VOL. 11, NO. 8, APRIL 2016 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

THE RELATIONSHIP BETWEEN WORKER INVOLVEMENT FACTOR AND CLEANER PRODUCTION FACTOR TOWARDS GREEN MANUFACTURING PERFORMANCE

A. H Nor Aziati[1], Muhammad Hairulnizam Hassan[1], Nor Hazana Abdullah[2] and Yunos Ngadiman[1]
[1]Faculty of Technology Management and Business, Department of Production and Operation Management, Universiti Tun Hussein Onn Malaysia
[2]Department of Technology Management, Universiti Tun Hussein Onn, Malaysia
E-Mail: aziati@uthm.edu.my

ABSTRACT

Green production in industries has been increasing significantly in the last few years in Malaysia and now is considered to be a mainstream challenge for organizations. In addition, the awareness is due to several factors including sustainability of the company as well as a green policy introduced by the government. Green manufacturing is considered as a form of cleaner production processes with optimization approach. However, studies related to green manufacturing practices are still insufficient because of unexposed to green technologies in production and low employee commitment. To address the gap, this study focuses on the factors involved in green production performance from Malaysia context. The two factors are worker involvement and cleaner production that significantly reported to have positive impact on green production performance. The companies selected are among electric and electronic manufacturer with ISO 14000 environment management systems and standards, waste electrical and electronic equipment in Johor as the basic criteria for the implementation of green practices. The study employed survey method adapted from previous studies and respondents were among the production engineers, managers and quality assurance personnel. The total sample size is 90 respondents. The study provides the scale to measure green practices and tested two developed hypotheses. The study confirmed cleaner production factor is the most influential factor with 61.2% of the factor explained the influence on green production performance compared with worker involvement factor (60.6%). Hence, the company should set the stage for cleaner production activities, in order to ensure collaboration and participation from the workers. Future research should include different sectors to enable comparative studies. A larger sample would also allow a detailed cross-sector comparison.

Keywords: green production performance, worker involvement, cleaner production, ISO14001.

INTRODUCTION

In recent years, green manufacturing has garnered consireable attention among Malaysia society and globally coinciding with the issue of global warming. Malaysian government has organized programs such as Earth Hour, 1Malaysia Green, *Anugerah Hijau* and others as some of the green initiatives and to increase awareness among citizen. In addition, to show continued support, the government has established the Ministry of Energy, Green Technology and Water (KeTTHA) in April 2009 during a cabinet reshuffle to replace the Ministry of Energy, Water and Communications (SMI SME Business Directory). As a kick-start, National Green Technology Policy was launched in 24th July 2009. The policy has four pillars; energy - seek to attain energy independence and promote efficient utilization, environment - conserve and minimize the impact on the environment, economy - enhance national economic development through the use of technology and social - improve the quality of life for all.

Basically, green policy is a part of government effort to educate Malaysian the healthy living and environmental friendly concept such as green living, green technology, green building, green eating and green production. This policy is essential in order to address the issue of environmental pollution resulting from manufacturing activities. For example, in 2005 Malaysia generated 151 million tons of CO_2 emission from fuel combustion in industries (Rahim and Abdul Raman 2015). In addition, the Malaysia Prime Minister committed to reduce 40% of Malaysian CO_2 intensity compared to that in 2005 by 2020 during the United Nations Climate Change Conference in Copenhagen in 2009. Thus, the practice was introduced to address the issue is Green Manufacturing (GM).

GM has become a requirement for sustainable development and a niche for competition for modern manufacturing industries. It applies the principles of environmental protection and energy conservation to production activities in order to reduce industrial waste, save energy and scarce resource, and minimize pollution to natural environment while accomplishing desired production economy (Zhang, Min, and Chen, 2011). Green production performance has seriously impacted by various factors such as worker involvement, cleaner production, supplier integration, total quality environment management and corporate environmental responsibility (Purba Rao, 2004), (Zakuan *et al*., 2010a). Among these factors, worker involvement and cleaner production were the most significant factors highlighted in previous literature. However, these factors are the least examined factors in the context of Malaysia. Malaysian companies were familiar with ISO accreditation compared to green technologies. Thus, the study able to provide a basic understanding of green production and the importance of ISO14001 implementation. This is to ensure that the company or the organizations already fulfil the conditions

in common green practices. ISO14001 registrations requires the existence of proper quality plans, programs, documentation and procedures and it is the minimal practices that helps green initiatives. Furthermore, Russo (2009) claimed that ISO 14001 certification reduced emissions significantly and give positive impact on electronic manufacturing green performance.

