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BENCHMARKING THE MANUFACTURING PROCESS OF SRI LANKAN GARMENT MANUFACTURING COMPANIES

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ABSTRACT

The research was carried out to develop a method to measure and compare the manufacturing performance of Sri Lankan garment manufacturers. A Performance Measurement Model was developed. TOPSIS and AHP Multi Criteria Decision Making (MCDM) techniques were used to compare the performances. A case study was done to validate the method. 25 manufactures participated in the study. Data were collected through questionnaire and structured interviews. A performance ranking was given to each manufacturer and their weak points were identified. The proposed method was validated and could be applied only for the manufacturing performance of garment manufactures.

Keywords

Benchmarking, Performance Measurement, Multi Criteria Decision Making, Key Performance Indicators

1. INTRODUCTION

The apparel industry is the key source of export income and formal employement in Sri Lanka. The industry contributes around 40 percent of total industrial production and provide employement to 280,000 people directly. Around 1.2 million people are dependent upon the industry indirectly (Acevedo G. L., Robertson R. 2012) the industry had 300 apparel manufacturing firms by 2009.

In this very competitive industry manufacturers have to constantly involve in continuous improvement of products, processes and methods to improve performance and to be sustained in the business. According to many industry experts, it is yet, an unfulfilled requirement to have tools and methods that can compare the performance of manufacturers against each other.

Benchmarking has been widely accepted as a tool for continuous improvement (Camp, 1989). "Benchmarking is classically seen as a tool to improve organization's performance and competitiveness in business life" (Kyro¨, 2003). Many organizations that have adopted benchmarking have attained numerous benefits and succeeded in their businesses (Denkena et al, 2006). However, we failed to find a scholary articale related to any benchmarking attempts in Sri Lankan garment industry. Therefore, this study will be the first attempt in this area.

This study aims to develop a benchmarking model incoperated with a performance measurement model by which benchmarking more than two organizations is possible. Two Multi Criteria Decision Making (MCDM)Techniques (Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) and Analytical Heirachy Process (AHP) were used as means of comparing. The paper begins with a review of benchmarking and performance measurement. The proposed models are then presented. The next section is about an application case study for evaluating the model and benchmarking of 25 manufacturers. Finally, we conclude with some discussion and future directions related to this benchmarking modeling and application effort.

2. LITERATURE SURVEY

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of past actions. Performance measurement is recognized as an important part of the manufacturing strategy literature (Parthiban &

Goh, 2011).Garvin (as cited in Parthiban & Goh, 2011) gives a phrase mentioned in Harverd Business Review implying how much performance measurement is important: "If you cannot measure it, you cannot manage it" therefore, ways and means of accurately measure performance is an important field in research for both academics and organizations (Parthiban & Goh, 2011)

To measure performance, performance indicators are required. A set of quantifiable measures that are used by a firm or industry to gauge or compare performance in terms of meeting their strategic and operational goals are known as Key Performance Indicators (KPI's) (INVESTOPEDIA).KPI's help organization to measure the current performance, identifying the areas to be improved, prepare plans and goals and improve the overall business. Gomes *et al* (as cited in Parthiban & Goh, 2011) have identified about 65 Key performance indicators that can be found in deferent dimensions such as Financial, Product quality and customer satisfaction, Process efficiency, Product and process innovation, Competitive environment, Quality/independence of management, Human resource management and Social responsibility. However, in this study it was difficult to collect data on financial KPIs since many participants believed that they were extremely sensitive information.

Performance measurement models are some comprehensive models which show the relations among various performance measures used by a firm (Magretta, 2002). Performance Measurement Models can be developed by researchers for various purposes. Examples are the DuPont ROI formula (Zimmerman, 1997), EVA (Adimando et al, 1994), Otley's (1999) performance management model, Epstein et al.'s (2000) APL model and the balanced scorecard (BSC) (Kaplan and Norton, 1996, 2001)

Camp (1989) introduces benchmarking process as a continuous process of analyzing performance gap and sharing best practices between two firms. But modern literatures discuss benchmarking in a multi institutional facet where more than two firms can participate in benchmarking. For example Goncharuk (as cited in Ivan, 2010)provides a broader definition by specifying the three main components of the aim of benchmarking; (1) to compare the performance of the companies against each other, (2) to identify which companies that operate the most efficient and (3) to give a ranking of their main companies referred the efficient ones.

