6	-0.07	0.98	-0.2	0.97	-0.36
7	-0.45	0.95	-0.54	1.05	0.57
8	-0.8	0.91	-1.06	0.89	-1.03
9	-0.42	0.9	-1.31	0.86	-1.49
10	-0.72	0.87	-1.73	0.85	-1.57
11	0.42	1.06	0.76	1.07	0.93
12	0.47	1.13	1.59	1.15	1.86
13	0.09	0.89	-1.34	0.87	-1.63
14	0.44	0.99	-0.12	0.99	-0.09
15	0.21	0.96	-0.39	0.97	-0.31
16	0.26	0.95	-0.52	0.98	-0.2

Appendix 5I: Item Fit Statistics (Tertiary Students Group, Dimension 1)

ENTRY	MEASURE	IN.MNSQ	IN.ZSTD	OUT.MNSQ	OUT.ZSTD
17	-0.37	1.04	0.54	1.16	1.57
18	0.5	0.98	-0.19	0.97	-0.3
19	-0.58	0.91	-1.24	0.87	-1.38
20	-0.55	0.91	-1.07	0.88	-0.98
21	0.12	1.22	2.7	1.24	2.87
22	-0.47	0.93	-0.89	0.89	-1.19
23	0.53	0.85	-2.28	0.8	-2.23
24	-0.74	0.88	-1.56	0.82	-1.59
25	0.87	0.95	-0.76	1.08	0.88
26	-0.22	0.88	-1.62	0.81	-2.16
27	-0.25	0.83	-2.34	0.77	-2.67
28	-0.23	0.95	-0.7	0.91	-0.93
29	-0.47	0.97	-0.33	0.95	-0.45
30	-0.41	1.05	0.59	1.05	0.55
31	-0.25	0.94	-0.85	0.9	-1.09
32	-0.28	0.89	-1.45	0.83	-1.93
33	0.01	0.84	-1.98	0.81	-2.05
34	-0.17	0.83	-2.23	0.79	-2.38
35	0.24	0.84	-2.11	0.83	-2.09
36	0.24	1.15	1.88	1.17	2.08
37	0.95	1.07	0.97	1.05	0.67
38	-0.02	1.05	0.59	1.02	0.32
39	0.52	0.92	-1.03	0.91	-1.11
40	0.13	1.31	3.7	1.49	4.56
41	0.03	0.96	-0.51	0.95	-0.6
42	0.1	1	0.01	1	0.05
43	0.13	1.06	0.81	1.1	1.3
44	0.36	1	0.09	1.02	0.22
45	0.01	1.18	2.24	1.16	1.91
46	0.28	1.54	6.07	1.62	6.29

Appendix 6A:DIF Measures and DIF Items Between Stakeholder Groups (All Items)

