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THE IMPACT OF GREEN MANAGEMENT AND TECHNOLOGY IN ELECTRICAL AND ELECTRONICS MANUFACTURING IN BUSINESS SUSTAINABILITY IN MALAYSIA

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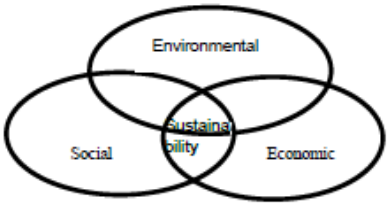
Graphical abstract



Abstract

This paper is aim to investigating the impact of green management (GM) and technology (GT)in the electrical and electronics industry. Environmental issues, pollution and corruption due to wrong doing. This questionnaire survey-based paper was a cross sectional approach. The samples were derived by simple random sampling from the Federation of Malaysian Manufacturing report of 2013/2014. A pilot test data of 40 respondents was collected and tested using factor analysis, construct validity and reliability. The data obtained and used in this survey were self-reporting by respondent from the respective industry. The outcome, suggested that GM and GT should be holistically implemented. This paper contributed to the body of knowledge through identifying the relationship between GM and GT practices in Business Sustainability.

Keywords: Green management, green technology, sustainability

1.0 INTRODUCTION

The globalized market has put a new demands on organizations due to the rapidly changing landscape in business. To stay ahead of competition, companies are transforming to re-invent themselves by implementing new strategies and ideas to achieve sustainability in business. All stakeholders' expectations must be met to achieve the business sustainability. Furthermore, pursuing sustainable will maintain companies on a right path to achieve their goals and mission. Importantly, companies today face an incredible challenges to continually improve the product's quality while comprehensively cost reduction, flexible to demand, short lead time delivery commitment, legal transference, social and environmental requirements. The ability to managing their resources against the on-going changing environment is critical to achieve the goals[1]. Recent studies on operational sustainability focused on industrial context such as security, oil, gas and university. On a technical perspective, by the previous studies, the Electrical and Electronics Industry have been neglected on the soft issue in particulars which Bose and Luo [2] stressed the failure of system implementation such as ERP. Hence, the newest development of the management of change and business sustainability have evolved. Businesses are focusing on the enhancement of the customer value and sustainability. Nordin, et al. [3] identified the challenges and opportunities faced by the companies in achieving the sustainable status. Furthermore, the

alignment is required by both the hard and soft factors aligning with the company strategy [4].

Companies which on their journey towards sustainability, have largely focused on the critical variables identified, which might better explain how organizational restructure can be managed to the maximum effect [5, 6]. Therefore, this study will provide an insight in understanding the contemporary influential systems that affect business sustainability, especially sustainable in operations. In discussing the operational sustainable, most of the practitioners and researchers prefer to relate it with manufacturers. Actually, manufacturing operation is one of the prime strategic factors in any business. Business which integrated a highly level of discipline in manufacturing operation will mostly achieve its competitive position and strategic potential.

2.0 LITERATURE REVIEW

2.1 Green Management

The increasing need for green management in the environmental awareness due to which occurred over the years by many aspects of human wrong doing [7]. Academicians and business leaders in this field are demanding more rigorous, complex and detail objectives in order to be green organizations. There are many types of practices taken by business and industry respectively such as improving the financial and green management [8, 9], strong measure taken for combating corruption in the organization [10, 11], upgrading human resource capability [12], providing state-of-the-art logistics for cost reduction and efficient delivery of raw components and saleable goods [13], measuring indicator for green manufacturing performance [14] and the top management decision making in adoption of green [15].

2.2 Green Technology

Green Technology is making things better such as upgraded methodologies, machines and material's enhancement for transforming a newer source of energy from dangerous toxic to free toxic detergent and products [16]. To achieve the sustainable status is the prime objective in economic development. International companies are aggressively working on achieving a competitive advantage by implementing technology strategy and sustainability in business by imitating then improving and finally to innovate as such of Chinese hi-tech firms. [17].