Therefore, the study aimed to examine the relationship of two most influential factors; worker involvement factor and cleaner production factor towards green production performance in the context of Malaysian's industries as to compare with western countries. Since there is a significant number of SME electric and electronic manufacturing plants in Malaysia, this study was conducted with the objective to demonstrate that cleaner production and worker involvement does effect green manufacturing performance. This study serves as a local case study for future literature reference since there are still a lot of research opportunities for this industry.

Problem statement

The implementation of green practices in Malaysia industries are still below the standard employed by most of western countries. This is due to the lack of green practices awareness among Malaysian companies. Government has allocated RM1.5 billion in National budget 2010 and another additional RM2.0 billion in 2013 National Budget with various types of incentives to companies. Among the incentives provided are 60% guarantee by government on green financing cost and 2% rebate on financing interest. This scheme purposed was to encourage companies and users of green technology involves in the programmes.

Green manufacturing differs from traditional manufacturing especially the focuses on environmental impact. Notwithstanding, this differentiation faces companies with new challenges, such as the major attributes of a green manufacturing success and how to assess the performance of green manufacturing. Many studies have attempted to investigate the critical success factor for green manufacturing from various perspectives such as technology, environment, resources, energy, economics and society dimensions. In current study, there are two factors to be measured; worker involvement factor and cleaner production factor towards the green manufacturing performance. Despite the high costs allocated, cleaner production strategy has been proven as an effective and economically viable approach for waste prevention and management for SME industries in developing countries such Malaysia (Rahim and Abdul Raman 2015). In fact, for most of the Japanese electric and electronic manifacturer in particular, has made it mandatory compliance to green practices in production.

Additionally, the literature highlighted the demand for Environmental Management System (EMS) and ISO 14001 accreditation. Functions of the environmental policies was to minimize and control natural environment effect that caused by the humans and industries itself. Data from International Energy Agency, (2007) state that manufacturing industries was responsible for 36% of global carbon dioxide (CO_2) emissions and it is largely blamed for the problem of global warming. Hence, many manufacturer required suppliers accredited with ISO 14001 qualification. However, the ISO certification solely does not effect on the full accomplishment of the green practices. It is because although the company has accredited with ISO 14001, it still not promising a positive impact on organisational performance. Worker involvement plays important roles in GM. Low level of worker involvement have impact the environmental regulation practices and job satisfaction in the industry (Lanfranchi and Pekovic 2014). Infect, Haslinda and Fuong (2010) asserted that the percentage of worker involvement towards green practices only 66.0% and job anxiety due to implementation of ISO14001 reached 15.5%.

Most manufacturers incompliant with the guidelines due to lack of knowledge about environmental management and effective decision-support for manufacturing enterprises to plan and implement GM projects. In reality, most green production projects are characterized by high initial investment, slow return, high risk and technical difficulty (Zhou *et al*. 2012). Therefore, the companies must adopt a systematic approach to evaluate various green production strategies and their associated risk, and identify the best decision alternative that optimizes the trade-off between production economy and green performance. Thus, this study will focus in the mention issues earlier by examine the two main factors impacting the GM Performance; worker involvement and cleaner production.

LITERATURE REVIEW

Green manufacturing

According to the Ministry of Energy, Green Technology and Water (KeTTHA), green is defined as the development and applications of products, equipments and systems used to conserve the natural environment and resources which minimize and reduce the negative impact of human activities. This shows Malaysian government seriously engaged with the environment issues. Previous studies defined green manufacturing from two persepctives (Chuang and Yang 2013); processes and product design. Defined green technology as the application of technology to conserve natural environment and resources, and to curb negative impacts of human involvement. Sivapirakasam *et al*. (2011) and Yacob *et al*. (2013) defined green manufacturing as advanced manufacturing mode, aimed to improve process efficiency and minimize environmental impact and resource consumption during manufacturing.

