

## Measurement of Facility Management Competencies in Higher Education Institution

Mariah Awang<sup>a,\*</sup>, Abdul Hakim Mohammad<sup>b,\*</sup>, Maimunah Sapri<sup>c,\*</sup>, Mohd Shahril Abdul Rahman<sup>d,\*</sup>, NikMohd Iezuan Bin Nik Lah<sup>e</sup>

<sup>a</sup>Jabatan Pengajian Politeknik, Kementerian Pengajian Tinggi Malaysia

<sup>b</sup>Fakulti Geoinformasi dan Harta Tanah, Universiti Teknologi Malaysia

\*Corresponding authors: <sup>a</sup>mariah4858@gmail.com, <sup>b</sup>abdhakim@utm.my, <sup>c</sup>maimunahsapri@utm.my, <sup>d</sup>shahrilaminshukri27@yahoo.com

### Article history

Received :6 February 2014

Received in revised form :  
24 July 2014

Accepted :9 October 2014

### Graphical abstract

### Abstract

Facility management competency plays an important role in providing conducive facilities for higher education institutions. This study will examine the selection of measurement items for facility management competencies in higher education institution. Variables examined in this study are leadership and management, managing people, understanding business organization, operation and maintenance, managing premises, managing services, managing resources, and managing the working environment. Respondents consisted of 646 individuals who manage the facilities of higher education institutions. Data was analysed by using SPSS version 20 software. Results showed that the stated variables were categorized into five areas of facility management competencies with Eigenvalues above 1.0. The value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy  $0.966 > 0.6$  was adequate for inter-correlation, while Bartlett's Test was significant (Chi Square = 23069.264,  $p < 0.05$ ). Hence, factor analysis was carried out and the results formed five constructs that were able to explain 71.78% of the polytechnic facility management competencies. In terms of reliability, the Cronbach's Alpha value classification was very high, exceeding 0.7. Accordingly, the findings obtained reveal that the instrument can identify facility management competencies required to manage facilities in the polytechnics.

*Keywords:* Facility management, competency, higher education institution, reliability and validity

### Abstrak

Kompetensi pengurusan fasiliti memainkan peranan penting dalam penyediaan fasiliti yang kondusif di sesebuah institusi pengajian tinggi. Kajian ini akan meneliti pemilihan pengukuran item untuk kompetensi pengurusan fasiliti di institusi pengajian tinggi. Pembolehubah yang digunakan untuk kajian ini ialah kepimpinan dan pengurusan, menguruskan sumber manusia, memahami organisasi perniagaan, pengurusan operasi dan penyenggaraan, menguruskan premis, menguruskan perkhidmatan, menguruskan sumber dan menguruskan persekitaran kerja. Responden terdiri daripada 646 individu yang menguruskan fasiliti di institusi pengajian tinggi. Data dianalisis dengan menggunakan perisian SPSS versi 20. Hasil kajian menunjukkan bahawa pembolehubah yang dinyatakan telah dikategorikan kepada lima bidang kompetensi pengurusan fasiliti dengan nilai Eigen melebihi 1.0. Nilai Kaiser-Meyer-Olkin *Measure of Sampling Adequacy* ialah  $0.966 > 0.6$ , adalah mencukupi untuk korelasi, manakala Ujian Bartlett adalah signifikan (Chi Square = 23069,264,  $p < 0.05$ ). Oleh itu, analisis faktor telah dilaksanakan dan hasilnya telah membentuk lima konstruk yang mampu untuk menerangkan 71.78% daripada kompetensi pengurusan fasiliti politeknik. Dari segi kebolehpercayaan, nilai Alfa Cronbach adalah sangat tinggi iaitu melebihi 0.7. Oleh itu, dapatan yang diperolehi menunjukkan bahawa instrumen yang digunakan boleh mengenal pasti kompetensi pengurusan fasiliti yang diperlukan untuk menguruskan fasiliti di politeknik.

*Katakunci:* Pengurusan fasiliti, kompetensi, institusi pengajian tinggi, kebolehpercayaan dan kesahihan

© 2014 Penerbit UTM Press. All rights reserved.

### 1.0 INTRODUCTION

The phenomena of globalization indicate the rapid growth in

industry, business and professional activities in moving towards a global market. This phenomenon has already affected numerous industries across the world and Malaysia is no exception. Among

the sectors involved are economy, education and services. The Malaysian education sector is one of the twelve fields that have been identified as making significant contributions towards the country's economic growth and also as an engine of growth in the country's Economy Transformation Programme. Transformation is a process of metamorphosis in nature and circumstances<sup>1</sup>. The sixth Prime Minister of Malaysia, Dato' Sri Najib Tun Razak, launched a government transformation programme in April 2009. Consequently, the Ministry of Higher Education in general and polytechnics in particular are committed to the government's mainstream transformation so that the dream can be achieved successfully. The Ministry of Higher Education transformation takes into account that the current and future challenges in the short, medium and long term, whether at the national, regional or global level. Higher Education Institutions (HEI) are organizations under the Ministry of Higher Education whose role is to provide a platform towards enhancing the country's competitiveness globally through delivery of education and effective, relevant quality training, and has a strong commitment to lifelong learning<sup>2</sup>. Thus, in line with the National Higher Education Strategic Plan (PSPTN) and the transformation of education and training in the country, the transformation of the polytechnics aims to generate human capital with a first class mentality and to fulfil the market demands. Among the aspects covered are the empowerment policies; improvements in the design process; delivery and programme evaluation; robust curriculum development; quality assurance programmes; the competency of teaching staff, the quality of the students, resources and facilities; a complete and continuous innovation effort.

In achieving the above transformation plan, the higher education institutions, particularly the polytechnics, have targeted three key performance indicators that must be obtained. This performance will be able to give the real picture of the polytechnic organizations' performance. Organizations' performance is closely related to three factors, namely the workers' knowledge, competencies and the way they achieve results<sup>3,4</sup>. Other than that, the polytechnics are also responsible for providing a high competency work force of about 37% in the year 2015. Thus, to achieve this vision, polytechnics have to identify the necessary competencies in facility management to provide a conducive environment. According to<sup>5</sup>, there are three issues relating to the facilities management implemented in Polytechnics, such as the qualification of staff employed under the Department of Polytechnic Education (DPE) and the ability of polytechnics to handle the facilities management scope of works. Firstly, regarding the DPE's staff management division, it is comprised of 7203 members, and unfortunately not even one has a qualification in facilities management<sup>6</sup>. According to<sup>7</sup>, weak maintenance management is due to the incompetence of individuals who are responsible for facility management. Secondly, the result of assessment of the facilities provided at Premier Polytechnic Johor Bahru shows that the level of facilities management is still below par and most students are still not satisfied with the facilities provided<sup>8-10</sup>. This issue needs to be considered because teaching facilities can influence learning behaviour in terms of academic performance, learning concentration, conducive classrooms and goal achievement<sup>11-14</sup>. Finally, there is the issue of increment in terms of numbers of polytechnics (to date, thirty polytechnics have operated in Malaysia in the last four decades) and also students' enrolment, which exceeded 89,000 in 2011 compared to only 262 in 1969<sup>6</sup>. The rapid development of polytechnics and the increasing student numbers indirectly indicate that polytechnic facilities need to be upgraded too. Additional facilities are needed and the

construction of new buildings, increasing size and renovation of facilities need to be carried out<sup>15-18</sup>. As an organizations that focus on customer service, Higher Education Institutions (HEIs) should take into account the facilities required by customers to ensure their comfort<sup>19</sup>. The function of HEIs can only be adequately performed when all the necessary resources - human, physical and financial - are made available<sup>20</sup>. In respect of the performance of educational facilities, the organization should provide a situation that is conducive to good work to improve the quality of learning outcomes<sup>14</sup>.