	Stakeholder Groups - DIF Measures				Effect Size between Groups						X^2
Item	1	2	3	4	1 & 2	1 & 3	1 & 4	2 & 3	2 & 4	3 & 4	p-value
1	-0.46	-0.14	0.36	0.46	-0.32	-0.82	-0.92	-0.50	-0.60	-0.10	0.0009*
2	-0.11	0.66	0.27	-0.10	-0.77	-0.38	-0.01	0.39	0.76	0.37	0.0013*
3	0.13	0.18	0.22	0.35	-0.05	-0.09	-0.22	-0.04	-0.17	-0.13	0.6425
4	-0.22	0.02	-0.05	0.45	-0.24	-0.17	-0.67	0.07	-0.43	-0.5	0.0048*
5	-0.29	0.43	-0.25	-0.44	-0.72	-0.04	0.15	0.68	0.87	0.19	0.0012*
6	0.19	0.06	-0.10	-0.04	0.13	0.29	0.23	0.16	0.10	-0.06	0.6796
7	-0.88	-1.24	-0.59	-0.32	0.36	-0.29	-0.56	-0.65	-0.92	-0.27	0.0098*
8	-0.69	-0.51	-0.75	-0.81	-0.18	0.06	0.12	0.24	0.30	0.06	0.7268
9	-0.46	-0.82	-0.55	-0.19	0.36	0.09	-0.27	-0.27	-0.63	-0.36	0.0832
10	-0.53	-0.31	-0.73	-0.44	-0.22	0.20	-0.09	0.42	0.13	-0.29	0.5985
11	-0.05	-0.03	-0.07	0.54	-0.02	0.02	-0.59	0.04	-0.57	-0.61	0.001*
12	0.21	0.23	0.26	0.55	-0.02	-0.05	-0.34	-0.03	-0.32	-0.29	0.1661
13	0.12	-0.08	0.21	0.27	0.20	-0.09	-0.15	-0.29	-0.35	-0.06	0.4814
14	0.52	0.54	0.46	0.43	-0.02	0.06	0.09	0.08	0.11	0.03	0.9435
15	0.29	0.39	0.33	0.33	-0.10	-0.04	-0.04	0.06	0.06	0.00	0.9884
16	0.31	0.29	0.23	0.29	0.02	0.08	0.02	0.06	0.00	-0.06	0.9912
17	-1.06	-0.42	-0.49	-0.20	-0.64	-0.57	-0.86	0.07	-0.22	-0.29	0.0114*
18	0.32	0.59	0.62	0.52	-0.27	-0.30	-0.20	-0.03	0.07	0.10	0.7708
19	-0.40	-0.96	-0.19	-0.30	0.56	-0.21	-0.10	-0.77	-0.66	0.11	0.1183
20	-0.25	-0.67	-0.31	-0.38	0.42	0.06	0.13	-0.36	-0.29	0.07	0.679
21	-0.05	-0.03	0.20	0.15	-0.02	-0.25	-0.20	-0.23	-0.18	0.05	0.673
22	-0.58	-0.60	-0.45	-0.47	0.02	-0.13	-0.11	-0.15	-0.13	0.02	0.9316
23	-0.66	-0.95	-0.56	-0.57	0.29	-0.10	-0.09	-0.39	-0.38	0.01	0.5823
24	-1.48	-1.07	-0.76	-0.63	-0.41	-0.72	-0.85	-0.31	-0.44	-0.13	0.0318*
25	-0.42	-0.42	-0.36	-0.56	0.00	-0.06	0.14	-0.06	0.14	0.20	0.7631
26	-0.33	-0.10	-0.26	-0.24	-0.23	-0.07	-0.09	0.16	0.14	-0.02	0.8987
27	-0.18	-0.05	-0.13	-0.01	-0.13	-0.05	-0.17	0.08	-0.04	-0.12	0.8789
28	-0.08	0.11	0.08	-0.15	-0.19	-0.16	0.07	0.03	0.26	0.23	0.5834
29	-0.55	-0.73	-0.31	-0.12	0.18	-0.24	-0.43	-0.42	-0.61	-0.19	0.0491*
30	-0.58	-0.57	-0.45	-0.24	-0.01	-0.13	-0.34	-0.12	-0.33	-0.21	0.3607
31	-0.28	-0.41	-0.46	-0.22	0.13	0.18	-0.06	0.05	-0.19	-0.24	0.7198
32	0.05	0.02	0.10	-0.08	0.03	-0.05	0.13	-0.08	0.10	0.18	0.8571
33	-0.13	0.41	0.26	-0.04	-0.54	-0.39	-0.09	0.15	0.45	0.30	0.1533
34	0.35	0.19	-0.11	-0.26	0.16	0.46	0.61	0.30	0.45	0.15	0.0483*
35	0.02	-0.02	-0.09	0.22	0.04	0.11	-0.20	0.07	-0.24	-0.31	0.4516
36	0.43	0.55	0.43	0.40	-0.12	0.00	0.03	0.12	0.15	0.03	0.913
37	0.08	0.17	-0.03	0.22	-0.09	0.11	-0.14	0.20	-0.05	-0.25	0.6429
38	0.34	0.36	0.07	-0.04	-0.02	0.27	0.38	0.29	0.40	0.11	0.1601
39	0.86	0.60	0.55	0.42	0.26	0.31	0.44	0.05	0.18	0.13	0.2998
40	0.30	-0.24	0.29	-0.37	0.54	0.01	0.67	-0.53	0.13	0.66	0.0004*
41	0.89	0.69	0.21	0.13	0.20	0.68	0.76	0.48	0.56	0.08	0.0025*
42	1.12	0.88	0.43	0.22	0.24	0.69	0.90	0.45	0.66	0.21	0.0001*
43	0.96	0.46	0.45	0.32	0.5	0.51	0.64	0.01	0.14	0.13	0.0675
44	0.81	0.43	0.84	0.53	0.38	-0.03	0.28	-0.41	-0.10	0.31	0.3275
45	0.70	0.23	0.41	0.15	0.47	0.29	0.55	-0.18	0.08	0.26	0.0447*
46	0.67	0.60	0.45	0.22	0.07	0.22	0.45	0.15	0.38	0.23	0.0403*

