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Selection and Review of Measurement Item to Study Students' Generic Skills

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This study was carried out to review the GS (generic skills) instruments used for engineering students. A total of 455 respondents were involved in this study. The variables presented in this study were the information management skills, communication skill, team working skill, problem-solving skill, lifelong learning skill, technology utilization skill, critical and creative thinking skill, leadership and personal qualities. Data were analyzed descriptively for reliability (Cronbach Alpha values) and factor analysis using SPSS (Statistical Package for Social Science) 17 software. The results showed that the Cronbach Alpha was reported high and very high which was higher than 0.70. Result of factor analysis showed 10 factors solution. Each item showed a satisfactory loading of more than 0.5. Thus, the questionnaire developed was suitable to be used to study the GS acquired by engineering students in the context of education in Malaysia.

Keywords: GS (generic skills), information management skills, communication skill, team working skill, problem-solving skill, lifelong learning skill, technology utilization skill, factor analysis

Introduction

Human capital development is an effort to achieve cost savings and improve the performance of the industry. According to Schultz (1963), human capital was defined as an essential element for upgrading the performance of the company and employees. Human capital was referred as a process that involves training, education and professional initiatives to improve the knowledge, skills, abilities, values and social assets that will lead to workers' job satisfaction and performance, while improving the performance of the company (Marimuthu, Arokiasamy, & Ismail, 2009). Human capital theory (Schultz, 1963) is essentially a theory of development in macroeconomic discipline. This theoretical approach was used by Becker (1993) in the education system. He commented that there are a variety of capitals including education, computer training and health needs. He referred human capital as the knowledge, expertise and skills acquired by a person through the medium of education and training.

In this era of globalization, industries are competing to comply and be imperishable in the market. The industry that has competent workers has a better opportunity of survival in the global market (Yahya & Abd

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Hair, 2008). The cost of developing the human capital is rising, hence, the employers are expecting that the educational institutions will be able to bring forth graduates who already has the necessary skills and do not need additional trainings from the industrial side. Thus, a graduate with GS (generic skills) stands a better chance to getting a job. The education institutions especially polytechnics should produce more graduates who not only possess technical skills, but also have non-technical skills (GS).

Mayer Committee (1992) defined GS as competencies essential for effective participation in the emerging patterns of work and work organization. They focus on the capacity to apply knowledge and skills in an integrated way in work situations. This characteristic means that the GS are essential not only for participation in work, but also for effective participation in further education and in adult life more generally. The committee established a set of required characteristics for a proposed generic skill to be acceptable as a key competency. The competencies are information management skills, communication, planning and organizing activities, working with others in the group, using mathematical ideas and techniques, problem-solving and using technology.

Model of SCANS (Secretary Commission on Achieving Necessary Skills, 2001) also has been documenting the skills needed by the students. This skill consists of two parts, competence in the workplace and basic skills. Competence at workplace was divided into five elements, namely, resources, interpersonal skills, information, systems and technology. The core skills were divided into three which are basic skills, thinking and personal qualities. Study done by Siti Rahayah, Nur Ashiqin, Rodiah, Ayesha, and Nur Aidah (2011) found nine construct to measure GS among pre-university student. The construct were: (1) social responsibility; (2) ethic and moral; (3) communication; (4) leadership; (5) teamwork; (6) critical thinking and problem-solving; (7) using technology; (8) lifelong learning; and (9) entrepreneurship.

Previous studies show the need for GS in the education system to ensure that graduates are competent and competitive. Based on the GS models and previous studies (Siti Rahayah et al., 2011; Mayer, 1992; Abdullah Sani & Mohd Lazim, 2007; SCANS, 2001; Mohamad Sattar, Md Yusof, Napsiah, Muhammad, & Amnah, 2008; Kamaruddin, 2010), there are 10 elements of the GS that are often seen and studied. The skills are information management skills, basic skills, team work skills, problem-solving skills, lifelong learning skills, technology utilizing skills, entrepreneurship, creative and critical thinking skills, leadership and personal qualities.

Recent research has raised many questions over the principles on which the instruments are founded. The use of existing measures as a means of measuring GS throughout the university students may have been tested with some degree of success, but this may not be the case for other education sector, particularly the technical education. As such, it may be fruitful to continue pursuing the development of a standard measurement scale applicable to technical students. Therefore, this study aimed to validate existing questionnaire using factor analysis that later will be useful in measuring engineering students' GS.

Research Methodology

The study was conducted at the Technical Institution involving students of semester January 2011 session. The sample consisted of 455 students who were randomly selected by systematic sampling based on Krejcie and Morgan (1970), where, for a population of 7,550 people, the number of sample size was 368 people. A total of 600 questionnaires were distributed to the students (students of final semester). A

total of 455 forms were collected. This study used a questionnaire instrument which consists of 55 items (SCANS, 2001; Mohamad Sattar et al., 2008; Kamaruddin, 2010). The researchers used SPSS version 17 for Windows to assist in the data analysis of the variables measured in this study. A principal component factor analysis was used in this study. Factor analysis has been usually known as a statistical technique for data reduction. However, it was also useful in searching for structure among a set of variables. Particularly, the principal component factor analysis provided direct insight into the interrelationships among variables and empirical support for addressing conceptual issues relating to the underlying structure of the data (Hair, Black, Babin, Anderson, & Tatham, 2006). Cronbach Alpha coefficient was used to assess internal consistency of each scale.