Therefore, to produce such a situation, individuals should have the competence to manage the facilities required for them to do the work so as to achieve the desired performance<sup>21-23</sup>. Facility management involves processes, places and human beings. A facilities manager must have competencies to ensure the process, place and human capital are managed effectively. The required competencies vary according to the need that is being managed. According to the various definitions that have been specified, it can be concluded that the relationship between the facility and facilities management is a combination of various activities of employees and work processes that support the operations of an organization. In this regard, the level of sophistication of infrastructure and technology supporting the core functions of the organization and the huge investments in their development suggests strongly that Facility Managers should be professionals, competent and expert in the management of these support facilities<sup>24</sup>. Best *et al.*<sup>25</sup> are also of the opinion that the facilities manager could not be just anybody with modern management skills but needs to be a certified professional who demonstrates a high level of competence in their areas of expertise<sup>25</sup>. Accordingly, research into facility management competencies has been conducted since 1999, and most of the studies published to date have listed the duties of facility managers and the competencies needed in the facilities management from professional bodies. The process of identifying competencies needs to be carried out by an organization that emphasizes excellence in performance because competencies vary from time to time<sup>26</sup> and between specific fields<sup>27</sup>. Other than that, these competencies are also needed by the effective facility management of an organization<sup>2,28-29</sup>. The Malaysian Public Works Minister has also urged in his speech during the Country Asset and Facility Management Convention<sup>30</sup> that these competencies need to be acquired by asset and facility managers, and by maintenance contractors.

Several countries, such as the United Kingdom, the United States and Australia, have recognized professional bodies in facility management. This is because the professional body is also a reference to other countries. The professional body is responsible for providing competency training for individuals who manage the facilities in each country according to the specific time period<sup>31,32,33</sup>. Professional bodies will provide a certificate of eligibility for competencies training attended by facility managers or individuals who manage facilities<sup>31-33</sup>. Consequently, the indirect facilities management industry in the country could be improved over time. However, in Malaysia, the professional body for this industry, which was established in 2003, is still in its infancy and is not performing like the professional bodies in the three states mentioned above. This is because, to date, the Malaysian Association of Facility Management (MAFM) has not set out the competencies needed by a facility manager or individual that manages facilities in Malaysia. Further, it does not play a role in giving competencies training to facility management practitioners, in contrast to the three countries mentioned earlier. To date, there is no empirical research identifying facility management competencies. Hence, this study sets out to identify the facility management competencies that are relevant to the

current growth of industries in Malaysia. This is because the research that has been carried out so far only involves competencies in the education field<sup>34,35</sup>, engineering<sup>77</sup> and human resources<sup>36</sup>. Because of the lack of prior empirical research and in order to ensure that the process of identifying competencies is genuine and of high quality, the questionnaire survey used should have reliability and validity value, so that the data and results obtained will be recognized by all bodies<sup>37</sup>. Hence, the objectives of this article are to ensure that the reliability and validity of the questionnaire is maintained in identifying facility management competencies in polytechnics so that the results obtained from this study will be able to establish a list of the competencies needed by polytechnic facility managers in Higher Education Institutions.

## 2.0 FACILITY MANAGEMENT COMPETENCIES

Uncertainty seen in the UK ten years ago has led to increased interest in the application of the competency framework in the development and selection of expert managers and general managers. Most of the works involved in developing this framework were focused upon the role of facilities managers<sup>29</sup>. Therefore, professional bodies such as the IFMA<sup>31</sup> and the BIFM<sup>32</sup> have adopted the competency framework as a basis for professional accreditation in the field of facility management<sup>26</sup>. These competency areas share some of the same competences: for example, in the field of human resources, communication competence and communication of information arise within the same field. Therefore, Markus and Cameron<sup>38</sup> have specified five areas of facility management competencies that are essential to realize the mission to the organization. Similarly, Clark and Hinxman<sup>26</sup> listed thirteen competencies recommended for

directors and senior managers of the facility, these being issues related to the environment, visionary building design, relevant law, project management, research and analysis, facility management process, real estate portfolio management, risk management, stress management, marketing, monitoring, managing conflict and managing time.

In contrast, Payne<sup>39</sup> suggested four areas that should be prerequisites for professionals involved in facilities management, although he did not specify these areas as competencies. By referring to the literature and the above discussion, it is argued that these fields can be used as a guide for identifying competency requirements for polytechnic facility management. Then, in 2005, a further study listed ten key features for a facilities manager to be used as a reference for facility management competency<sup>40</sup> while the Institute of Higher Education Facilities Management Professionals in the Netherlands has identified nine key competencies for facility managers<sup>41</sup>. Meanwhile, as regards education organizations, Hauptfleisch and Verster<sup>42</sup> identified seventeen Higher Education Facility Management Associations but only four of these are active: the Association of Physical Plant Administrators (APPA)<sup>43</sup> in the United States of America, the Association of University Directors of Estates (AUDE)<sup>57</sup> in the United Kingdom, the Tertiary Education Facilities Management Association (TEFMA)<sup>58</sup> in Australia and the Higher Education Facilities Management Association (HEFMA) in South Africa. Of these four associations, the only one that has indicated a list of core competency areas involved in higher education institutions is APPA, which sets out four areas of core competencies: General Administration and Management, Operations and Maintenance, Planning, Design and Construction and Energy, Utilities and Environment<sup>43</sup>. Table 1 summarizes the competencies identified above.

**Table 1** Facility management competencies from literature and facility management professional bodies

Variable	Competencies	Professional bodies, associations and research institutions											
		IFMA 2010 <sup>31</sup>	BIFM 2010 <sup>32</sup>	FMA Australia 2010 <sup>44</sup>	RICS <sup>45</sup>	HKIFM 2010 <sup>46</sup>	APPA 2010 <sup>43</sup>	Clark and Hinxman 1999 <sup>26</sup>	Payne 2000 <sup>39</sup>	Markus and Cameron 2002 <sup>38</sup>	Atkins and Brooks 2000, 2010 <sup>40</sup>	Marcos Van de Ende, 2000, 2011 <sup>41</sup>	National Research Council 2008 <sup>47</sup>
<b>1</b>	<b>Leadership and Management</b>												
	Leadership and Management	√					√						√
	Managing Change			√					√			√	√
	Professional Practice				√		√	√		√		√	√
	Law				√	√	√	√				√	√
	Real Estate Law					√							
	Manage the assigned personnel to the facility function	√										√	√
<b>2</b>	<b>Organization management</b>												
	Understand the Organization's Structure and Organization Administration		√					√			√		√
	Understand Organizational Aim and Strategy		√		√						√		√

