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A Review on Critical Success Factors for Energy Management Towards Sustainable University

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ABSTRACT

Presently, the world is threatened by critical energy problems such as energy resources, climate change as well as environmental pollution and degradation. The energy consumption has been considerably increased especially in developing countries and Malaysia is not exempted from this issue with increasing level of modernization and population recently. Universities are increasingly consuming energy due to its activities and population. Malaysia Ministry of Higher Education has urged all universities to save energy for high energy consumption which had become the concerns for many parties. It is very crucial to improve energy usage by creating a long term sustainable for future energy demand. Thus, this paper identified the Critical Success Factors (CSFs) for implementing Energy Management (EM) towards sustainable university through literature review. By identifying these CSFs, it can be a reference to assist people involved to know exactly what factors are most important towards the success of implementing EM towards sustainability.

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INTRODUCTION

Energy is one of the most important resources to sustain our lives or in other word energy is an essential factor in overall efforts to achieve sustainable development (Vera and Langlois (2007). It has become one of the essential inputs for economic factor, environmental impacts and social to nation's growth and development. Today, energy usage is expected to increase rapidly in the twenty-first century, as mainly because of the expansion of the economy of developing nation (Lincoln, 2006). Goldemberg *et al*., (2000) has stated that the production and use of energy should not endanger the quality of life of creatures and be able to help in the ecosystems.

An expert of UNEP, Dr Arab Hoballah (2009) specified that almost no country in the world can hope to achieve carbon dioxide reduction targets without including the building sector into their plan of action. It is also supported by Melchert (2007) where building industry has been identified as one of the big resource user of energy consumption. According to Ryghaug and Sorensen (2009), buildings are important contributors to energy consumption which represent 40% of energy usage. This scenario similarly applies to developed countries, such as Japan, United States and China. At present, Malaysia is being considered as rapid development country with increasing level of modernization and population. It is also supported by Choong *et al*., (2012), where energy consumption in Malaysia is relatively high compared to other middle income developing countries. Figure 1 shows the demand of electricity in Malaysia is growing in parallel with its Gross Domestic Product (GDP) growth where more people with more income means that the consumption of energy will rise (Global Insight, 2012; APERC Analysis; 2012). This became a serious issue to many countries all over the world.

From the economic perspective, the ride on the roller coaster of energy prices has gotten pretty wild. Malaysia, has also been effected of the world's increasing oil prices (IEA, 2007). The International Energy Outlook (IEO) 2013 projected that world energy consumption will grow by 56 percent between 2010 and 2040 as shown in Figure 2. Malaysia is classified as non-OECD though indirectly has been listed in white list to implement OECD standards for transparency and exchange of information between countries (MOF, 2010).

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This shows that the energy consumption in Malaysia as non-OECD country is high and need alternatives to minimize the usage of energy.

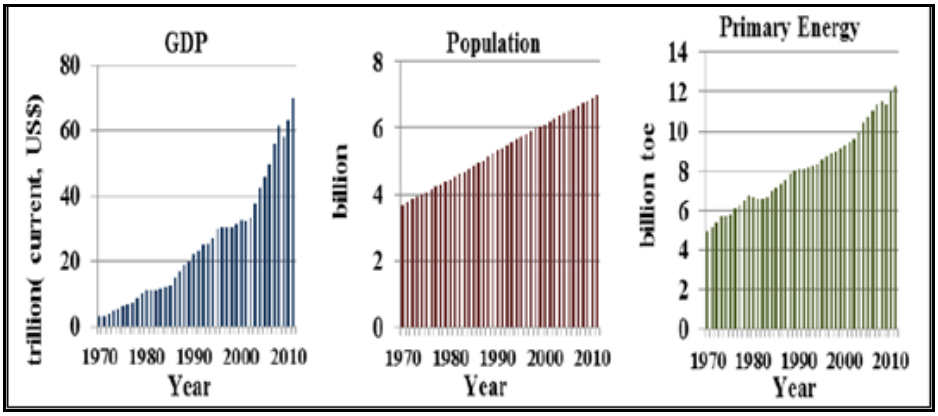

Fig. 1: Correlation between Economic Activity, Population and Energy Demand between 1970-2010. (*Source: Malaysia Energy Commission*, *2012*)