State-of-the-art manufacturing technologies produced a numerous ranges of advantages inclusive of excellence in quality, up-to-date inventory control, maximizing the machinery usage and delivery efficiency [18, 19]. Overwhelmingly, the green technology management strategy is valuable once the mechanisms for technology's implementation, renewal and sources are synchronizing in process [20]. The top management's commitment is playing a vital role in reengineering the technology changes, be it in green technology management, market integration and innovation with technology [17, 21].

2.3 Sustainable Business

According to The Brundtland Commission (1987) at the United Nations World Commission on Environment and Development has defined a sustainable development as one that ***"meets the needs of the present without compromising the ability of future generations to meet their own needs"****[22]*. Among the activities are the re-planting of trees to avoid landslide, toxic waste from an industry to be properly send to designated landfill and new products ready to be recycle, re use and remanufactured upon expire date. Seidel, et al [23]. also concluded from Brundtland Commission that the development of today using the natural resources in consideration of preserving for future generations to consume. President Theodore Roosevelt has spoken on the concept of sustainability way back in 1910 said: ***"I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after you"***[24] .

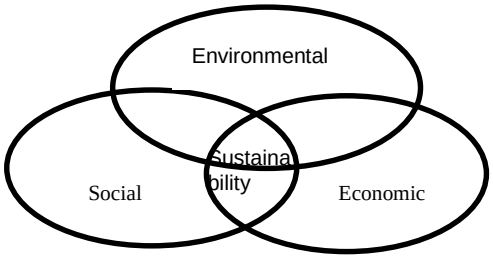


Figure 1 The Integrated approach of sustainability

Figure 1with regard of various businesses sustainability's definition, in the field of working in sustainability the as always interlink with three (3) factors, which are environment, economic, and social - often called as the "triple bottom line" [22]. Sustainability will always moderate to optimize the three factors, which is switching against each other by environment, jobs; and healthy environment or by economic growth; habitual harmony and development [25].

Anderson [29] broadly described the RAYC Anderson foundation achievement in the business sustainability as interconnectedness of all things. For example: Transforming petrol intensive industrial business enterprise to reduce its impacts to the environment, reduction of scrap to the landfills and others. In addition, the foundation began removing another linkage to the biosphere by shutting down 109 plants in the last decade, equivalent to a 39 per cent reduction. Resource-efficient transport (logistics) such as Toyota and Honda has launched their hybrid generated gas to electric cars. The Germans engineers are producing jets that consume hydrogen rather than petrol; Daimler-Benz has invested millions in Canadian fuel cell venture

[26]. In education, partnering with suppliers, customers, stakeholders and getting everybody involve in an understanding of the importance of GM and GT is the main objectives Next is to determine where we are going and what is on going in the GM and GT implementation. This leads to increases among all including our societies in the awareness of the thousands of little things in achieving sustainability.

Manufacturing, industries and businesses based on which producing products and services are backbones of the economy and champion in growth and development, are aggressively participate in sustainable activities [5, 27, 28]. Chen [29] found in his study towards green business performance in after sale service experiencing a positive revenue. Saxena and Khandelwal [30] focused on the industries go along with greening philosophy, management and operations are achieving competitive advantage in sustaining business in the local, regional and global market. Even though some researchers almost more than a decade ago, Vesela and Ellenecker [8] found business 'hard to operate' and proposed a framework for business sustainability mainly focusing on material usage, energy consumption, community activities, natural resources, economic capability, and social integrity, workers, products and services.

3.0 METHODOLOGY

The Electrical and Electronics manufacturing is one of most prime sectors that largely contributed to the GDP of Malaysia [31]. The contribution is very significant, particularly in employment opportunities and export products. Therefore, the population in this study is from the Electrical and Electronics manufacturing operating in Malaysia in conjunction to the enormous contribution to the GDP of the country and its huge contribution to the environmental degradation to the nation due to its aggressive operational activities.

A mail survey questionnaire, e-mail and personally approach method were used for data collection from the selected respondents of pilot test. Roscoe (1975) proposed the rule of thumb of the appropriate sampling size from 30 to 500. The name lists of the selected respondents are derived from the directory of the Federation of Malaysian Manufacturers 2013/2014 [31].