Green manufacturing is a part of green business strategies that are based on the principle of environmental sustainability. It focuses on profitability through environmentally friendly operating processes. These processes may constitute a key basis for competitive advantage in the coming decades. It is not just instituting pollution controls or recycling programs when

manufacturing goods but it is about minimizing the harmful impact of the manufacturing processes on the environment at every stage. Zhou *et al.* (2012) measured green manufacturing form two persepctives; energy or resource conservation (water, electricity, natural gas/oil, and recycled materials) and environmental emission/pollution. Some of the effort can be done is minimize emissions, effluents, and accidents. Second, minimize the use of virgin materials and non-renewable forms of energy. Third, minimize the life-cycle cost (cradle to grave) of products or services. However, in the context of performance, green manufacturing is usually measured from economic perspective. The next following section will discuss the details on the measurement.

Dependent variable - green manufacturing performance

According to Montabon *et al*. (2007), industry may become environmentally proactive in anticipation of more efficient utilization of resources and improved their performance and corporate image in adopting green practices. Besides, green practices can give more impacts towards the industries such as increasing efficiency, reducing costs, improving customer response time, and contributing to improved quality, greater profitability, and enhance public image (Bergmiller and Mccright 2009).

Many studies have proven the implementation of green manufacturing towards overall green initiave. For instance, Zhu *et al.,* (2007), claimed the implementation of GM has slightly improved environmental and operational performance besides creating opportunities such company's market extension. There are various methods of measurement used in the GM performance. According to Tseng *et al*. (2011), green performance is measured by fours aspect; financial aspect, learning and growth aspects, customer aspect and internal business aspect. However, Juriah Conding *et al.* (2013) measure green performance from four different perspectives; environmental performance, economic performance, operational performance and innovation performance. Therefore, this study will adopt Juriah Conding *et al.* (2013) measurement because the study is much suited with the Malaysian context. Table-1 shows the items measurement for green production performance.

Table-1. Measure of green manufacturing performance items.

Dimension	Item	Adopted sources
Green Manufacturing performance	**Environmental Performance**	- Zhu *et al*. (2008)
	- Reduce air emissions	- Montabon *et al*. (2007)
	- Reduce effluent waste	- Wagner, (2008)
	- Reduce solid wastes	- Purba Rao, (2004)
	- Decrease consumption of hazardous and toxic materials	- Lee and Klassen, (2008)
		- Dangelico (2014)
		- Juriah Conding *et al*. (2013)
	Economic Performance	- Zhu *et al*. (2008)
	- Reduce costs associated with purchased materials	- Zhu and Sarkis,(2004)
		- Wagner, (2008)
	- Energy consumption	- Purba Rao, (2004)
	- Waste treatment	- Juriah Conding *et al*. (2013)
	- Fines for environmental accidents	- Zhou *et al*. (2013)
	Operational Performance	- Zhu *et al*. (2008)
	- Efficiency in product production	- Chien *et al*. (2007)
	- Efficiency in deliver products to customers	- Juriah Conding *et al*. (2013)
	Innovation Performance	- Montabon *et al*. (2007)
	- Develop new ideas in produce product	- Wagner, (2008)
	- Reduction of environmental burdens	- Rennings, (2000)
		- Nidumolu *et al*. (2009)
		- Juriah Conding *et al*. (2013)

Independent variable - worker involvement

Many environmental agencies are now organizing training sessions and workshops to increase the awareness among the SMEs and encourage them to take active steps in pollution control and prevention (Rao 2004). Thus, Singh and Sangwan (2011) asserted that the management must ensure the total involvement of employees because organizations may have environmental experts at plant level but they are not familiar with production and design processes. They suggest that adequate training will also be needed for employees to avoid costly environmental mistakes and to increase environmental awareness. Table-2 shows the items measurement for worker involvement.

Table-2. Table of worker involvement items.

Dimension	Item	Adopted sources
Worker involvement	**Top management commitment** - Decide level of training - Decide policies - Decide communication required **Employee Training** - Well-trained workforce - Best-trained environmental engineers - Staff are given Correct version of documentation - Training areidentified **Employee Empowerment** - Ensure worker commitment - Participation in environmental practices - Motivation of employees	- Abhijeet K. Digalwar *et al*. 2013) - Harjeet Kaur, (2011) - Purba Rao, (2004) - DouglasW.S. Renwick *et al*. (2013) - Harjeet Kaur, (2011) - Purba Rao, (2004) - DouglasW.S. Renwick *et al*. (2013) - Harjeet Kaur, (2011) - Tan,(2005) - Purba Rao, (2004) - DouglasW.S. Renwick *et al*. (2013)

Independent variable - cleaner production

Cleaner production is defined as "continuous application of an integrated preventive environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment", (United Nations Environment Programme). According to J. Lash, President of the World Resources Institute, cleaner production is "an understanding of the business value to be gained from efficient use of natural resources is an important first step toward sustainability: toward building a world in which resources are managed to meet the needs of all people now and in the future". The concept of cleaner production that keeping with the sustainable development concept was to tries eliminating completely pollution and giving benefit future generations (Rao, 2004). Table-3 shows the item measurement for cleaner production.