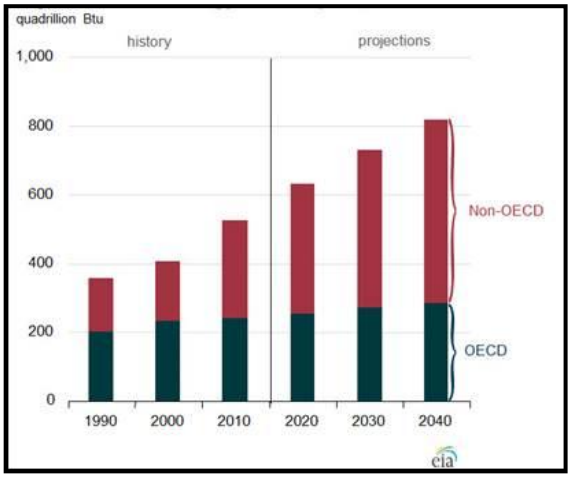

Fig. 2: World Energy Consumption from Year 1990-2040. (*Source: The International Energy Outlook 2013*).

Another energy related issue is from the environment perspective. Excessive energy use leads to emissions of greenhouse gases (Bhargava, 2006). According to Halicioglu (2009), the increasing threat of climate change has become a major, worldwide, and ongoing concern. As stated in British Scientific Journal Nature, the release of carbon dioxide (CO_2) to the atmosphere by the burning of fossil fuels is conceivably the most important environmental issue in the world today where CO_2 is one of the main causes of global warming (Omar and Mohammed, 2004; Leisserowitz, 2007; Lombard *et al*., 2008). From the Figure 3 below, it shows Malaysia is in the third ranking of energy usage among Asean countries after Brunei and Indonesia. This growth has been driven by strong demand from commercial and domestic sectors (EPU, 2011). University is almost comparable to commercial sector due to its size, activities and population (Sohif Mat *et al*., 2009; Najihah *et al*., 2013).

Next, energy uncontrollable fear is social energy issues, which include sturdy increases in the world population. Energy consumption is predictably expanding in parallel to the increasing of world population due to the number of births in a family (Say and Yucel, 2006). Human overpopulation combined with energy dependent lifestyle patterns is one of the critical challenges when approaching to sustainability (Krajnc *et al*., 2008). Population has increased continually in almost every country. A gradual increase in the world's population as well as steady growth across many countries in the world has led to energy demand. More people equal more carbon emissions (Wilson, 2013). Most of the universities are increasingly consuming energy due to the population and to support the activities (Choong *et al*., 2009). A huge amount of energy consumption in Malaysian university has received a serious attention for instance Universiti Teknologi Malaysia and International Islamic University Malaysia The energy charges in that particular university is more than ten million ringgit annually due to increment of students' population almost every year (Choong *et al*., 2012). The statistic of Malaysia Ministry of Higher Education (MOHE) shows the building users are more than 1 million

people at any given time in higher education institutes, which include the public and private universities, colleges and polytechnics in Malaysia. Table 1 shows total of students and academic staff in Higher Education Institute for year 2010 (MOHE, 2011).

Table 1: Number of Students and Academic Staff in Higher Education Institute for Year 2010.