The three (3) indicators of in this study were adopted from the literatures which consist of (i) Green management, (ii) Green Technology and (iii) Sustainable Business. The green management dimension includes of environmental outcome, economic and social growth. Respondents were asked to choose to indicate the extent of which they agree with indicators implemented in their company based on a Likert scale varies from 1 to 5 in which 1 = Not at All and 5 = Significant. From here, 40 usable questionnaires were analyzed by using SPSS version 20, and the findings of the study are presented below.

3.1 Respondent profile

A total of 40 survey questionnaires was completed and compiled. The companies are strictly from the location in Penang mainland and on the island. They are E&E subsector of 19 electronic components (47.5 percent), 11 industrial electronics (27.5 percent), 6 electrical products (15 percent) and 4 components electronics (10 percent). Based on the usable responses, most of the respondents were the EHS Manager (75 percent) and their representatives (25 percent).

3.2 Construct reliability and Validity

In data analyzing, which involving testing for assumptions requires a Instrutment multivariate analysis as a statistical based. For a successful multivariate analysis, meeting some of the assumption aspects is critical.

Cooper and Schindler [32] described, firstly, the researchers have to be sure whether the tested data actually measured what elements to be measured (validity) and maintain the consistency of the measured results (reliability). Factor analysis was used to examine the construct validity for each construct separately due to the limitation of sample size [33] and retained items with the factor loading of minimum 0.45 and above .

Table 1 below exhibits a number of items that were suggested to be omitted. All the KMO values are bigger than 0.50 as recommended by Kaiser [34], signaling that patterns of correlations are relatively firm and compact, therefore, confirmed the factor analysis is reliable. Furthermore, The Bartlett's test is significant at a = 0.05 for all the constructs, signaling the variables are correlated highly to produce a reasonable basis for factor analysis [35]. As a result, the constructs used are eligible and valid.

Cronbach's a was used to access the construct reliability. George and Mallery [36] provided a rule of thumb that a which is greater than 0.50 are adequate. Previously, Jones and James [37] argued that a with values in a range of 0.44 to 0.81 was acceptable since a is a function of the figure of items in the composite and tendency of being conservative. The table shows that factor loadings for the retained constructs ranged from 0.47 to 0.94. In addition, all constructs explained more than 50% of total variance with the percent variance values ranged from 68.02 percent and 84.81percent. Based on the argument and the current study used items adopted from the past studies, it was decided that a values over 0.50 were appropriate and adequate. Table 1 shows a(Alpha) values ranging from 0.74 to 0.94. Thus, proven that the internal consistency and construct validity are satisfactory. As the molar concentration of the dual components as shown in Table 1

Table 1 Construct validity and reliability

Constructs	No.of items[a]	Deleted items[b]	Factor loading for retained items	KMO	Eigenvalue	%variance	α[c]
Environmental outcome	8	nil	.77, .93, .75, .88, .47,.53, .54, .84	.87	5.71	71.42	.94
Economy	4	1	.94, .92, .71	.64	2.31	75.30	.74
Social growth	4	nil	.57, .53, .86, .77	.62	2.26	68.02	.83
Green management	4	nil	.78, .82, .89, .89	.67	2.72	84.81	.92
Green technology	4	nil	.82, .77, .92, , .76	.82	3.28	82.03	.91
Spiritual leadership	7	7	.79, .82, .89, .91, .79, .78,	.76	4.99	83.28	.88

Notes: [a] Number of items before deletion; [b]sequence number of questionnaire; Cronbach's α after deleting the items in factor analysis stage

4.0 SIGNIFICANT OF THE STUDY

The relationship presented in this paper was theoretically and empirically supported. Technically, this paper has proven the existing linkages between GM, GT and SB. This study contributes to the knowledge of how GM able to affect the GT and finally producing the sustainable status in business. This paper also provides a sense of integral and holistic practices of GM and GT comprehensively, which is resulting in sustainable business measurement. Moreover, through demonstrating the effect of direct and indirect influence of GM and GT, this study proved as an evidence that both are important to enhance the company's' business sustainability.