Variable	Competencies	Professional bodies, associations and research institutions											
		IFMA 2010 <sup>31</sup>	BIFM 2010 <sup>32</sup>	FMA Australia 2010 <sup>44</sup>	RICS <sup>45</sup>	HKIFM 2010 <sup>46</sup>	APPA 2010 <sup>43</sup>	Clark and Hinxman 1999 <sup>36</sup>	Payne 2000 <sup>39</sup>	Markus and Cameron 2002 <sup>38</sup>	Atkins and Brooks 2006, 2010 <sup>40</sup>	Marcos Van de Ende, 2000, 2011 <sup>41</sup>	National Research Council 2008 <sup>47</sup>
	Develop FM Strategy in Line with Organizational Strategy	√	√	√	√			√		√	√	√	
<b>3</b>	<b>Human Resource Management</b>												
	Human resource management in facility management work process		√	√	√	√	√			√	√	√	√
	Effective Communication	√	√	√				√				√	√
	Cooperation with suppliers and specialists for matters/work process related to facility management		√		√								
	Workplace Management rapport			√				√	√	√	√		
<b>4</b>	<b>Premises management</b>												
	Management matters on Organizational Property	√	√	√	√	√	√	√					
	Understand building design		√					√	√				√
	Maintenance of building elements (roof, floor, external wall, stairs, etc.)		√	√	√								
	Improve facility performance			√									√
	Workplace management relations				√		√						
<b>5</b>	<b>Service Management</b>												
	Manage building service systems (e.g. drainage, piping, sanitary, safety, electrical system, etc.)	√	√	√	√		√		√	√			√
	Execute the Contract Management works	√	√	√					√				
	Manage support services (e.g. cleaning team, caterer/food supplier, landscaping, etc.)	√	√	√	√					√			
	Project management (includes minor renovation and repair/refurbishment etc.)	√	√	√	√	√	√	√					√
<b>6</b>	<b>Operation and Maintenance management</b>												
	Monitor the procurement, installation, operation, maintenance and	√				√	√		√	√			√

Variable	Competencies	Professional bodies, associations and research institutions											
		IFMA 2010 <sup>31</sup>	BIFM 2010 <sup>32</sup>	FMA Australia 2010 <sup>44</sup>	RICS <sup>45</sup>	HKIFM 2010 <sup>46</sup>	APPA 2010 <sup>43</sup>	Clark and Hinxman 1999 <sup>36</sup>	Payne 2000 <sup>39</sup>	Markus and Cameron 2002 <sup>38</sup>	Atkins and Brooks 2006,2040	Marcos Van de Ende, 2006,31	National Research Council 2008 <sup>47</sup>
	disposal of internal building system												
	Manage the building structure and maintenance of internal permanent fittings	√	√					√	√	√			√
	Monitor the procurement, installation, operation, maintenance and disposal of furniture and equipment.	√						√	√	√			√
	Monitor the procurement, Installation, Operation, maintenance and disposal of exterior building elements	√						√	√	√			√
	Implement operation and maintenance management	√	√					√	√	√			√
<b>7</b>	<b>Work Environment Management</b>												
	Environmental issues (such as recycling, energy saving, etc.)	√	√	√		√	√	√	√	√			√
	Space management		√	√		√	√		√	√			√
	Regard the health, safety and physical safety management in the organization	√				√	√		√	√			√
<b>8</b>	<b>Resource Management</b>												
	Works related to resource procurement		√	√	√								√
	Risk management involved in the work process done		√	√				√		√	√		√
	Financial management in managing organizational resources	√	√	√	√	√	√			√		√	√
	Quality management in managing the organization's resources	√	√					√		√	√		√
	Information management in managing the organization's resources	√	√		√	√							

By referring to Table 1, questions arise as to whether these competencies are appropriate for all higher education institutions around the world. Numerous answers are possible, as some of these competencies are likely to be widely applicable while others

are specific to certain fields. Hence the research in facility management competencies in Malaysian Higher Education Institutions should be viewed more closely. From previous literature<sup>25, 26, 29 40-42, 48, 49, 50-55, ,</sup> facilities management professional bodies<sup>31, 32, 44, 46, 56</sup> and facility management associations of Higher

Education Institutions<sup>43,57,58</sup>, we recommend eight areas of facility management competencies that need to be reviewed in order to realize the polytechnics' transformation plan, which was launched based on a synthesis of all of these sources of information. Subsequently, in light of the necessary competencies for facility management and features that should in place, the competencies required in facilities managements are summarised in Table 2. This table divides the set of competencies into eight areas consisting of thirty-six competencies. The competency areas are leadership and management, understanding the business, human resource management, managing the premises, management services, operations and maintenance, managing the work environment and manage resources.

**Table 2** The eight areas of polytechnic facility management competencies

Variable	Competencies	No. of Items	Sources
<b>1. Leadership and Management</b>		<b>(6)</b>	
	Plan and sort the facility function <sup>26, 31,41, 47</sup>		IFMA, 2010; <sup>26</sup> ; Marcos, 2006; ; National Research Council, 2008
	Characteristics of Leadership and Management <sup>31,43, 47</sup>		IFMA, 2010; APPA, 2010; National Research Council , 2008
	Knowledge in Real Estate Law <sup>46</sup>		HKIFM, 2010
	Knowledge of the relevant law <sup>26,39,41,43, 45, 46, 47</sup>		RICS; HKIFM, 2010; APPA, 2010; Clark & Hinxman, 1999; Payne, 2000; Marcos, 2006; National Research Council , 2008
	Professional practices in the management <sup>39,43, 45, 47</sup>		RICS, 2010; APPA, 2010; Payne, 2000; Atkin & Brooks, 2005; National Research Council , 2008
	Ability to manage change <sup>38,41,44,47</sup>		FMA Australia, 2010; Markus & Cameron, 2002; Marcos, 2006; National Research Council , 2008
<b>2. Understanding Business Organisation</b>		<b>(3)</b>	
	Understand the organization's structure and administration <sup>32</sup>		BIFM, 2010; BIFM, 2010; Atkin & Brooks, 2005; National Research Council , 2008
	Understand organizational aim and strategy <sup>32, 45,47</sup>		BIFM, 2010; RICS, 2010; Atkin & Brooks, 2005; National Research Council , 2008
	Develop FM strategy in line with organizational strategy <sup>26, 31, 32, 41, 44, 45,47</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; RICS; Clark & Hinxman, 1999; Markus & Cameron, 2002; Atkins & Brooks, 2005; Marcos, 2006
<b>3. Managing Human Resources</b>		<b>(5)</b>	
	Human resource management in facility management work process <sup>32, 41, 43, 44, 45, 46,47</sup>		BIFM, 2010; FMA Australia, 2010; RICS; HKIFM, 2010; APPA, 2010; Markus & Cameron, 2002; Atkins & Brooks, 2005; Marcos, 2006; National Research Council , 2008
	Effective communication <sup>31, 32</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010;

Variable	Competencies	No. of Items	Sources
			39,41,43, 44,47
	Cooperation with suppliers and specialists for matters/work processes related to facility management <sup>32, 45</sup>		APPA, 2010; Payne, 2000; Marcos, 2006; National Research Council , 2008
	Logistics management <sup>46</sup>		BIFM, 2010; RICS, 2010; HKIFM, 2010;
	Workplace management rapport <sup>39,41,44</sup>		FMA Australia, 2010; Payne, 2000; Markus & Cameron, 2002; Atkins & Brooks, 2005; Marcos, 2006;
<b>4. Managing Premises</b>		<b>(5)</b>	
	Management of matters of organizational property <sup>26, 31, 32, 43, 44, 45, 46</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; RICS, 2010; HKIFM, 2010; APPA, 2010; Clark & Hinxman, 1999;
	Understand building design <sup>26, 32,43,47</sup>		BIFM, 2010; APPA, 2010; Clark & Hinxman, 1999; National Research Council , 2008
	Maintenance of building elements (roof, floor, external wall, stairs, etc.) <sup>32, 44, 45</sup>		BIFM, 2010; FMA Australia, 2010; RICS;
	Improve facility performance <sup>44,47</sup>		FMA Australia, 2010; National Research Council , 2008
	Workplace management relation <sup>43, 45</sup>		RICS, 2010; APPA, 2010
<b>5. Managing Services</b>		<b>(4)</b>	
	Manage building service systems (e.g. drainage, piping, sanitary, safety, or electrical system, etc.) <sup>31, 32, 39, 43, 44, 45,47</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; RICS; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council , 2008
	Execute the contract management works <sup>46</sup>		HKIFM, 2010; National Research Council , 2008
	Manage support services (e.g. cleaning team, caterer/food supplier, landscaping, etc.) <sup>31, 32, 39, 44</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; Payne, 2000
	Project management (includes minor renovation and repair/refurbishment etc.) <sup>26, 31, 32, 43, 44, 45, 46</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; RICS, 2010; HKIFM, 2010; APPA, 2010; Clark & Hinxman, 1999; National Research Council , 2008
<b>6. Managing the Work Environment</b>		<b>(3)</b>	
	Environmental issues (such as recycling, energy saving, etc.) <sup>26, 31, 32, 39, 43, 44, 46</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; HKIFM, 2010; APPA, 2010; Clark & Hinxman, 1999; Payne, 2000; National