Energy users in higher education institute for year 2010	IPTA	IPTS	Polytechnics	Community Colleges
Student	437,420	509,556	86,471	17,279
Academic Staff	28,571	33,613	6,741	2,259
Total	465,991	517,369	93,212	19,538
Grand Total of student and academic staff in IPTA, IPTS, Polytechnics and Community Colleges	1,096,110			

Note: IPTA - Institut Pengajian Tinggi Awam; IPTS - Institut Pengajian Tinggi Swasta
(*Source: MOHE, 2011*)

However, the world is competing to find energy solutions (Zainul Abidin and Pasquire, 2005), where energy management (EM) is one of the strategic approach for energy savings (Energy Management, NC State University, 2010). It is also supported by Kamarul Anuar from Construction Research Institute of Malaysia where 15%-25% of energy consumption for existing building can be reduced through a good EM. In spite of this, Malaysia MOHE has urged all universities to anticipate and propose a comprehensive approach to achieve the targets in reducing the issues concerning the energy consumption (Choong *et al*., 2012). The universities has been raised and embarked to the sustainable agenda in the decade of 21st century (Lozano *et al*., 2011; Waas *et al*., 2010; Wright, 2004). Malaysia university is also not excused by signing international declaration towards sustainability. As stated by Lozano (2008), *"Universities are like any other organization, should have a holistic view of the roles and responsibilities and consider the long-term impacts of their decisions which are beyond the present time".* Thus, universities should establish EM as a stepping stone for a sustainable future (Pike *et al*. 2003). Successful EM must combine an effective strategy with the right practical involvements (The UK Carbon Trust, 2011).

In this regard, CSFs are important areas of activity that must be performed well if university is aiming to achieve the mission, objectives or goals for implementing EM towards sustainability. According to Mobey and Parker (2002), to increase the chances of a project success, the university is necessary to understand of what are the CSFs and then choose appropriate methods of dealing with them. In response to the call by the Malaysia MOHE to save energy, thus this paper aims to identify CSFs for EM towards sustainable university.

CSFs to Implement Em Towards Sustainable University:

EM is a comprehensive approach to achieve and maintain the optimum of energy utilization. It is widely acknowledged as the best solution for direct and immediate reduction of energy consumption which may help in minimizing energy costs and mitigating environmental effects (Marechal *et al*., 2005; Albrecht, 2007; Asif and Muneer, 2007; Cai *et al*., 2009; Clarke and Kouri, 2009; Ching Sin *et al*., 2011; Backlund *et al*., 2012; Ahmad, 2013). Choong *et al*., (2012) has identified EM as the process of planning, implementing, monitoring and evaluating in a building. Many benefits can be achieved by working continuously on EM, where it can detect inefficiencies and malfunctioning equipment, optimize the energy system and evaluate the technologies performance (Backlund *et al*., 2012). Infact, in economic aspect, EM is considered as profits improvement and as effort to save cost (Capehart *et al*., 2008). According to Payne (2001), "……when many costs are escalating and difficult to control, energy is often one area where effective savings can be made and costs can be contained……". However, in spite of this shared understanding and the many benefits energy efficiency does not necessarily occur 'spontaneously' due to a variety of barriers. Therefore, all parties in university need to play an important role in stimulating the EM improvement, lowering barriers in order to align with macro-economic and societal goals. This can be done by identifying CSFs.

CSFs have been used significantly to present or identify a few key factors that organizations should focus on to be successful. CSFs refer to "the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, organization" (Rockart and Bullen, 1981). Meanwhile, many practitioners are often looking the success factors for the existing organization rather than seeking for new one (International Institute of Sustainable Development). Identifying CSFs is important as it allows organizations to focus their efforts on building their capabilities to meet the CSFs, or even allow firms to decide if they have the capability to build the requirements necessary to meet CSFs. In other perspective, CSFs are needed for practitioners to improve their organization which will indicate the progress in particular areas (McCabe, 2001). CSFs refer to something, which must be implemented if any organization wants to be successful in a specific field.