Research Findings

Reliability

According to Babbie (1992), the Cronbach Alpha reliability is classified based on the reliability classification index where 0.90-1.00 is very high, 0.70-0.89 is high, 0.30-0.69 is moderate and 0.00-0.30 is low. The analysis results showed that the Cronbach Alpha is higher than 0.70.

Factor Analysis

In this study, factors were extracted by employing EFA (exploratory factor analysis). Objectives of PCA (principal component analysis) is to reduce the number of variables, thus, items were omitted, if they were found to be problematic in factorial complexity, uncorrelated with other variables, one variable factor, and inconsistent in terms of direction (i.e., positive and negative). An EFA was performed through the use of the SPSS version 17.0. In order to increase the interpretability of factors, orthogonal rotation through the varimax method was used. The advantage of the varimax rotational approach is that it tends to be some high loadings which are close to ±1 and some loadings near 0 in each column of the matrix, and this consequently eases our interpretation of factors in the sense that when variable factor correlations are: (1) close to ±1, this indicates a clear positive or negative correlation between the variable and the factor; or (2) close to 0, this indicates a clear lack of association (Hair et al., 2006). Generally, the meaning of a factor is determined by the items, which load most highly on it. As suggested by Hair et al. (2006), factor loadings of ±0.50 or greater are considered practically significant. The larger the absolute size of the factor loading, the more significant loading is in interpreting the factor matrix, and this is because factor loading is the correlation of the item and the factor (Hair et al., 2006).

Factor analysis (see Table 1) was performed using the varimax rotation to confirm the 10 constructs being researched which are the information management skills, basic skills, team working skills, problem-solving skills, life-long learning skills, technology utilizing skill, entrepreneurship, critical and creative thinking skill, leadership and personal qualities. Results showed that ten factor solutions with Eigen values above 1.0. The value of Kaiser-Meyer-Olkin measure of sampling adequacy 0.938 > 0.6 is adequate for inter-correlation, while Barlett Test was significant (Chi square = 11,768.4, $p < 0.05$). The anti-image correlation matrix by the MSA (measure of sampling adequacy) is more than the value of 0.5. Nine items were dropped based on the criteria by Hair et al., (2006), where each item should exceed the value of 0.50. Total variance explained for this loading was 66% and it is sufficient, and according to Hair et al. (2006), the total variance explained must be more than 60%.

Table 1

Factor Analysis

Items	Basic skills	Critical thinking problem solving	Utilizing technology	Lifelong learning	Leaderships	Team working	Information management	Creative thinking	Entrepreneur	Personal qualities	Extraction
CS1	0.653										0.579
CS2	0.602										0.622
CS3	0.684										0.667
CS5	0.575										0.503
CTPS1		0.611									0.607
CTPS2		0.695									0.632
CTPS3		0.761									0.676
CTPS4		0.710									0.678
CTPS5		0.620									0.589
MT1			0.644								0.606
MT2			0.694								0.667
MT3			0.626								0.526
MT4			0.750								0.667
MT5			0.572								0.481
LL1				0.610							0.530
LL2				0.647							0.636
LL4				0.712							0.704
LL5				0.645							0.631
KK1					0.812						0.780
KK2					0.809						0.782
KK3					0.703						0.684
KK4					0.722						0.686
KK5					0.525						0.523
KK6					0.547						0.589
TS1						0.719					0.762
TS2						0.733					0.810
TS3						0.596					0.686
TS5						0.671					0.683
MMM1							0.624				0.654
MMM2							0.689				0.688
MMM3							0.653				0.661
BBK1								0.680			0.666
BBK2								0.625			0.641
BBK4								0.743			0.763
BBK5								0.711			0.732
KU1									0.575		0.521
KU3									0.745		0.628
KU4									0.870		0.812
KU5									0.841		0.786
KU6									0.800		0.731
EM1										0.664	0.659
EM2										0.714	0.711
EM3										0.646	0.576
EM4										0.690	0.677
EM5										0.719	0.663
EM6										0.698	0.620
Total Variances Explained											66%

Conclusions

The results showed that the Cronbach Alpha value classification is high and very high, which was more than 0.70. This instrument had high reliability in accordance with the classification of Babbie (1992), while the factor analysis indicated 10 factors which are information management skills, basic skills, team working skills, problem-solving skills, life-long learning skills, technology utilizing skill, entrepreneurship, critical and creative thinking skill, leadership and personal qualities. Each item shows a satisfactory loading of more than 0.5 (Hair et al., 2006). Thus, the questionnaire developed is suitable to be used to study the GS acquire by engineering students in the context of education in Malaysia.

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