Table-3. Table of cleaner production items.

Dimension	Item	Adopted sources
Cleaner Production	- Environmentally friendly raw material - Prevention of pollution at the source - Substitutions of environmentally questionable materials and processes - Environmental design consideration - Use of cleaner technology processes to make savings - Use of alternative sources of energy	- Purba Rao, (2004) - Abhijeet K. Digalwar *et al*. (2013) - Stuart L. Hart and Gautam Ahuja, (1996) - Hart (2005) - Milstein (2003) - Zakuan, N *et al*. (2010b)

Conceptual framework and hypotheses

A conceptual framework illustrates in Figure-1 is developed based on the literature review discussed in earlier. The hypotheses are generated to answer the two identified research questions. Previous studies stated that the two factors have positive significant correlation towards green production performance. The hypothesis is tested against the collected questionnaire data. Table-4 lists two constructed hypotheses for the study.

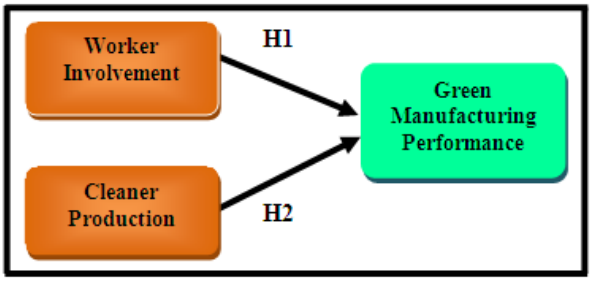

Figure-1. Conceptual framework.

Table-4. Research hypothesis.

Hypotheses		Inference
H_1	Worker involvement has a positive significant correlation towards green production performance.	Accept at $p<0.001$
H_2	Cleaner production has a positive and significant correlation towards green production performance.	Accept at $p<0.001$

METHODOLOGY

The study employed quantitative research using survey method. The purpose of using survey questionnaire was to determine the perception of the respondents towards the green production performance in the selected company. The collected data were analyzed using Statistical Package for Social Science (SPSS) version 20.0. Data collection occurred in three phases including a pre-testing, pilot test, actual survey.

Based on the literature review and the pre-test phase with the experts, a total of 28 items were developed. The items under each dimension were identified based on the literature review. While the items are literature based, inputs from the experts helped to determine appropriateness of the items and their classification under each measure. Respondents were asked to rate each item

under a five-point interval rating scale to indicate the extent of practice in their respective organizations. The study employed purposive sampling where the respondents were selected among the production line personnel incharge, production engineers, quality control and assuarance staff and official personnel involved directly with the ISO 14001 documentation and environmental management system in the company. Target comapnies were selected from the directory of ISO 9000 and ISO 14000 certified industries and industrial directory. This approach is consistent with the method adopted by Digalwar *et al*. (2013) in their study on development and validation of performance measures for green manufacturing perfoemance.

A total of 200 questionnaires were mailed out. To increase the response rate, a reminder was sent to each of the companies after about two weeks of posting of the questionnaire. Personal calls were also made in some cases. Finally 90 completed questionnaires were returned and valid.

Reliability analysis

Zakuan. N, *et al.*, (2010b) defined reliability as internal consistency of the items within a scale that aim to measure a theoretical construct. It is estimated by using Cronbach alpha's value. Nunnally (1978) stated that values of Cronbach's alpha that are above 0.7 (ranging from 0.6-0.9) for all performance measures are acceptable. During the pilot test phase, none of the items were dropped to improve reliability.

Table-5. Reliability analysis.