In recent years, research on project success factors has gradually gained interest. For instance, the understandings of CSFs in project management within an organizational context have been presented (Hyvari,

2006; Steinfort nd Walker, 2007; Ahadzie *et al*., 2008; Yu and Kwon, 2011; Soon Han *et al*., 2011). In addition, there are also researches conducted within the context of value management (Shen & Liu, 2003), quality management system (Psomas *et al*., 2010; Salaheldin, 2009), project sponsorship (Bryde, 2008), stakeholder management (Jing *et al*., 2010), building maintenance projects (Zutshi *et al*., 2004; Lam *et al*., 2010; Zulkarnain *et al*., 2011), knowledge management (Wu, 2012; Huang and Lai, 2012), environmental management system (Henderson, 2007; Sambasivan and Fei, 2008; Wiengarten and Pagell, 2012), enterprise resource planning system (Bradley, 2008), waste management (Lu & Yuan, 2010), supply chain management (Tummala *et al*., 2006) and sustainability (Abu Bakar *et al*., 2008; Xu *et al*., 2011; Wai *et al*., 2012). In supporting sustainable development in response to Chapter 36 of Agenda 21, the four international organizations with a strong commitment have formed a "Global Higher Education for Sustainability Partnership" (GHESP). According to Habib and Ismaila (2008), the four founding partners of the initiative are the International Association of Universities (IAU), the Association of University Leaders for a Sustainable Future (ULSF), the COPERNICUS Program of the Association of European Universities (CRE) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) to organize universities towards sustainability.

Many researches on CSFs in various areas have been conducted previously. To date, CSFs for implementing EM towards sustainable university in Malaysia context has not been explored. Although context-driven research may differ on the nature of focus, there are some common factors can be used for EM. The initiatives highlighted by these four founding partners and previous researchers can lead to identifying the CSFs to implement EM towards sustainability.

1) Top Management Support:

i. Develop Energy Policy and Guidelines :

Energy management is first and foremost a management and organizational effort. Without proper attention, the program will have only marginal success or fail altogether. Developing a clear and achievable energy policy and guidelines is important (Sanvido *et al*., 1992; Pinto and Slevin, 1989; Cooke-Davies, 2002; Lozano, 2006; Velazquez *et al*., 2006; Xu *et al*., 2011; Choong *et al*, 2012; Yang, 2013) to ensure the success of EM implementation. It integrates SMART concept which are Specific, Measurable, Attainable, Realistic and Timely. The energy policy and guidelines should be periodically updated and performance against the established policy and guidelines should be assessed on an ongoing basis.

ii. Leadership to implement and manage committee of EM:

Pinto and Slevin (1989); Sanvido *et al*., (1992); Belassi and Tukel (1996); Xu *et al*., (2011); Choong *et al*., (2012) identified leadership and management as success factors on projects though this competence is seldom identified as CSFs. According to Birgeneau (2011), a comprehensive approach can help to create a culture of sustainability on campus, which can be as important as the reductions in environmental impacts. Leadership and champions are required at all levels of the University, since a large number of tools are needed to achieve these goals.

iii. Create Incentives by Establishing an Award for Positive Contribution:

A way to improve EM is by developing incentives that will reward and motivate the university energy teams as well as the faculty, staff and students that contribute significantly to meeting the goals and objectives of the university. Tangible incentives, motivation and recognition are need from top management committee or from government agencies to reward achievement for example through awards, certificates, financial or other means (Morris and Hough, 1987; Yang 2013). According to Manan, (2012), UTM will be the first Malaysian university to participate in ASEAN Energy Award, and he also addressed that not even one university in Asean has taken up the challenge.

iv. Allocation of Sufficient Resources; Manpower, Technology Fixation, Money and Time:

The availability of adequate resources has been identified in the literature as an important factor in achieving successful (Belassi and Tukel, 1996; Xu *et al*., 2011; Choong *et al*., 2012; Yang, 2013). Resources are important to survive and function in a long time, and the results of the robustness of process in strategic facilities management. Referring to the Malaysia National Higher Education Strategic Plan (MNHESP) in 2007, resources are one of the CSFs to be given a special attention to ensure smooth operations and activities of the organization. Therefore, resources must include people, technology beside money and sufficient time.

v. Training provisions:

The literature review indicates that training is a key factor during implementation of EM, and that training may change attitude and behaviour among managers and employees (Pinto and Kharbanda, 1995; Choong *et al*., 2012; Manan, 2012; Yang, 2013). It is also to ensure the employees involve understand the process of EM. Outside of the Ministry of Energy, Green Technology and Water, many government institutions had limited

knowledge of how to conduct EM (APEC, 2011). The training courses either on a one-off or regular basis will focus on methods for improving performance in energy management that will reduce energy costs and environmental impacts. Training also provides an excellent opportunity for gathering employee feedback and evaluations. For example, in Chinese Taipei, personnel of government agencies and schools must undertake four hours of study in the area of energy efficiency each year under the Environmental Education Act (APEC, 2011). In Malaysia, some of the universities have set up an in-house energy management committee with representation from all faculties to train and develop energy managers on sustainable energy management (Ng and Akasah, 2011). The type and nature of training is depending on the university's specific action plan. Normally, the training course will establish a peer network of professionals from various institutions who will share expertise and lesson learned that may benefit all employees in university.

2) Comprehensive Facility or Energy Management Team:

i. Conduct Energy Audit:

"If you cannot measure it, you cannot improve it" as stated by Lord Kelvin (1824-1907). Energy audit is needed to reduce energy costs is a crucial business practice for successful organizations (Pinto and Slevin, 1989; Belassi and Tukel, 1996; Cooke-Davies, 2002; Velazquez *et al*., 2006; Lozano, 2006; Choong *et al*., 2012; Manan, 2012; Yang, 2013). Energy audits play a more significant role in managing energy expenses. Energy audits can encompass a variety of surveying techniques but most commonly consist of an analysis of energy usage within a building or facility and its contained equipment. Cortese, (2003); Koester *et al*., (2006) stressed out that measuring the progress towards campus sustainability can improve environmental performance. During an energy audit, a comprehensive approach is necessary. Then progressively zooms in on the specific issues and opportunities that deserve further investigation. The energy audit report can be used as the starting point for efficient EM. Audits include comprehensive lists of energy efficiency measures derived from building and facility performance. Energy audits also include financial analysis for each identified measure. Energy audits can use information from building management systems with the goal of reducing energy usage without negatively impacting the university's everyday practices. Energy audits in university often focus on key aspects of the overall system that tend to use the most energy. Common examples of audited equipment include HVAC, lighting, and plug load.

A more detailed of data can be collected to complete analyses on the performance of university's building system. With more accurate, complete and consistent data and analysis, energy management decisions related to specific building systems can be made proactively to run systems efficiently, lowering operating costs, extending equipment life and improving occupant comfort. Studies by the Carbon Trust show energy audit can typically deliver energy use savings of between 5% and 15%. By establishing energy audit, it also can provide relevant information to energy manager or energy coordinator on energy use and energy performance of buildings and processes. EM will always be continuously improved and evaluated by regular audits through adequate documentation and benchmarking. Working on this formula, consistent and positive changes on sustainability can be accurately addressed (Sohif Mat *et al*., 2009).

ii. Operation and Maintenance (O&M):

Many studies have shown that gains in energy efficiency and cost savings are easily lost when an organization does not support the continued O&M of improvement. It shows significantly to perform O&M as mentioned by Capehart *et al*., (2008). According to Cooke Davies (2002), the impact of poor O&M will affect the organization in terms of business continuity and give impact on organizational performance. It is also supported by Morris and Hough (1987); Pinto and Slevin (1989); Belassi nad Tukel (1996); Choong *et al*., (2012) and Yang (2013) where good maintenance program could provide effective energy saving with NO or minimum cost. The O&M can be implemented for ensured performance and sustainability. O&M is valuable in that it allows energy efficiency measures to be implemented without requiring a major retrofit, so energy costs can be lowered without a significant amount of funding or lead time for planning and budgeting (Amy Cook, 2011).