Practically, this paper introduces new opportunity for the practitioners to obtain more understanding and knowledge regarding the GM, GT and SB relationships. All GM and GT practices should be holistically executed since all the practices are interdependent and equally important. The findings of this study indicate a direction to survive in the global competition as a company got no other choice rather than implementing the GM and GT because the empirical evidence has shown a strong support of their ability to increase the sustainability in business.

Hopefully, this study will move forward and open path for researchers in dealing with the limited empirical studies performed and conducted at E&E in the developing countries, particularly in Malaysia.

5.0 LIMITATION AND FURTHER RESEARCH

This paper has its own limitation. Similarly in all surveys based research, a general assumption in the data collection was that the respondents got enough knowledge to provide an answer to the questionnaire, with anticipation that the respondents will answer the items truthfully and conscientiously. In addressing the issue of common method variance (CMV) some items were questioned in reverse [38]. Statistically, all measures were loaded into an exploratory factor analysis, and CMV did not present in this study. However, future studies are recommended to consider multiple sources of data in expecting more accurate results. Hopefully, this paper will stimulate the interest of other researchers in the similar interest as more research in this subject is necessary both in qualitative and quantitative approach.

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References

[1] M. Jarvie. 2011 "Sustainable Development (Business)," in *Green Issues and Debates*, H. S. Schiffman, Ed., ed Thousand Oaks, California: Sage Publication. 448-454.

[2] R. Bose and X. R. Luo. 2012."Green IT adoption: a process management approach," *International Journal of Accounting and Information Management*l. 20: 63-77

[3] N. Nordin, H. Ashari, and M. G. Hassan. 2014. "Drivers and Barriers in Sustainable Manufacturing Implementation in Malaysian Manufacturing Firms," *Industrial Engineering and Engineering Management (IEEM)*. 687-691

[4] O. Fok-Yew and H. Ahmad. 2014. "The Effect of Change Management on Operational Excellence in Electrical and Electronics Industry: Evidence from Malaysia," *British Journal of Economics, Management & Trade*. 4

[5] B. Urban and R. Naidoo. 2012. "Business sustainability: empirical evidence on operational skills in SMEs in South Africa," *Journal of Small Business and Enterprise Development*. 19: 146-163

[6] V. Vesela and M. Ellenecker. 2000. "A Proposal for Measuring Business Sustainability," *Greener Management International*. 2000: 101-120

[7] S. S. P. Haden, J. D. Oyler, and J. H. Humphreys. 2009. "Historical, practical, and theoretical perspectives on green management: An exploratory analysis," *Management Decision*. 47: 1041-1055

[8] J. F. Molina-Azorı, E. Claver-Cortes, M. D. Lo´pez-Gamero, and J. J. Tarı´. 2009. "Green management and financial performance: a literature review," *Management Decision*. 47

[9] S. Watts and J. Noh. 2014. "Going Green With Management - Management Technology Comparison Within Green Companies: China, USA And Korea," *International Journal of e-Education, e-Business, e-Management and e-Learning*. 4: 160-165

[10] H. Labelle, "Global Corruption Report: Education," Transparency International, 2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN2013.

[11] N. A. Siddiquee. 2009. "Combating Corruption and Managing Integrity in Malaysia: A Critical Overview of Recent Strategies and Initiatives," *Public Organization Review*. 10: 153-171

[12] M. Branine and D. Pollard. 2010. "Human resource management with Islamic management principles: A dialectic for a reverse diffusion in management," *Personnel Review*. 39: 712-727

[13] U. Martinsen and M. Björklund. 2012. "Matches and gaps in the green logistics market," *International Journal of Physical Distribution & Logistics Management*. 42: 562-583

[14] A. K. Digalwar, A. R. Tagalpallewar, and V. K. Sunnapwar, 2013. "Green manufacturing performance measures: an empirical investigation from Indian manufacturing industries," *Measuring Business Excellence*. 17: 59-75

[15] H. R. Gollnow,.2014. "Factors InfluencingThe Adoption Of Green It Practices By Decision-Making It Managers," Doctor of Philosophy School of Business and Technology Capella University, USA, Ann Arbor, Michigan, USA

[16] N. Harrison and D. Samson, *Technology Management*. NewYork, USA: McGraw-Hill, 2006.