Variables	Cronbach's alpha	No. of items	No. of item deleted
Worker Involvement Factor	0.942	12	None
Cleaner Production Factor	0.910	12	None
Green Production Performance	0.928	14	None
Total		38	

Table-5 shows all the Cronbach's alpha values in the study are greater than 0.7, revealing the high internal consistency. The content validity of the questionnaire in the study is based on an exhaustive literature review and detailed evaluations. The worker involvement factor recorded about 0.942 while cleaner production factor is 0.902 and green production performance recorded about 0.928. Therefore, none of the items were deleted because of the high value of Cronbach's Alpha.

DATA ANALYSIS AND FINDINGS

Analysis of the data is based on the findings obtained from questionnaires distributed to 90 respondents. From the demographic profile shown in Table 4.0, male respondents is the highest respondent 65.6% with frequency of 59 respondent and female 34.4% with frequency of 31 respondents. Meanwhile, the majority of respondents aged 40 years and above with 42.2% or 38 respondents and the least is 26-30 years reaching 11.1% or only 10 respondents. This is because most of the respondents were served as supervisor at 38.9% with frequency of 35 respondents. The minority position is assistant manager about 6.6% (6 respondents) and others about 5.6% (5 respondent). Most of respondents were married with 81.1% (73 respondents) and Malays worker is the highest ethnic in the company about 86.7% (78 respondents). In term of working experience, the workers have work more than 10 years (65.6%). Next, 87.8% or 79 respondents state that the organization has operated in 16 years and above with the number of employee achieve 200 and above (87.8%).

Descriptive analysis

Respondents need to answer each question in the survey by scoring a point of 5 to 1 according to their opinion. Then, the data is computed into mean and standard deviation. Morgan *et al*., (2012) stated that the mean value obtained gives the average some of their response for each of the items that the respondents answered. While standard deviation is used to measure the dispersion of the data in which how close the entire set of data is to the average value. The lower the value of standard deviation, the closer is the data to the average value. Table-6 shows the level of mean measurement which is ranked by the central tendency level according to (Wiersma, 1995).

Table-6. Level of mean measurement.

Mean range	Central tendency level
High	**3.68-5.00**
Moderate	2.34-3.67
Low	1.00-2.33

(Source, Wiersma, 1995)

Overall, the worker involvement items in the survey questionnaire have a high mean score according to the central tendency level. The standard deviation is in range of 0.570 to 0.811. The results shows the data point are closely grouping around the mean.

For Cleaner Production factor**,** one of the items have moderate score mean. The item is "the use of alternative energy sources in manufacturing" with mean value of 3.58. Nonetheless, the items were recorded with high mean score. Additionally, the standard deviation value is in range of 0.686 to 0.914. Meanwhile, the standard deviation for green performance item is in range of 0.582 to 0.885. In conclusion, all items achieved high mean score. Next, the reseachers performed normality test by using Kolmogrov-Smirnov and Shapiro-Wilk test. The data is not normally distributed (p values < 0.005)

therefore, the study proceeds with Spearman's rho correlation test to achieve the objectives of the study. Correlation with the significance value below 0.05 is considered significant. Thus, null hypotheses will be rejected. Table-7 shows the hypotheses testing results. The correlation coefficient shows that there is relationship between worker involvement factor (60.6%), cleaner production (61.2%) and green manufacturing performance. Thus, the study confirmed that Cleaner Production factor is the most influential factor for the case of this study.

Table-7. Correlation analysis.

		WI	CP	GM
WI factor	**Correlation coefficient**	**1.000**	**0.596****	**.606****
	Sig. (2-tailed)		0.000	0.000
CP Factor	Correlation Coefficient	0.596**	1.000	0.612**
	Sig. (2-tailed)	0.000		0.000

*CP- Cleaner production, WI- Worker Involvement, GM-Green Manufacturing

CONCLUSIONS

As conclusion, the outcome of this study provide better understanding on the two factors which are worker involvement and cleaner production towards green production performance. Questionnaires survey method has been chosen as data collection instrument for this quantitative research study. Main focus of this study to determine level of two factors, worker involvement and cleaner production relationships towards green production performance. Based on those factors also, several items have been identified according to each variables contained. The listed items are the criteria needed in this study to measuring green production performance and it will be put via questionnaire forms survey. The results have shown that cleaner production factor is the most prominent factor effects firm's green production with 61.6% of the factor explained the green manufacturing performance at significant level of $p<0.000$ compared to 60.6% of worker involvement factor. Relatively, the Cleaner Production (CP) has been considered as more important that contributed to the improved performance of green production in the companies involved. Furthermore, there is no significant difference between each factor influence on green manufacturing performance perceived by different manufacturer.