Thus, O&M plays an integral part in an EM where it enables equipment free from failing, prevents excess capital expenditures, and maintains quality and safety of the product or facility. In this way, energy efficient actions become an integral part of standard tasks. For example, maintenance schedules include specifications for reducing energy wastage (i.e. changing or cleaning air filters at the correct intervals), job or priority sheets include actions for reducing energy waste (i.e. repair of compressed air leaks), operating instructions include energy use issues (i.e. shut down procedures). It is also worth introducing active reporting systems for energy waste (lights on, doors open, steam leaks etc.) and for staff members to make suggestions.

iii. Management Review & Verification:

After the program is completed, then, reporting of progress and meeting policy objectives to top management team is needed. The progress also must be reported to a number of internal and external

stakeholders. All staff should be informed about the organisation's progress and performance. These reports will largely be produced by the Energy Management Team. Understanding energy performance and its effective reporting relies on the availability of good data and sound analysis. This requires reliable information that enables production of suitable reports. It should be developed to meet the university's strategic requirements and, in turn, the information it provides will support the delivery of that strategy. The results shall be assessed and analysed for any good and bad points (Morris and Hough, 1987; Cooke Davies, 2002; Lozano, 2006; Xu *et al*., 2011, Choong *et al*., 2012; Yang, 2013). The lesson shall be utilized as a feedback in the subsequent plan or program. Thus the activities are repeated to form a cyclic movement.

iv. Continuous Improvement:

The Plan-Do-Check,-Act (P-D-C-A) cycle is a useful tool to coordinate continuous improvement efforts. This is a management philosophy that seeks improvements as a never ending process of achieving improvements (Chase and Aquilano, 2001). Under the continuous improvement philosophy, progress is most often incremental, thus delivering improvements over prolonged periods is vital (Pinto and Kharbanda, 1995; Belassi and Tukel, 1996; Cooke Davies, 2002; Choong *et al*., 2012; Manan, 2012). However, the cycle is not stopped at this step. It is always necessary to go through the cycle again for solving new challenges and problems. The implementation of the model must not be a static process for generating a particular initiative.

3) Stakeholders involvement:

i. Understanding of Project Vision and Goal:

A shared vision is an important element towards a success of any projects (Morris and Hough, 1987; Pinto and Slevin, 1989; Belassi and Tukel, 1996; Cooke Davis, 2002; Lozano, 2006; Yang, 2013). The vision has implications for how universities are organised and the roles that are assumed by administrators, lecturers, parents and students. Once developed, a vision is not static but is part of a regular cycle of reflection, planning and evaluation. The vision informs and is informed by the goals and objectives that follow.

ii. Good Communication among the stakeholders:

Good communication throughout the stakeholders is essential for ensuring that they work together to implement any project (Pinto and Slevin, 1989; Belassi and Tukel, 1996; Lozano, 2006; Choong *et al*., 2012; Manan, 2012; Yang, 2013) and specifically to EM. It is vital to communicate the energy management plan to the stakeholders at every stage, as effective energy management relies on everyone being involved and playing their part. Communication within an organisation can help to reduce much inefficiency. There is often a wealth of information within an organisation which can be used to reduce energy consumption. These include operating instructions and recommendations for machinery, the flexibility of an organisation to change certain practices and behaviours in order to become more energy efficient among others. The stakeholders need to be informed of the benefits of saving energy in the university building. If they do not understand what they are doing and why they are doing it, EM will not be successful (The UK Carbon Trust, 2011). Effective communication to provide information by communicating either by "personal touch" (i.e small face to face meetings, dedicated presentations, internal training, informal gathering, door-to-door canvassing, competitions, suggestion box, videos, web casts, and DVDs or by "print material" (i.e direct letters, newsletters, pamphlets and brochures, books, external publicity, posters, sticker and websites) to avoid inadequate communication.

iii. Knowledge & Skill:

The social aspects can play a vital role in the successful implementation of EM which aimed at removing barriers to energy efficiency. Therefore, the stakeholders should not only comply with high requirements on the specialist knowledge but should also have social skills. Knowledge has been recognized as a core strategic asset in increasingly dynamic business environments and communities, depends on a more systematic and effective capture, dissemination, transfer and application of knowledge (Morris and Hough, 1987; Pinto and Slevin, 1989; Belassi and Tukel, 1996; Xu *et al*., 2011; Yang, 2013). By having knowledge, stakeholders are able to implement EM effectively and efficiently. From the skills that the stakeholders have, knowledge sharing through computer-based information systems provides a robust means for best practices, technologies, and operational guidance. While these systems can range from complex databases to a simple intranet site. They are a centralized and accessible place to store and transfer energy management information within the university communities.