[17] R. Li-Hua and L. Lu. 2013. "Technology strategy and sustainability of business: Empirical experiences from Chinese cases," *Journal of Technology Management in China*. 8: 62-82

[18] K. Chaharbaghi and R. Willis. 2000. "The Technology, Mythology And Economy Of Technology," *Management Decision*. 38

[19] S. Orr and A. S. Sohal. 1999. "Technology And Global Manufacturing: Some German Experiences," *Management Decision*. 37

[20] R. Phaal, C. J. P. Farrukh, and D. R. Probert, 2001. "Technology management process assessment: a case

study," *International Journal of Operations & Production Management.* 21: 1116-1132..
[21] D. Bennett. 2013. "Tracking the trends in manufacturing technology management," *Journal of Manufacturing Technology Management.* 24: 5-8
[22] D. Hitchcock and M. Williard. 2006.*The Business Guide to Sustainability*. Quicksilver Drive, Sterling, VA 20166-2012, USA: Earthscan
[23] R. Seidel, M. Shahbazpour, and M. Seidel. 2011. "Establishing Sustainable Manufacturing Practices in SMEs," in *International Conference on Sustainability Engineering and Science, Talking and Walking Sustainability*, Auckland, New Zealand. 1-10.
[24] B. Tran. 2009."Green Management:The Reality of Being Green in Business," *Journal of Economics, Finance and Administrative Science.* 14,
[25] C. Y. Keong. 2003. "Energy demand, economic growth, and energy efficiency—the Bakun dam-induced sustainable energy policy revisited," *Energy Policy.* 33: 679-689
[26] R. A. Anderson. 2004. ""Climbing Mount Sustainability"," *Quality Progress.* 37: 32-7
[27] N. M. Høgevold and G. r. Svensson. 2012. "A business sustainability model: a European case study," *Journal of Business & Industrial Marketing.* 27: 142 - 151
[28] A. Reilly and A. Weirup. 2012. "Sustainability initiatives, social media activity, and organizational culture: An exploratory study," *Journal of Sustainability and Green Business.* 1: 1-15
[29] Y.-S. Chen and C.-H. Chang. 2012. "Enhance green purchase intentions: The roles of green perceived value, green perceived risk, and green trust," *Management Decision.* 50: 502-520
[30] R. P. Saxena and P. K. Khandelwal. 2012. "Greening of industries for sustainable growth: An exploratory study on durable, non-durable and services industries," *International Journal of Social Economics.* 39: 551-586
[31] Federation of Malaysian Manufacturers. 2014. "Malaysian Industries-FMM DIRECTORY 2014," Kuala Lumpur, Malaysia KDN.PP 1279/10/2012(030669)
[32] Dr Cooper and P. Schindler. 2003. *Business Research Methods*. New York, NY: McGraw-Hill/Irwin,
[33] J. Joseph F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson. 2010. *Multivariate Data Analysis: A Global Perspective*, 7th ed. Upper Saddle River, NJ: Pearson Education,
[34] H. F. Kaiser. 1974. "An index of factorial simplicity," *Psychometrika.* 39: 31-36 (
[35] S. J. Coakes and L. Steed. 2009. *SPSS: Analysis Without Anguish Using Spss Version 14.0 for Windows*. New York, NY, USA: John Wiley & Sons, Inc.
[36] D. George and P. Mallery. 2002. *A Simple Guide and Reference (11.0 update)*, 4th ed. Boston, MA: Allyn & Bacon
[37] A. P. Jones and L. R. James. 1979. "Psychological climate: Dimensions and Relationships of Individual and Aggregated Work Environment Perceptions," *Organizational Behavior and Human Performance.* 23: 201-250
[38] P. M. Podsakoff, S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology.* 88: 879-903.