As a proactive measure, plant manager, need to set the stage for CP activities, in order to ensure collaboration and participation from the workers because good CP opportunities are dependent on the involvement of the workers. Workers, in particular those involved in the daily operations and maintenance on the shop-floor, is responsible for the green practices, and are often able to come up with solutions. The study also affirmed that the implementation of ISO14001 has contributed to basic practices of green manufacturing processes. As overall, the expectation through this study was to help in improving green production performance in this country within the industries especially and to keep better environment condition in the future.

REFERENCES

Aamadi, A. 2002. Mathematic and Statistic. Tehran Universities Publications Centres: Tehran.

Bergmiller, G.G. and Mccright, P.R. 2009. Parallel Models for Lean and Green Operations. Industrial Engineering Research Conference, pp.1138–1143.

Chuang, S.-P. and Yang, C.-L. 2013. Key success factors when implementing a green-manufacturing system. Production Planning and Control, 25(11), pp. 923-937. Available at: http://www.tandfonline.com/doi/abs/10.1080/09537287.2013.780314.

Dangelico, R.M. 2014. Improving firm environmental performance and reputation: The role of employee green teams. Business Strategy and the Environment.

Digalwar, A.K., Tagalpallewar, A.R. and Sunnapwar, V.K. 2013. Green manufacturing performance measures: an empirical investigation from Indian manufacturing industries. Measuring Business Excellence, 17, pp. 59-75. Available at: http://www.emeraldinsight.com/10.1108/MBE-09-2012-0046.

Goh Yen Nee. 2011. Determining Factors for ISO14001 EMS Implementation among SMEs in Malaysia: A Resource Based View. World Academy of Science, Engineering and Technology International. Journal of Social, Human Science and Engineering. Vol. 5, No. 11, 41-46.

Gonzalez-Benito, J. and Gonzalez-Benito, O. 2005. Environmental proclivity and business performance: An empirical analysis. The International Journal of Management Science, 33: 1-15.

Haslinda, A. and Fuong, C.C. 2010. The Implementation of ISO 14001 Environmental Management System in Manufacturing Firms in Malaysia. Asian Social, 6(3), pp. 100-107.

Hart, S. L., Ahuja, G. and Arbor, A. 2000. Does it pay to be Green? An Empirical Examination of The Relationship Between Emission Reduction and Firm Performance, 5 (1996), 30-37.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. and Tatham, R. L. 2006. Multivariate data analysis. 6th edition, Upper Saddle River: Pearson Education International.

Juriah Conding *et al*. 2013. A Review: The Impacts of Green Practices Adoption on Green Performance in the Malaysian Automotive Industry. Journal of Sustainable Development Studies, 2(1), pp. 109-126.

Kaur, H. and Unisa, D. B. A. 2011. Impact of Human Resource Factors on Perceived Environmental Performance : an Empirical Analysis of a Sample of ISO 14001 EMS Companies in Malaysia, 4(1), 211–224.

Lanfranchi, J. and Pekovic, S. 2014. How green is my firm? Workers' attitudes and behaviors towards job in environmentally-related firms. Ecological Economics, 100, pp. 16-29. Available at: http://dx.doi.org/10.1016/j.ecolecon.2013.12.019.

Montalvo, C. 2008. General wisdom concerning the factors affecting the adoption of cleaner technologies: A survey 1990-2007. Journal of Cleaner Production, 16(1), S7-S13.

Montabon, F., Sroufe, R. and Narasimhan, R. 2007. An examination of corporate reporting, environmental management practices and firm performance. Journal of Operations Management, 25(5), pp. 998-1014.

Morgan, G. A., Leech, N. L., Gloeckner, G. W. and Barrett, K. C. 2012. IBM SPSS for Introductory Statistics: Use and Interpretation, Fifth Edition. Routledge.

Nunnally, J. 1978. Psychometric Theory, 2nd ed., McGraw-Hill, New York, NY.

Perminder Jit Singh, KS Sangwan. 2011. Management Commitment and Employee Empowerment in Environmentally Conscious Manufacturing Implementation. Proceedings of the World Congress on Engineering, Vol 1.