*DIF items at the 0.05 significance level
Stakeholder Group 1: Employers
Stakeholder Group 2: Academics and College Administrators
Stakeholder Group 3: College Graduates
Stakeholder Group 4: Tertiary Students

The DIF hypothesis is that all stakeholder groups have ranked the attributes the same. At the 0.05 significance level, the test has identified the following DIF items between groups (effect size) and among groups (chi-square statistic) as follows:

Appendix 6B:DIF Measures and DIF Items Between Stakeholder Groups (Dimension 2)

	Stakeholder Groups				Effect Size between Groups						X^2
Item	1	2	3	4	1 & 2	1 & 3	1 & 4	2 & 3	2 & 4	3 & 4	p-value
1	-0.37	-0.16	0.46	0.43	-0.21	-0.83	-0.8	-0.62	-0.59	0.03	0.0044
2	-0.06	0.67	0.31	-0.23	-0.73	-0.37	0.17	0.36	0.90	0.54	0.0001
3	0.28	0.19	0.28	0.28	0.09	0.00	0.00	-0.09	-0.09	0.00	0.9774
4	-0.12	0.01	0.02	0.42	-0.13	-0.14	-0.54	-0.01	-0.41	-0.40	0.0389
5	-0.23	0.43	-0.25	-0.60	-0.66	0.02	0.37	0.68	1.03	0.35	0.0001
6	0.34	0.05	-0.07	-0.13	0.29	0.41	0.47	0.12	0.18	0.06	0.2101
7	-0.84	-1.35	-0.56	-0.42	0.51	-0.28	-0.42	-0.79	-0.93	-0.14	0.0273
8	-0.61	-0.55	-0.71	-0.94	-0.06	0.10	0.33	0.16	0.39	0.23	0.373
9	-0.38	-0.91	-0.53	-0.29	0.53	0.15	-0.09	-0.38	-0.62	-0.24	0.1838
10	-0.45	-0.35	-0.72	-0.54	-0.10	0.27	0.09	0.37	0.19	-0.18	0.7396
11	0.08	-0.05	-0.05	0.49	0.13	0.13	-0.41	0.00	-0.54	-0.54	0.013
12	0.36	0.23	0.31	0.50	0.13	0.05	-0.14	-0.08	-0.27	-0.19	0.5754
13	0.23	-0.13	0.24	0.16	0.36	-0.01	0.07	-0.37	-0.29	0.08	0.5977
14	0.71	0.59	0.54	0.38	0.12	0.17	0.33	0.05	0.21	0.16	0.4316
15	0.41	0.39	0.34	0.23	0.02	0.07	0.18	0.05	0.16	0.11	0.8038
16	0.44	0.28	0.25	0.21	0.16	0.19	0.23	0.03	0.07	0.04	0.7986

Appendix 6C:DIF Measures and DIF Items Between Stakeholder Groups (Dimension 1)