Benchmarking and performance are closely related terms. Establishing a definition for benchmarking, Vaziri (1992) states "Benchmarking is the process of continually comparing a company's performance on critical customer requirements against that of the best in the industry (direct competitors) or class (companies recognized for their superiority in performing certain functions) to determine what should be improved".(Vaziri, 1992).

Traditional benchmarking enables the performance comparison between two organizations only. Some early literatures such as

Anand and Kodali (2008) define benchmarking process models are models which describe the steps that should be carried out while performing benchmarking. In research literature, it is seen that a large number of process models have been suggested to contribute to the carrying out of a benchmarking (Buyukozkan and Maire, 1998; Maire, 2002).

According to Anand & Kodali (2008), Anderson and Moen (1999) have identified 60 different existing models developed and proposed by various academics, researchers, consultants and experts in the field. All of these models are not similar but they consist of quasi similar steps. Therefore, the benchmarking process should be customized by participating firm(s) depending on their strategic requirements.

In a benchmarking model where more than two firms can participate by consensus, the model uses some comparative tools to give a ranking to each firm for its performance. The model further allows studding the performance gap, and letting organizations to identify what caused them for low performance or high performance having compared to their peers. For example Stoeberl *et al.*(2009) explains such an attempt to benchmark selected coffee retailer shops. They use Data Envelopment Analysis (DEA) as a tool and Charnes-Cooper-Rhodes (CCR), Banker-Charnes-Cooper (BCC), and bilateral CCR and BCC models for benchmarking. Another similar attempt is discussed by Goncharuk (2008) in benchmarking performance of gas distribution centres where DEA is used as the tool.

Mehregan *et al.*(2010) explains a benchmarking process model of which the focus is on performance measures not on input variables. TOPSIS and Goal Programming techniques are used as comparitive tools. Each firm is ranked according to its performance. The model can indicate which performance measures should be improved . The major difference of this model from other models is that even the top ranked rival has a benchmark to be achieved.

TOPSIS, Goal Programming and AHP are known as Multi Criteria Decision Making (MCDM) techniques. The TOPSIS selects the most preferable alternative such that it has the shortest distance from Ideal solution and the longest distance from negative idal solution (Mehregan *et al.*2010). "Ideal solution is composed of all the best values attainable of criteria, whereas negative ideal solution is made up of all worst values" (Tsaur et al., (2002) as cited in Mehregan *et al.*2010).

3. RESEARCH METHODOLOGY

3.1. Data Collection

The purpose of data collection was to find the most effective KPI's in Sri Lankan garment industry and to develop the performance measurement model. Prior to the actual data collection, few pre industry visits were done to extract KPIs in different organizations. Also, the generic model had to be validated with Sri Lankan industry. A list of 107 KPIs was prepared from these visits and through literature survey. Then the list was tested in two organizations and reduced to 76 KPI's. A questionnaire is prepared from these KPI's which were distributed among ten sub functional areas. Questionnaire was tested with one organization.

Actual data collection was carried out through on site visit and interviews with firm's representatives. The interviews were well structured. The firms were informed about the research and the questionnaire was mailed to them prior to the visits. They were convinced that their identity would be kept at anonymous state to protect the privacy of data. They were asked to fill the questionnaire during the interview sessions. Due to this well-structured format of the interviews the effectiveness of the data collection was kept at markedly high level, and it was possible to collect even very sensitive data about the organization. The questionnaire consisted of three parts. In the first part of the questionnaire the 76 KPI's were presented and firms were asked to give ratings based on the impact of each KPI to the relevant sub functional area. In the second part each firm was asked to rate sub functional areas based on their impact to the each key functional area. In the third part each key functional area was required to be rated based on its impact to the overall performance. A 1-5 scale was used for all the three parts; 1 being "not related" all and 5 being "very high".