Variable	Competencies	No. of Items	Sources
	Space management <sup>32, 39, 43, 46</sup>		Research Council, 2008 BIFM, 2010; FMA Australia, 2010; HKIFM, 2010; APPA, 2010; Payne, 2000; National Research Council, 2008
	Consideration of the health, safety and physical safety management in the organization <sup>31, 39, 43, 44, 46</sup>		IFMA, 2010; HKIFM, 2010; APPA, 2010; Payne, 2000; National Research Council, 2008
<b>7. Managing Resources</b>		<b>(5)</b>	
	Works related to resource procurement <sup>32, 44, 45</sup>		BIFM, 2010; FMA Australia, 2010; RICS, 2010; National Research Council, 2008
	Risk management involved in the work process undertaken <sup>26, 32, 44</sup>		BIFM, 2010; FMA Australia, 2010; Clark & Hinxman, 1999; Markus & Cameron, 2002; Atkin & Brooks, 2005; National Research Council, 2008 Cameron, 2002; Atkin & Brooks, 2005; National Research Council, 2008
	Financial management of organizational resources <sup>31, 32, 41, 43, 44, 45, 46</sup>		IFMA, 2010; BIFM, 2010; FMA Australia, 2010; RICS, 2010; HKIFM, 2010; APPA, 2010; Markus & Cameron, 2002; Marcos, 2006; National Research Council, 2008
	Quality management of organizational resources		FMA Australia, 2010; BIFM, 2010; Clark & Hinxman, 1999; Markus & Cameron, 2002; Atkin & Brooks, 2005; National Research Council, 2008
	Information management of organization resources		IFMA, 2010; BIFM, 2010; RICS, 2010; HKIFM, 2010
<b>8. Operations and Maintenance</b>		<b>(5)</b>	
	Monitoring the procurement, installation, operation, maintenance and disposal of internal building system <sup>31, 32, 39, 43</sup>		IFMA, 2010; BIFM, 2010; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council, 2008
	Managing the building structure and internal permanent fittings maintenance <sup>31, 39, 43</sup>		IFMA, 2010; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council, 2008
	Monitor the procurement, installation, operation, maintenance and disposal of furniture and equipment <sup>31, 39, 43</sup>		IFMA, 2010; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council, 2008
	Monitor the procurement, installation, operation, maintenance and disposal of exterior building elements <sup>31, 32, 39, 43</sup>		IFMA, 2010; BIFM, 2010; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council, 2008
	Implement operation and maintenance management <sup>31, 39, 43, 46</sup>		IFMA, 2010; HKIFM, 2010; APPA, 2010; Payne, 2000; Markus & Cameron, 2002; National Research Council, 2008

### 3.0 METHODOLOGY

This paper seeks to examine the value in terms of reliability and validity of the facility management competencies questionnaire in Higher Education Institutions, namely polytechnics. This study used qualitative and quantitative approaches. The qualitative approach used expert interviews (individuals with knowledge related to the subject of the study<sup>59</sup> to extract facility management competencies elements in Higher Education Institutions with question developed through a literature review. In this study, seven experts were interviewed, including two associate professors, one consultant personnel, one director of a student innovation centre and three facility managers from the Malaysian Public Works Department, a Higher Education Institution and the Ministry of Higher Education. Prior to the interviews, semi-structured interview questions were developed. In the interview sessions, we discussed the vision, problems, recent industrial status and necessary facility management competencies. Then, we improvised the elements of facility management competencies based on the interviews conducted. Finally, we organized the facility management competencies into clusters, as shown in Table 2. Meanwhile, for the quantitative approach, the data were obtained through a questionnaire. Thus, the information used to measure the facility management competencies elements are taken from the literature and interviews carried out, as mentioned in Table 2.

This questionnaire consisted of two sections, A and B. Section A aimed to collect general information about respondents. Section B aimed to highlight the importance of facility management competencies at the Polytechnic. A six-point Likert scale was used to measure the importance of facility management competencies (1 = Not important at all and 6 = extremely important). Apart from expert opinion, this questionnaire was also tested through a pilot study. For this pilot study, the approach recommended by Hair et al.<sup>76</sup> was used. According to them, a pilot study of more than thirty respondents will not provide significant additional information to be used in the revised instrument. Therefore, a pilot study was conducted in two polytechnics in Malacca and Perak involving twenty and seventeen respondents respectively. The questionnaire was distributed to these individuals via the self-returned envelopes (express mail) posted (by courier) to the top management to be distributed to the relevant respondents. The purpose of the research was explained and all these items were prepared in English and the national language, as those who are responsible for the implementation of the facility management are professional or support workers and come from different educational backgrounds.

Of the thirty-seven questionnaires distributed by mail, twenty-six (70.27%) were returned. Overall, the researchers received few recommendations in terms of ambiguity or non-relevant questions. There were recommendations from two respondents, as shown in Table 3.

**Table 3** Recommendations from Pilot Study

Competencies	Item	Respondents' recommendation
Resource Management	1 and 2	The question should be given a clearer explanation
Human Resource Management	3	

Improvements were made based on feedback to provide a clearer explanation of each item. The other twenty-four respondents did not provide any recommendations, indicating that they were able to accept and understand the questions. To analyse the data from

the survey, SPSS version 20 was used to conduct factor analysis and reliability analysis to answer the research objectives. With regard to the item scores given by the respondents, it is assumed that they have understood the statements given. Based on respondents' demography, they are considered to be experienced and knowledgeable in facility management. What have been discussed can be summarised as follows:

- i) Questionnaires were validated by seven experts in facility management interviews (according to Pranc<sup>60</sup>, for sampling purposes, six experts are enough). Experts were chosen carefully so that the data collected would increase the value of the information gathered<sup>61-63</sup>
- ii) Suggestions and recommendations from experts were made where the authors corrected operation and maintenance competencies elements to the competencies field.
- iii) Then, these questionnaires were used as a pilot study with respondents who have the features of genuine respondents.
- iv) Suggestions and comments from the pilot study were made and improved appropriately and these questionnaires could then be used to collect the actual data.

In short, it can be concluded that these questionnaires are suitable and can be used to collect the actual data for the purpose of this study of polytechnic facility management competencies in Higher Education Institutions in Malaysia.