iv. Trust among stakeholders:

Trust among all stakeholders is concerned in the project (Pinto and Slevin, 1989; Sanvido *et al*., 1992; Belassi and Tukel, 1996; Lozano, 2006; Xu *et al*., 2011; Yang, 2013). The trustworthiness of is equally important to determine the success of EM. Trust among stakeholders can enrich the way of any organization project towards success. Moreover, it is not easy to success in implementing any activity without trust relation in

an organization, no matter how the activity is well planned (Wu, 2012). There is also no reliable standard for EM implementation, if they do not trust each other (Xu and Chan, 2011). Without trust, it is also difficult to agree with each other about the result of energy saving.

4) Raising Awareness:

i. Understanding the issues:

Before trying to make out any future programs or action plans, it is essential for the university management to understand the current situation in a proper and accurate manner (Pinto and Slevin, 1989; Belassi and Tukel, 1996; Lozano, 2006; Choong *et al*., 2012; Yang, 2013). The current data of energy consumption shall be obtained by measurement, calculation or estimation. The data shall be gathered regularly and arranged/summarized daily, weekly, monthly, by seasons or annually. Then the data shall be checked for the past historical trend and interpreted with relation to operational modes and production scales. That shall also be utilized for the forecast of future trends.

ii. Increase general energy awareness:

Most people are unaware of how their everyday actions and activities in university influence the excessive usage of energy. Increasing overall awareness can be an effective way to gain greater support for energy initiatives (Pinto and Slevin, 1989; Belassi and Tukel, 1996; Lozano, 2006; Choong *et al*., 2012; Yang, 2013). Davis (2009) in his research findings which stated that individual staff's attitudes may impact on the culture of a university. Therefore staff's awareness towards sustainable development and sustainability should be increased.

iii. Improve facility energy awareness:

Individuals working in or even managing a facility may have little understanding of the energy performance of the facility or its impact on the organization and environment. Targeted efforts designed to increase awareness of facility's energy use can help build support for EM (Choong *et al*., 2012; Yang, 2013). Such awareness raising initiatives was installation of poster raising awareness in a central section of the building for all to see.

iv. Education by Research & Development (R&D), Teaching and Learning:

Energy education is another way to establish a proper energy education scheme in the field of energy conservation by means of introducing new courses for both conventional and renewable energy sources (Velazquez *et al*., 2006; Lozano, 2006; Choong *et al*., 2012; Yang, 2013). Such education schemes may include energy basic principles, consumption loads and the relevant environmental effects. It may also include the development of new experiments for laboratories in universities and technical colleges. It is also important to pursue academic research work and postgraduate studies in conjunction with industry in order to solve problems related directly to energy conservation and management (Hasnain *et al*., 1995).University of Georgia President Michael F.Adams (2007) mentioned that education is essential because energy management is not a destination, but a process. Academic education cannot be completely separated from research since one complements teaching and research which serves the overall goal of professional education and guarantees a high proportion of prevailing and highly relevant topics in teaching and research.

Many campaigns promoting energy conservation do not achieve the desired sustained results because the education effort is not an integral part of the continuous improvement management system of the university. Whereas, university is the best place to educate and provide quality education including its commitment to the progress of society. For instance, Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE) in Malaysia is a body funded by MEGTW to conduct programs to create awareness and disseminate knowledge on energy efficiency among energy users in Malaysia. The main target groups for CETREE'S programs are school children and universities' students. Prioritization of this function is essential for success, where it has a potential to be a leader in all fields of R&D, teaching and learning (Moore, 2005; Stephens and Graham, 2010). Similarly, Velazquez *et al*., (2006) has put the effort to include R&D, teaching and learning in his model for university sustainability practices.

v. Community Engagement and Partnerships:

University has a longstanding commitment to community engagement and values partnership with its local communities, business, industry and government at regional, national and global level that can benefit both (Velazquez *et al*., 2006; Lozano, 2006; Yang, 2013). Further, reporting campus greening efforts indicates an institution's commitment to sustainability and thus may stimulate related community partnerships (Ferreira *et al*., 2006; Lozano, 2011). There are university programs that involve public participation and campus activities, such as visits to learn about the university, community care with resources from donations, giving everyone the opportunity for education and others. Several persons from the community participate in the university projects have some type of physical limitation, thus university offers job opportunities for the physically handicapped,

although accessibility needs to be improved (de Castro and Jabbour, 2013). This influence will contribute to a robust, equitable and environmentally sustainable society. Such initiatives can help in more effective dissemination of information, experiences and good practices related to EM. It shows that community engagement and partnership as one of the important CSFs in promoting university towards sustainability. It is supported with the statement by Md Shahbudin *et al*., (2011) where most of the universities nowadays are changing their mission, vision and educational practices to better cope with the demand from the public for a sustainable society. Energy efficiency movement can get a big boost and momentum through better sharing of knowledge and best practices among countries.

vi. Energy Information:

An important and relatively neglected issue is the role of information and communications in sustainable development. Sustainable benefits of any development effort could be enhanced through investment in improved and more equitable information flows (Russell, 1994). Information is a link between a system and its environment. Energy information may include the latest scientific technological progresses published in useful books, periodicals, reports and journals. Maintaining a specialized library and documentation could help to provide such requested information by individuals, organizations and institutions. Information packages on energy should be provided to decision makers, planners, research scholars and the public (Velazquez *et al*., 2006; Lozano, 2006; Yang, 2013). Computer software for energy projects should be designed and accumulated for solving problems related to energy conservation and the whole energy system under investigation. More recently, the importance of building a suitable databank is very crucial to increase research methodology, like energy consumption and conservation.

5) Risks Management:

The university should employ a robust risk management system to address the external and internal factors that could be detrimental to the strategic plan and the transition towards excellence where the management able to eliminate or reduce the risks involve (Morris and Hough, 1987; Pinto and Slevin, 1989; Selin and Selin, 1994; Dvir *et al*., 1998; Whittaker, 1999; Cooke-Davies, 2002; Yeo, 2002; Chan *et al*., 2002; Westerveld, 2003; Baccarini, 2003; Xu *et al*., 2011). By having a robust risk management system in place, it allows the flexibility and agility to deal effectively with both existing and emergent risks. Amongst the risks towards sustainability in university is human resource risk, sustainable funding risk, students' risk, regional nature of the university and, market share risk. The processes of risks management involve:-

i. Identify the Risk:

This step is brainstorming where all the potential risks are identified. Risks are then categorized and prioritized by using an assessment instrument. The process of prioritization helps top management and the stakeholders to manage those risks that have both a high impact and high probability of occurrence.

ii. Assess the Risk:

Traditional problem solving often moves from problem identification to problem solution. However, before trying to determine how best to manage the risks, the root causes of the identified risks must be identified by the project team.

Develop Responses to the Risk:

The process of assessing possible remedies to manage risk or possibly, prevent the risk from occurring is ready

iii. Develop a Contingency Plan or Preventive Measures for the Risk:

At this stage, the project team will convert into tasks in order to reduce or eliminate risk likelihood. The tasks identified to manage risk are developed into short contingency plan that can be put aside. When the risk occurs, this plan can be quickly put into action to manage the risk by crisis.

Conclusion:

This paper reported a critical review of EM towards sustainable university. The results showed the CSFs generally can be classified into five clusters namely, i) top management support, ii) comprehensive energy management team, iii) stakeholders' involvement, iv) awareness, v) risks management. A number of influencing CSFs are grouped into these five clusters to make the improvement in university precisely. By identifying these CSFs, it can be a reference to assist many people involved in inspiring EM improvement, lowering environmental problems in order to align with environmental, economic and societal goals towards sustainability in university precisely.

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