As stated above the team visited all manufacturing sites and therefore the total sample collected was 27. Two responses were not used due to the incompleteness in questionnaires. Therefore, the number of total responses used in analysis was 25. The population that covered by the research is 300 and it is highly diverse in nature due to product portfolio, customers, production capacity, geological location, technology, and the group. The sample was selected covering all of these factors. There were five intimate suppliers (20 percent), five active wear suppliers (20 percent), five casual wear suppliers (20 percent), four child wear suppliers (16 percent) and eight others (24 percent) with different product categories.

60 percent of the sample was found from the Western province of Sri Lanka and 40 percent of the sample was taken outside the Western province.

3.2. Development of conceptual models

According to Hurreeram (2007) generic model, a garment manufacturing system consists of three key functional areas, namely Operations, Plan & Policy and Merchandising/Marketing. In his generic model all the sub functional areas are also defined. The proposed performance measurement model is adapted from this generic model. Our model uses the same hierarchical layout due to two reasons; (1) It fits with the manufacturing process of Sri Lankan garment manufacturer, (2) The layout best fits with the organizational structure, reprsents the decision making heirarchy. Therefore, it is easy to take corrective actions.

The suggested PMM represents performance of an organization in three levels. Further the model allows comparing perfomance with other organizations and identification of weak areas.

After reviewing many literatures, the benchmarking process model was developed. The benchmarking model should be operated with the

performance measurement model, TOPSIS and AHP as analytical tools. .

3.3. Identification of Most Effective KPIs

To identify the most effective KPI's for the model, an importance index was calculated for each KPI. Zhang (as cited in Haponava & Al-Jibouri, 2010) presents a simple formula for calculating the importance index using a 1-3 scale. This formula has been modified for this study since it uses a 1-5 scale.

$$\text{Importance Index } (I_i) = \frac{20*R_{i1}+40*R_{i2}+60*R_{i3}+80*R_{i4}+100*R_{i5}}{R_{i1}+R_{i2}+R_{i3}+R_{i4}+R_{i5}}$$

Where I_i=importance index for the *i*th issue,

R_{i1} =number of responses "Not related",

R_{i2} =number of responses "Low",

R_{i3} =number of responses "Medium",

R_{i4} =number of responses "High".

R_{i5} =number of responses "Very high".

3.4. Calculation of relative importance weights

For the calculation of relative weights for KPI's the following simple equation was employed.

$$\text{Relative importace weight } (W_k) = \frac{I_k}{\sum_{k=1}^{n} I_k}$$

Where,

I_k = importance index of K^{th} KPI in a particular sub functional area

Importance index for each sub functional area was also calculated based on the ratings obtained in the questionnaire. The index was then converted into importance weight for each sub functional area following equation.

$$\text{Relative importace weight} = \frac{\text{Impotance index of the sub functional area}}{\text{Total index of all sub functional areas in the key functional area}}$$

Importance index for each key functional area was also calculated based on the responses (ratings) obtained through questionnaire. . The importance index was then converted to relative importance weight from following equation.

$$\text{Relative importace weight} = \frac{\text{Impotance index of the key functional area}}{\text{Total index of all key functional areas}}$$