### 4.0 RESULTS AND DISCUSSION

#### Validity of instrument

Validity of an instrument is where a measure evaluates whether the instrument is measuring what is supposed to be measured<sup>64</sup> and to what extent the instrument is able to gather the data needed for the study conducted<sup>65</sup>. There are three types of validity, namely content validity, predictive validity and construct validity<sup>66</sup>. Content validity relies more on the consumer's opinion or expertise, whereas predictive validity and construct validity emphasize empirical proof that a correlation exists within the variables<sup>66</sup>. In this section, only construct validity will be discussed, as content validity has been discussed in the methodology section.

#### Construct validity

The construct validity will demonstrate to what extent the results obtained (by using the specific management tool, e.g. the questionnaire forms) are in line with the theory or concept built. A measurement tool is said to have construct validity if it is successfully able to measure the theoretical construction that has been designed. This study is an exploratory type: Robert and Clifton<sup>67</sup> stated that exploratory studies potentially involve both theoretical and methodological difficulties, making the interpretation of traditional validity tests problematic. Construct validity can be evaluated by using factor analysis methods such as varimax rotation. The factor analysis will be able to structure the correlation between various variables or items by gathering the variables that contain high correlation in a group (known as a factor) and considering them as one<sup>68</sup>. In order to elaborate on the output or factor analysis results, several statistical indicators will



be evaluated to obtain a suitable structural form. The common indicators used are Kaiser-Meyer-Olkin (KMO) measurements, Bartlett's Test of Sphericity, Eigenvalue, a clear percentage of variance, factor loadings and the number of items representing the factor. The relevant indicators used are as follows:

- a. A KMO value that exceeds 0.7 indicates that the sample is sufficient to conduct factor analysis<sup>69</sup>
- b. A value of  $p < 0.001$  in Bartlett's Test of Sphericity demonstrates that the variables are free and suitable for factor analysis<sup>68</sup>
- c. An Eigenvalue exceeding 1 is significant, indicating that there are several high correlation items in a component<sup>69</sup>
- d. The percentage of variance explained must at least 60% of the total variance<sup>69</sup>
- e. Significant factor loadings must be 0.4 and above (for sample size around 200)<sup>68</sup>. Items that have factor loadings less than 0.4 or have cross-loading will not be maintained.
- f. The number of items that represent a factor must be at least four or five<sup>69</sup>

The results (Table 4) showed that the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy ( $0.966 > 0.7$ ) was adequate for inter-correlation while Bartlett's Test was significant (Chi Square = 23069.264;  $p < 0.001$ ).

**Table 4** Value of KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.966
Bartlett's Test of Sphericity	Approx. Chi-Square	23069.264
	df	630
	Sig.	0.000

Next, to observe the correlation between the free variables, please refer to the Anti-Image Matrices Table. The values observed are the Measure of Sampling Adequacy (MSA). The value of MSA range from 0 to 1 with the following terms:

- a.  $MSA = 1$ , the variables can be predicted without errors to the other variables
- b.  $MSA > 0.5$ , the variables still can be predicted and can be further analysed
- c.  $MSA < 0.5$ , the variables cannot be predicted and cannot be further analysed or taken out of other variables

A summary of the test results is shown in Table 5.

**Table 5** Anti-image Correlation and Measures of Sampling Adequacy (MSA) value

Anti-image Correlation	Measures of Sampling Adequacy (MSA)
Plan and sort the facility's functions	.965 <sup>a</sup>
Manage the personnel assigned to the facility functions	.968 <sup>a</sup>
Acquire knowledge in Real Estate Law	.914 <sup>a</sup>
Acquire knowledge of relevant law	.956 <sup>a</sup>
Professional practices in the management	.965 <sup>a</sup>
Ability to manage change	.964 <sup>a</sup>
Understand the organization's structure and administration	.960 <sup>a</sup>

Anti-image Correlation	Measures of Sampling Adequacy (MSA)
Understand organizational aim and strategy	.939 <sup>a</sup>
Develop FM strategy in line with organizational strategy	.967 <sup>a</sup>
Human resource management in facility management work process	.972 <sup>a</sup>
Effective communication	.961 <sup>a</sup>
Cooperation with suppliers and specialists for matters/work process related to facility management	.979 <sup>a</sup>
Logistic management	.970 <sup>a</sup>
Workplace management rapport	.984 <sup>a</sup>
Management of matters of organizational property	.968 <sup>a</sup>
Understand building design	.950 <sup>a</sup>
Maintenance of building elements (roof, floor, external wall, stairs, etc.)	.967 <sup>a</sup>
Improve facility performance	.969 <sup>a</sup>
Workplace management rapport	.968 <sup>a</sup>
Manage building service systems (e.g. drainage, piping, sanitary, safety, or electrical system, etc.)	.969 <sup>a</sup>
Execute the contract management works	.963 <sup>a</sup>
Manage support services (e.g. cleaning team, caterer/food supplier, landscaping, etc.)	.962 <sup>a</sup>
Project management (includes minor renovation and repair/refurbishment etc.)	.976 <sup>a</sup>
Environmental issues (such as recycling, energy saving, etc.)	.960 <sup>a</sup>
Space management	.962 <sup>a</sup>
Regard the health, safety and physical safety management in the organization	.956 <sup>a</sup>
Works related to resource procurement	.979 <sup>a</sup>
Risk management involved in the work process done	.984 <sup>a</sup>
Financial management of organizational resources	.964 <sup>a</sup>
Quality management of organizational resources	.957 <sup>a</sup>
Information management of the organizational resources	.971 <sup>a</sup>
Monitor the procurement, installation, operation, maintenance and disposal of internal building system	.978 <sup>a</sup>
Manage the building structure and internal permanent fittings maintenance	.976 <sup>a</sup>
Monitor the procurement, installation, operation, maintenance and disposal of furniture and equipment.	.971 <sup>a</sup>
Monitor the procurement, installation, operation, maintenance and disposal of exterior building elements	.959 <sup>a</sup>
Implement operation and maintenance management	.966 <sup>a</sup>

Based on the MSA value results in Table 5, all the free variables can be further analysed because each has a value  $> 0.5$ . The next step is to ensure that the free variables can be gathered into one or several factors. For this process, the Communalities Table has to be used, as principal component analysis works on the initial assumption that all variance is common; therefore, before extraction, the communalities are all 1.000. The communalities in the column labelled 'Extraction' reflect the common variance in the data structure. So, for example, we can say that 56.70% of the variance associated with question 1 is common or shared variance. As shown in Table 6, all the variables have clarification values of more than 50%, so the factor analysis will be determined.

**Table 6** Communalities of Initial and Extraction Value

Competencies	Initial	Extraction
Plan and sort the facility function	1.000	0.567
Manage the assigned personnel to the facility function	1.000	0.699
Acquire knowledge in real estate law	1.000	0.797
Acquire knowledge of relevant law	1.000	0.766
Professional management practices	1.000	0.698
Ability to manage change	1.000	0.671
Understand the organization structure and administration	1.000	0.747
Understand organizational aim and strategy	1.000	0.726
Develop FM strategy in line with organizational strategy	1.000	0.688
Human resource management in facility management work process	1.000	0.684
Effective communication	1.000	0.683
Cooperation with suppliers and specialists for matters/work processes related to facility management	1.000	0.596
Logistic management	1.000	0.614
Workplace management rapport	1.000	0.696
Management of matters of organizational property	1.000	0.678
Understand building design	1.000	0.644
Maintenance of building elements (roof, floor, external wall, stairs, etc.)	1.000	0.736
Improve facility performance	1.000	0.724
Workplace management rapport	1.000	0.627
Manage building service systems (E.g. drainage, piping, sanitary, safety, electrical system, etc.)	1.000	0.749
Execute contract management works	1.000	0.743
Manage support services (e.g. cleaning team, caterer/food supplier, landscaping, etc.)	1.000	0.737
Project management (includes minor renovation and repair/refurbishment etc.)	1.000	0.730
Environmental issues (such as recycling, energy saving, etc.)	1.000	0.699
Space management	1.000	0.696
Regard the health, safety and physical safety management in the organization	1.000	0.762
Works related to resource procurement	1.000	0.703
Risk management involved in the work process done	1.000	0.712
Financial management in managing organizational resources	1.000	0.720
Quality management in managing organizational resources	1.000	0.715
Information management in managing organization resources	1.000	0.636
Monitor the procurement, installation, operation, maintenance and disposal of internal building systems	1.000	0.831
Manage the building structure and internal permanent fittings maintenance	1.000	0.790
Monitor the procurement, installation, operation, maintenance and disposal of furniture and equipment.	1.000	0.864
Monitor the procurement, installation, operation, maintenance and disposal of exterior building elements	1.000	0.841
Implement operation and maintenance management	1.000	0.870