	Stakeholder Groups				Effect Size between Groups						X^2
Item	1	2	3	4	1 & 2	1 & 3	1 & 4	2 & 3	2 & 4	3 & 4	p-value
17	-1.34	-0.54	-0.66	-0.26	-0.80	-0.68	-1.08	0.12	-0.28	-0.40	0.0013
18	0.32	0.69	0.70	0.68	-0.37	-0.38	-0.36	-0.01	0.01	0.02	0.5667
19	-0.51	-1.03	-0.23	-0.28	0.52	-0.28	-0.23	-0.8	-0.75	0.05	0.0766
20	-0.38	-0.75	-0.41	-0.40	0.37	0.03	0.02	-0.34	-0.35	-0.01	0.7132
21	-0.15	-0.05	0.18	0.21	-0.10	-0.33	-0.36	-0.23	-0.26	-0.03	0.3726
22	-0.67	-0.60	-0.47	-0.43	-0.07	-0.20	-0.24	-0.13	-0.17	-0.04	0.7697
23	-0.78	-1.01	-0.61	-0.57	0.23	-0.17	-0.21	-0.40	-0.44	-0.04	0.4477
24	-1.70	-1.14	-0.84	-0.64	-0.56	-0.86	-1.06	-0.30	-0.50	-0.20	0.0083
25	-0.48	-0.41	-0.37	-0.53	-0.07	-0.11	0.05	-0.04	0.12	0.16	0.9033
26	-0.40	-0.05	-0.27	-0.20	-0.35	-0.13	-0.20	0.22	0.15	-0.07	0.7564
27	-0.26	-0.04	-0.15	0.05	-0.22	-0.11	-0.31	0.11	-0.09	-0.20	0.5886
28	-0.13	0.16	0.10	-0.09	-0.29	-0.23	-0.04	0.06	0.25	0.19	0.67
29	-0.81	-0.90	-0.48	-0.20	0.09	-0.33	-0.61	-0.42	-0.70	-0.28	0.0118
30	-0.84	-0.74	-0.66	-0.34	-0.10	-0.18	-0.50	-0.08	-0.40	-0.32	0.1351
31	-0.35	-0.41	-0.50	-0.17	0.06	0.15	-0.18	0.09	-0.24	-0.33	0.4839
32	0.00	0.04	0.08	-0.03	-0.04	-0.08	0.03	-0.04	0.07	0.11	0.9661
33	-0.22	0.47	0.26	-0.01	-0.69	-0.48	-0.21	0.21	0.48	0.27	0.1401
34	0.33	0.23	-0.12	-0.23	0.10	0.45	0.56	0.35	0.46	0.11	0.0919
35	-0.01	0.02	-0.08	0.35	-0.03	0.07	-0.36	0.10	-0.33	-0.43	0.1786
36	0.41	0.60	0.44	0.49	-0.19	-0.03	-0.08	0.16	0.11	-0.05	0.9283
37	0.00	0.15	-0.10	0.28	-0.15	0.10	-0.28	0.25	-0.13	-0.38	0.2937
38	0.29	0.37	0.01	-0.02	-0.08	0.28	0.31	0.36	0.39	0.03	0.2757
39	0.94	0.70	0.63	0.56	0.24	0.31	0.38	0.07	0.14	0.07	0.5133
40	0.22	-0.31	0.24	-0.43	0.53	-0.02	0.65	-0.55	0.12	0.67	0.0013
41	0.97	0.80	0.23	0.23	0.17	0.74	0.74	0.57	0.57	0.00	0.0050
42	1.21	1.02	0.46	0.31	0.19	0.75	0.90	0.56	0.71	0.15	0.0002
43	1.07	0.55	0.53	0.46	0.52	0.54	0.61	0.02	0.09	0.07	0.1313
44	0.89	0.52	0.95	0.69	0.37	-0.06	0.20	-0.43	-0.17	0.26	0.4774
45	0.70	0.24	0.41	0.19	0.46	0.29	0.51	-0.17	0.05	0.22	0.1197
46	0.70	0.69	0.49	0.31	0.01	0.21	0.39	0.20	0.38	0.18	0.1071