Rahim, R. and Abdul Raman, A.A. 2015. Cleaner Production implementation in a fruit juice production plant. Journal of Cleaner Production, 101, pp. 215-221. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0959652615002966.

Rao, P. 2004. Greening production: a South-East Asian experience. International Journal of Operations and Production Management, 24(3), pp. 289-320.

Rehman, M. A. A., Shrivastava, R. R. and Shrivastava, R. L. 2013. Validating Green Manufacturing (GM) Framework for Sustainable Development in an Indian Steel Industry, 1(2), 49-61. doi:10.13189/ujme.2013.010204.

Renwick, D. W. S., Redman, T. and Maguire, S. 2013. Green Human Resource Management: A Review and Research Agenda*. International Journal of Management Reviews, 15(1), 1-14. doi:10.1111/j.1468-2370.2011.00328.x

Rusinko, C. A. 2010. Green Manufacturing : An Evaluation of Environmentally Sustainable Manufacturing Practices and Their Impact on Competitive Outcomes, 54(3), 445-454.

Russo, M. V. 2009. Explaining the impact of ISO 14001 on emission performance: A dynamic capabilities perspective on process and learning. Business Strategy and the Environment, 18(5), pp. 307-319.

Saraph, J.V., Benson, P.G. and Schroeder, R.G. 1989. An instrument for measuring the critical factorsof quality management'', Decision Sciences Journal, Vol. 20 No. 4, pp. 810-829.

Sulaiman Maseri. 2005. Kaedah Penyelidikan Dan Panduan Penulisan, Utusan Publishing and Distributors, Kuala Lumpur.

Shrivastava, P, and Stuart Hart. 1992. "Greening Organizations." Academy of Management Best Paper Proceedings. Vol. 52, 185-189.

Singh, P.J. and Sangwan, K.S. 2011. Management Commitment and Employee Empowerment in Environmentally Conscious Manufacturing Implementation. , I.

Sivapirakasam, S.P., Mathew, J. and Surianarayanan, M. 2011. Multi-attribute decision making for green electrical discharge machining. Expert Systems with Applications, 38(7), pp. 8370-8374. Available at: http://dx.doi.org/10.1016/j.eswa.2011.01.026.

Taylor, P., Chuang, S. and Yang, C. (n.d.). Production Planning and Control : The Management of Operations Key success factors when implementing a green-manufacturing system, (October 2013), 37-41. doi:10.1080/09537287.2013.780314.

Tseng, M.L. *et al*. 2011. Using hybrid method to evaluate the green performance in uncertainty. Environmental Monitoring and Assessment, 175(1-4), pp. 367-385.

Tuttle, T. and Heap, J. 2008. Green productivity: moving the agenda. International Journal of Productivity and Performance Management. 57(1), 93-106. doi:10.1108/17410400810841254

Wiersma W. 1995. Research methods in education: An Introduction" (6th ed.). Boston: Allyn and Bacon.

Yacob, P. *et al*. 2013. The policies and green practices of Malaysian SMEs. Global Business and Economics Research Journal, 2(2), pp. 52-74.

Zakuan N.M., Yusof S.M., Laosirihongthong T., Shaharoun A.M. 2010. Proposed relationship of TQM and organisational performance using structured equation modelling, Total Quality Management and Business Excellence, 21(2), pp. 185-203.

Zakuan, N, Saman, M.Z.M, Hemdi, A.R. 2010. Critical Success Factors of Green Design Implementation for Malaysia Automotive Industry, (Icmst), 36-40.

Zhou, M. *et al*. 2013. Optimizing green production strategies: An integrated approach. Computers and Industrial Engineering, 65(3), pp. 517-528. Available at: http://dx.doi.org/10.1016/j.cie.2013.02.020.

Zhou, M. *et al*. 2012. Selection and evaluation of green production strategies: Analytic and simulation models. Journal of Cleaner Production, 26, pp. 9-17. Available at: http://dx.doi.org/10.1016/j.jclepro.2011.12.014.

Zhu, Q. and Sarkis, J. 2007. The moderating effects of institutional pressures on emergent green supply chain practices and performance", International Journal of Production Research, Vol. 45, Nos. 18-19, pp. 4333-4355.

Zhang, Q., Min, X. and Chen, Y. 2011. Reflection on the development of low-carbon cities from the perspective of systems engineering. Systems Engineering, 29(1), 1-7.