component column that states the number from 1 to 36 represents the total number of free variables. Five components have total initial Eigenvalues more than 1.000. As such, the number of factors obtained from the thirty-six items is five.

**Table 7** Total Variance Explained

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.147	53.187	53.187	9.147	53.187	53.187
2	2.706	7.518	60.705	2.706	7.518	60.705
3	1.644	4.568	65.273	1.644	4.568	65.273
4	1.252	3.478	68.751	1.252	3.478	68.751
5	1.090	3.028	71.778	1.090	3.028	71.778
6	.901	2.504	74.282			
7	.853	2.368	76.650			
8	.792	2.201	78.851			
9	.732	2.034	80.885			
10	.548	1.523	82.408			
11	.487	1.353	83.761			
12	.443	1.232	84.993			
13	.401	1.113	86.106			
14	.364	1.012	87.118			
15	.327	.909	88.026			
16	.310	.862	88.888			
17	.298	.828	89.716			
18	.294	.817	90.533			
19	.289	.802	91.335			
20	.271	.753	92.088			
21	.263	.731	92.819			
22	.244	.678	93.498			
23	.239	.664	94.162			
24	.221	.615	94.777			
25	.215	.598	95.375			
26	.205	.569	95.944			
27	.197	.548	96.492			
28	.181	.504	96.996			
29	.173	.479	97.475			
30	.158	.439	97.914			
31	.150	.417	98.331			
32	.140	.390	98.721			
33	.128	.356	99.078			
34	.125	.346	99.424			
35	.109	.304	99.728			
36	.098	.272	100.000			

In addition, to determine the number of factors formed from the 36 items that were analysed, Table 7 should be consulted. The

The factor analysis was conducted with reference to the indicators discussed earlier. A total of thirty-six items were analysed and none was dropped; five constructs were formed, as shown in Table 8. The end results showed that these five factors were able to explain 71.78% of the variance in the concept of polytechnic facility management competencies. In social science studies, this percentage is considered acceptable<sup>68</sup>. The analysis shows that the first factor contains items from the constructs of Leadership and Management, Management Organization and Human Resource Management. The combination of these three constructs will form one factor, which needs to be given a suitable name. Hence, the first factor, which is comprised of twelve items, is called Leadership in Organization and Human Resources Management. This factor has an Eigenvalue of 19.15 and contributes 53.19% of the variance. The second factor obtained contained item from the Services Management and Premises Management constructs. It was found that, this nine-item factor focused on services issues. Hence, the new name given to this factor must be considered appropriate when considering the stated nine focus items. The new name suggested is Services Management: this factor has an Eigenvalue of 2.71 and contributes 7.52% of the variance. The third factor obtained is the Operation and Maintenance Management factor, which contains five items, has an Eigenvalue of 1.64 and contributes 4.57% of the variance. The fourth factor obtained contains items from the Working Environment and Resources Management construct, so the suggested new name for this factor is Working Environment and Resources Management (taking into consideration the eight focus items below). This factor has an Eigenvalue of 1.25 and contributes 3.48% of the variance. The fifth factor is obtained from the Leadership and Management construct. As the two items in the fifth factor are seen to have a clear focus on the law, it is named Law Management. This factor has an Eigenvalue of 1.09 and contributes 3.03% of the variance.

**Table 8** Factor Analysis

Competencies	1	2	3	4	5
Understand the organization's structure and administration	0.809				
Understand organizational aim and strategy	0.808				
Develop FM Strategy in line with organizational strategy	0.737				
Practice professionalism in management	0.729				
Manage the personnel assigned to the facility function	0.717				
Effective communication	0.716				
Ability to manage changes	0.691				
Human resource management in facility management work process	0.685				
Relationship in working places management	0.667				
Plan and sort the facility's functions	0.608				
Cooperation with suppliers and specialists for matters/work process related to facility management	0.544				
Logistic management	0.501				

Competencies	1	2	3	4	5
Manage building service systems (e.g. drainage, piping, sanitary, safety, electrical system, etc.)		0.716			
Maintenance of building elements (roof, floor, external wall, stairs, etc.)		0.714			
Understand building design		0.684			
Manage support services (e.g. cleaning team, caterer/food supplier, landscaping, etc.)		0.679			
Execute contract management works		0.679			
Project management (includes minor renovation and repair/refurbishment etc.)		0.652			
Implement simple development in workplace management relations		0.63			
Management matters on organizational property		0.627			
Improve facility performance		0.61			
Implement operation and maintenance management			0.799		
Monitor the procurement, installation, operation, maintenance and disposal of furniture and equipment.			0.795		
Monitor the procurement, installation, operation, maintenance and disposal of exterior building elements			0.766		
Monitor the procurement, installation, operation, maintenance and disposal of internal building system			0.746		
Manage the building structure and internal permanent fittings maintenance			0.707		
Regard the health, safety and physical safety management in the organization				0.751	
Space management				0.701	
Environmental issues (such as recycling, energy saving, etc.)				0.677	
Financial management in managing organizational resources				0.647	
Quality management in managing organizational resources				0.614	
Risk management involved in the work process done				0.603	
Information management in managing the organization's resources				0.591	
Works related to resource procurement				0.578	
Acquire knowledge in real estate law					0.825
Acquire knowledge of relevant related					0.729

### Reliability of Instrument

After conducting the factor analysis, a reliability analysis must be carried out<sup>70</sup> to ensure that all the five factors are quality constructs and can be trusted. Reliability of the instrument refers to its ability to produce consistent results<sup>71</sup>. He also stated that reliability refers to whether measurement tools can detect and confirm whether previous studies scored in the same way were true at the time and in different places<sup>74</sup>. Creswell<sup>71</sup> states that the reliability of the instrument refers to whether the instrument can measure what is to be measured accurately. Hence, to measure the levels of reliability and consistency, the Cronbach's Alpha method is used by researchers to test the assumption that each item is considered as an equivalent test and all correlations between the items are the same. Cronbach's Alpha measure of internal consistency reliability, implementing methods recommended by Churchill<sup>72</sup>, is very appropriate to this study, since it only requires a measurement of an instrument<sup>73</sup>.