Appendix 7A: Comparative Rankings of All Items, All Groups

Ranking	Overall	Employers	Academics	Graduates	Students
1	24	24	20	20	8
2	8	7	19	29	24
3	23	9	9	27	10
4	25	8	7	19	19
5	7	10	23	8	20
6	22	30	10	31	22
7	10	1	30	5	7
8	20	4	4	10	9
9	19	17	17	32	29
10	17	29	25	9	30
11	30	20	32	24	17
12	9	31	27	28	32
13	5	19	8	4	27
14	31	32	24	41	31
15	26	27	13	2	26
16	29	33	29	7	28
17	40	23	44	30	34
18	34	22	31	13	2
19	28	28	18	15	5
20	27	26	41	17	6
21	32	41	43	40	38
22	6	44	6	16	41
23	2	36	2	34	45
24	33	5	3	42	33
25	38	25	40	23	43
26	21	2	45	37	42
27	35	14	1	1	21
28	37	35	15	18	40
29	13	46	22	45	13
30	45	34	5	33	35
31	4	45	34	36	36
32	3	18	21	43	1
33	16	13	33	22	4
34	1	15	16	26	15
35	41	11	42	6	46
36	15	16	26	38	44
37	11	40	36	25	16
38	46	21	28	44	3
39	36	3	35	3	18
40	42	12	14	35	11
41	43	6	46	14	14
42	12	39	39	46	23
43	14	37	11	39	39
44	39	42	12	11	12
45	18	38	37	12	25
46	44	43	38	21	37

Appendix 7B: Comparative Rankings of Dimension 1 Items, All Groups

Ranking	Employers	Academics	Graduates	Students
30	43	38	21	38
29	38	37	39	37
28	42	39	46	39
27	37	46	35	46
26	39	35	25	35
25	21	28	44	28
24	40	36	26	36
23	18	26	22	26
22	45	42	33	42
21	34	33	38	33
20	46	34	43	34
19	35	21	23	21
18	25	22	36	22
17	36	45	34	45
16	44	40	18	40
15	41	31	17	31
14	26	43	42	43
13	28	41	45	41
12	22	18	30	18
11	23	44	40	44
10	33	29	37	29
9	27	24	24	24
8	32	27	31	27
7	19	30	41	30
6	31	17	28	17
5	20	32	32	32
4	29	25	20	25
3	17	23	19	23
2	30	19	27	19
1	24	20	29	20

Appendix 7C: Comparative Rankings of Dimension 2 Items, All Groups

Ranking	Employers	Academics	Graduates	Students
16	12	12	12	12
15	6	11	11	14
14	3	14	14	11
13	16	16	3	3
12	11	5	6	16
11	15	15	1	4
10	13	1	16	1
9	2	3	15	15
8	5	2	13	13
7	14	6	7	6
6	4	13	2	5
5	1	8	4	2
4	10	4	9	9
3	8	10	10	7
2	9	7	5	10
1	7	9	8	8

Appendix 8: Correlation Matrix

	Chinese	English	Numeric	I.T.	Analytical	Attitude	I.P. Skills	Mgmt Skills	Technical
Chinese	1.000	0.351	0.207	0.310	0.295	0.241	0.256	0.224	0.222
English	0.351	1.000	0.323	0.341	0.338	0.284	0.238	0.236	0.180
Numeric	0.207	0.323	1.000	0.343	0.261	0.168	0.130	0.232	0.237
I.T.	0.310	0.341	0.343	1.000	0.376	0.363	0.364	0.404	0.263
Analytical	0.295	0.338	0.261	0.376	1.000	0.599	0.547	0.540	0.415
Attitude	0.241	0.284	0.168	0.363	0.599	1.000	0.609	0.511	0.437
I.P. Skills	0.256	0.238	0.130	0.364	0.547	0.609	1.000	0.579	0.389
Mgmt Skills	0.224	0.236	0.232	0.404	0.540	0.511	0.579	1.000	0.391
Technical	0.222	0.180	0.237	0.263	0.415	0.437	0.389	0.391	1.000