The closer of Cronbach's Alpha coefficient to 1.0, is the higher the reliability that each item is measuring the same concept. Generally, a reliability value under 0.6 is considered weak, 0.7 is considered acceptable and a value exceeding 0.8 is considered to be good<sup>64</sup>. Nunnally and Bernstein<sup>66</sup> states that it is sufficient to use an instrument that has a reliability value of 0.7. According to Babbie<sup>75</sup>, Cronbach's Alpha values are classified based on the criteria that a reliability index of 0.90-1.00 is very high, 0.70-0.89 is high, 0.30-0.69 is moderate, and 0.00 to 0.30 is low. Based on the reliability analysis conducted, all the five factors had a high reliability index, exceeding 0.7<sup>66</sup>. Factors 1, 2, 3 and 4 had the same Cronbach's Alpha value (0.973), whereas factor five 5 had a Cronbach's Alpha value of 0.974. The results showed that the Cronbach's Alpha for this instrument is classified as very high<sup>64, 66, 75</sup>. We can conclude that this instrument has high reliability, since the Cronbach's Alpha values for all variables are more than 0.7 (Table 9).

**Table 9** Value of Cronbach's Alpha for facility management competencies area

Competencies area	Number of Items	Cronbach's Alpha Value
Leadership in Organization and Human Resources Management	12	0.973
Services Management	10	0.973
Operation and Maintenance Management	5	0.973
Working Environment and Resource Management	8	0.973
Law Management	2	0.974

### 5.0 CONCLUSION

Validity and reliability of an instrument are of vital importance in maintaining the instrument's precision from exposing to any weaknesses. The higher the degree of validity and reliability of the instrument, the more exact and correct the data that will be achieved, with better quality results. For validity tests, the factor analysis indicated five competency factors, namely Leadership in Organization and Human Resources Management, Services Management, Operation and Maintenance Management, Working Environment and Resource Management and Law Management. Each item shows a satisfactory loading of more than 0.5<sup>68</sup>; thus, the questionnaire developed is suitable to be used to study the facility management competencies. For the reliability test, the results showed that the Cronbach Alpha value

classification is very high, exceeding 0.70. This instrument has high reliability in accordance with the classifications<sup>64, 66, 75</sup>. The instrument is also suitable to be used within the context of other educational organizations in Malaysia. Accordingly, to demonstrate that the validity and reliability of the instrument used are consistent, it is proposed that studies of facility management competencies are also carried out in other organizations in Malaysia.

### Acknowledgement

We are grateful for the HLP-KPT scholarship to Author 1.

### References

- [1] *Kamus Dewan Edisi Keempat*. 2005. Kuala Lumpur: Dewan Bahasa dan Pustaka
- [2] *Kamus Dewan Edisi Keempat*. 2005. Kuala Lumpur: Dewan Bahasa dan Pustaka
- [3] Kementerian Pengajian Tinggi. 2007. *Pelan Strategik Pengajian Tinggi*. Kementerian Pengajian Tinggi.
- [4] Rothwell, W. J., and Lindholm, J. E. 1999. Competency Identification, Modelling and Assessment In The USA. *International Journal Of Training And Development*. 3 : 90–105.
- [5] Abel, M. H. 2008. Competencies Management And Learning Organizational Memory. *Journal Of Knowledge Management*. 12(6): 15–30.
- [6] Awang, M. and Muhammad, H. 2011. Malaysian Polytechnics Transformation of Excellence Entails Competence in Facilities Management. *International Journal of Emerging Sciences*. 1(3) : 260–284. September 2011. ISSN: 2222-4254 © IJES - indexed in the University of Cambridge
- [7] Jabatan Pengajian Politeknik. 2011. *Fakta Ringkas Mac 2011*. Kementerian Pengajian Tinggi Malaysia.
- [8] Zainal Abidin Akasah. 2008. *Model Proses Generik Pengurusan Penyelenggaraan Bangunan Sekolah*. Tesis PhD. Universiti Teknologi Malaysia, Skudai, Johor.
- [9] Politeknik Premier Johor Bahru. 2008. *Laporan Kajian Semula Pengurusan Politeknik Premier Johor Bahru - 2008*. Unpublished.
- [10] Politeknik Premier Johor Bahru. 2009. *Laporan Kajian Semula Pengurusan Politeknik Premier Johor Bahru - 2009*. Unpublished
- [11] Politeknik Premier Johor Bahru. 2010. *Laporan Kajian Semula Pengurusan Politeknik Premier Johor Bahru - 2010*. Unpublished
- [12] Abdul Hadi Kasimon. 2008. *Kepuasan Pelanggan Terhadap Fasilitas Bilik Darjah Dan Kesannya Terhadap Tingkah Laku Pembelajaran Pelajar*. Tesis Sarjana, Universiti Teknologi Malaysia.
- [13] Gifford, R. 1976. Environmental Numbness In The Classroom. *The Journal of Experimental Education*. Heldref Publications, Washington, D.C.
- [14] Knirk, F. 1987. Instructional Facilities For The Information Age. Syracuse, NY: *Educational Resource Information Center: Clearinghouse On Information Resources*.
- [15] Lackney, J. A. 1999. The Relationship Between Environmental Quality Of School Facilities And Student Performance. Congressional
- [16] Abramson, P. 2011. Building confidence: 16th annual college construction report. New Castle, PA: *College Planning & Management*.
- [17] Agron, J. 2004. *Growth spurt 30th annual official education construction report*. Overland Park, KS: American School and University.
- [18] Baker, K. 2009. Consensus construction forecast. AIArchitect. Retrieve from <http://info.aia.org/aiarchitect/pdf>
- [19] Haughey, J. 2010. Construction forecast: Education construction spending returns to 2009 year and level. Norcross, GA: *Reed Construction Data*.
- [20] Kotler, P. 1998. *Marketing Management (7th Ed.)*. New Delhi, India. Prentice-Hall.

- [21] Muhammad, S., Sapri, M., and Sipan, I. 2013. Academic buildings and their influence on students' wellbeing in higher education institution. *Social Indicator Research*. DOI 10.1007/s11205-013-0262-6.
- [22] Klemp, G.O. 1980. *The Assessment of Occupational Competence*. Washington, DC: National Institute of Education.
- [23] Parry, S. B. 1996. The Quest For Competencies. *Training*. 33(7) : 48–54.
- [24] Sanghi, S. 2004. *The Handbook Of Competency Mapping*. Sage. London.
- [25] Endoghogho Ogbeifun. 2011. *Facilities Management in A Multi Campus Setting : A case study of the University of the Witwatersrand*. Master of Science in Engineering, University of the Witwatersrand. Johannesburg
- [26] Best R. Langston, C., and De Valence, G. (Ed). 2003. *Workplace strategies and facilities management: Building value*. Oxford: Butherworth-Heinemann.
- [27] Clark, E., and Hinxman, L. 1999. Developing a Framework of Competencies for Facilities Management. *Facilities*. 17(7/8) : 246–252. Doi:10.1108/02632779910270203
- [28] Price, I. and Shaw, R. 1999. *Shifting The Patterns: Transforming The Performance Of People and Companies*. Chalfont. *Management Books* 2000.
- [29] *Manual Pengurusan Aset Menyeluruh (MPAM)*. 2009. Jabatan Perdana Menteri. Kerajaan Malaysia
- [30] Roberts, P. 2001. *Corporate Competence in FM: Current Problems and Issues*. *Facilities*. 19(7/8) : 269–275.
- [31] Shaziman, M. 2009. *Konvensyen Pengurusan Aset Dan Fasiliti Kebangsaan (NAFAM)*. Kuala Lumpur.
- [32] IFMA. 2010. International Facility Management Association web-page. <http://www.ifma.com>
- [33] BIFM. 2010. British Institute of Facilities Management web-page. <http://www.bifm.org.uk/bifm/home>.
- [34] FMAA. 2010. Facilities Management Association of Australia web-page, <http://www.fma.com.au/cms/index.php>
- [35] Yahya Don. 2009. *Korelasi Dan Pengaruh Kompetensi Emosi Terhadap Kepimpinan Sekolah: Perbandingan Antara Sekolah Berkesan Dengan Sekolah Kurang Berkesan*. *Tesis Doktor Falsafah*. Universiti Malaya.
- [36] Fadhilah Puteh. 2005. *Pendidikan Berterusan Dalam Peningkatan Kompetensi Di Kalangan Professional Organisasi. Kajian Kes Di KUITHHO. Tesis Master Fakulti Pengurusan Dan Pembangunan Sumber Manusia*. Universiti Teknologi Malaysia.
- [37] Ilhaemie Binti Abdul Ghani Azmi. 2008. *Amalan Pengurusan Sumber Manusia Berteraskan Kompetensi Dan Kualiti Perkhidmatan Dalam Organisasi Awam Di Malaysia: Kesaling Bergantungan Tugas Sebagai Penyederhana*. *Tesis Doktor Falsafah*. Universiti Sains Malaysia.
- [38] Hair, Joseph F., William C. Black, Barry J. Babin, and Rolph E. Anderson. 2010. *Multivariate Data Analysis*. Englewood Cliffs, NJ: Prentice Hall.
- [39] Cameron, D. and Markus, T. 2002. *The Words Between The Spaces: Building And Language*. London: Routledge.
- [40] Payne. T. 2000. *Facilities Management: A strategy for success*. The Chandos Serries on Construction and Facilities: Chandos Publishing.
- [41] Atkins, B. and Brooks, A. 2005. *Total Facilities Management*. Oxford, UK: Blackwell Publishing.
- [42] Marcos Van Den Ende The Netherlands. 2006. Euro FM Conference 7.-9.3.2006. *Conference Proceedings*.
- [43] Hauptfleisch A.C. and Verster J.J.P. 2011. *Facilities Management: Proposals for Practice Improvement and Development Support Through Educational Programmes in South Africa. Management and Innovation for a Sustainable Built Environment Amsterdam*. The Netherlands.
- [44] APPA. 2010. Leadership in Educational Facilities. Webpage, <http://www.appa.org>
- [45] FMA Australia 2010. Facilities Management Association of Australia web-page, <http://www.fma.com.au/cms/index.php>
- [46] RICS. 2010. Royal Institution of Chartered Surveyors; webpage, <http://www.rics.org>
- [47] HKIFM. 2010. Hong Kong Institute Of Facilities Management web-page <http://www.hkifm.org.hk>.
- [48] National Research Council. 2008. *Core Competencies for Federal Facilities Asset Management Through 2020. Transformational Strategies*. Washington D.C.: The National Academic Press.
- [49] Lopes, J.L.R. 1996. Corporate Real Estate Management Features. *Facilities*. 14(7/8).
- [50] Price, I., and Akhlaghi, F. 1999. New patterns in facilities management: Industry best practice new organizational theory. *Facilities*. 22(13/14).
- [51] PCA (Property Council of Australia). 2000. *Unleashing Corporate Property Getting Ahead of the Pack*.
- [52] Mc Gregor, W. 2000. Preparing For An Uncertain Future. *Facilities*. 18 (10/11/12)
- [53] Hinks, J. 2001. All FM is non-core, but is some FM less core than others? A discussion on realizing the strategic potential of FM. *FMLink white paper*.
- [54] Cotts, D., and E.P.Rondean. 2004. *The Facility Managers Guide to Finance and Budgeting*. New York. AMACON.
- [55] Rodgers, P.A. 2004. Performance matters: How the high performance business unit leverages facilities management effectiveness. *Journal of Facilities Management*. 2(4).
- [56] Warren, C. M. J., and Heng, S. K. 2005. FM Education-Are We Meeting Industry Needs. PPRE5: *Pacific Rim Real Estate Society 11th Annual Conference*. 1–20. Retrieved From <http://espace.library.uq.edu.au/view/uq:9956>
- [57] CIDB Malaysia. 2011. *Asset and Facility Management (Implementation Manual)*. Construction Industry Development Board Malaysia. ISBN ; 978-969-5317-41-5.
- [58] AUDE. 2010. Association of University Directors of Estates. web-page, <http://www.aude.ac.uk/info/centre>
- [59] TEFMA. 2010. Tertiary Education Facilities Management Association <http://www.tefma.com/about-us/overview>
- [60] Neuman, W. L. 2003. *Social Research Methods: Qualitative and quantitative approaches (5th ed.)* Boston: Allyn and Bacon.
- [61] Prance, G.T. 2004. The uses of *Atuna racemosa* Raf. (Chrysobalanaceae) in Samoa. *Economic Botany*. 58:470–475.
- [62] Johnson, B., and Christensen, L. 2004. *Educational Research: Quantitative, Qualitative, and Mixed Approaches (2nd Ed.)*. Needham Heights, MA: Allyn & Bacon.
- [63] Sabitha Marican. 2006. *Penyelidikan Sains Sosial Pendekatan Pragmatik*. Batu Caves Edusystem.
- [64] Chua, Yan Piaw. 2006. *Kaedah Dan Statistik Penyelidikan. Buku 1. Kaedah Penyelidikan*. Malaysia: McGraw-Hill (Malaysia) Sdn Bhd.
- [65] Sekaran, U. 2003. *Research Methods for Business: A Skill Building Approach (2nd Ed.)*. New York: John Wiley & Sons, Inc.
- [66] Best, J. W., and Kahn, J. V. 1998. *Research in education (8th ed.)*. Boston: Allyn and Bacon.
- [67] Nunnally, J. C., & Bernstein, I. H. 1994. *Psychometric Theory (3rd Ed.)*. New York: Mcgraw-Hill, Inc.
- [68] Roberts, L.W. and Clifton, R.A. 1992. Measuring the Affective Quality of Life of University Students: The validation of an instrument. *Social Indicator Research*. 27: 113–137.
- [69] Hair, J. Black, W. Babin, B. Anderson, R and Tatham, R. 2006. *Multivariate Data Analysis (Sixth Ed.)*. New Jersey: Pearson Educational International.
- [70] Meyer, L.S., Gamst, G., and Guarino, A.J. 2006. *Applied Multivariate Research: Design and interpretation*. California, USA: Sage Publication, Inc.
- [71] Coakes, S.J., Steed, L., and Dzidic, P. 2006. *SPSS: Analysis without anguish version 13.0 for window*. Milton, Qld: John Wiley and Sons Australia.
- [72] Creswell, J. W. 2005. *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research (2nd Ed.)*. Upper Saddle River, NJ: Pearson Education.
- [73] Churchill, G. A., Jr. (1979). A Paradigm For Developing Better Measures Of Marketing Constructs. *Journal of Marketing Research*, 16 (February), 64–73.
- [74] Nunnally, J. 1978. *Psychometric Theory*. New York: Mcgraw-Hill
- [75] Iran Herman. 2004. *Statistik Dan Analisis Data Sains Sosial. Alor Setar: Percetakan Ustaz Sdn.Bhd.*
- [76] Babbie, E. 1992. *The practice of social research*. California: Wardsworth Publishing Company.
- [77] Hair, J. F., Jr, Babin, B., Money, A. H., and Samouel, P. 2003. *Essentials of Business Research Methods*. New Jersey: John Wiley & Son, Inc.
- [78] Jabatan Kerja Raya (JKR). 2011. *Competency Model and Dictionary*. Jabatan Kerja Raya Malaysia. Printed by MISAS Advertising Sdn. Bhd. ISBN; 978–967-5957-08-6.