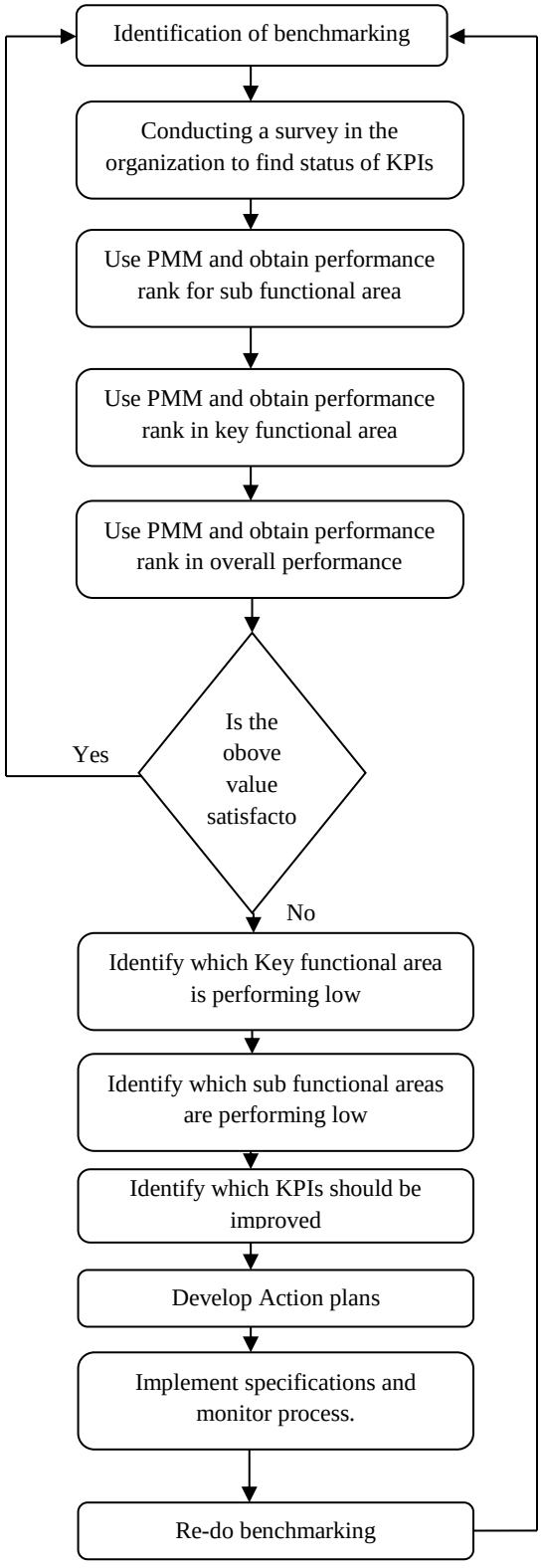

Figure 3.1 Benchmarking Model

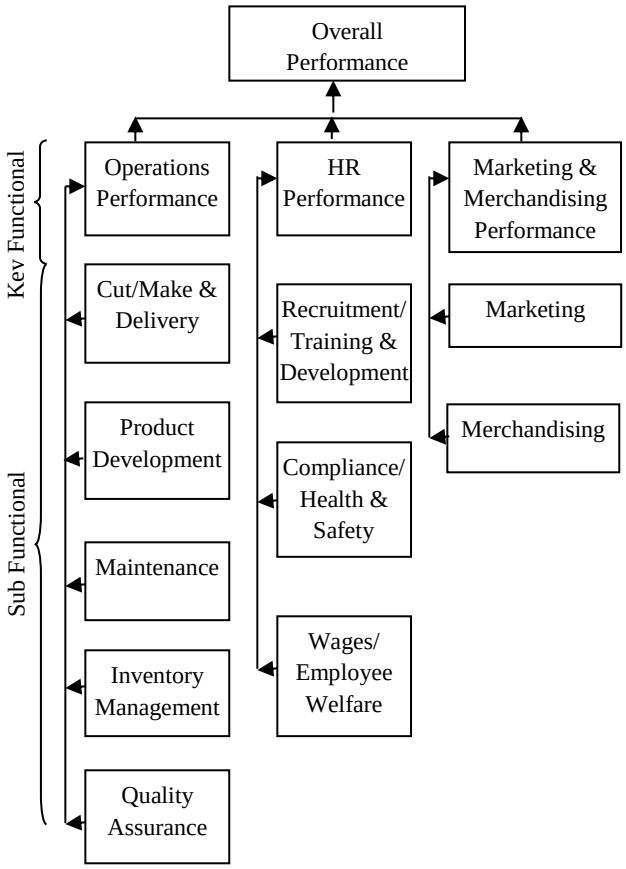

Figure 3.2 Performance Measurement Model

3.5. Obtaining the Performance Ranking within Sub Functional Area Applying TOPSIS

For each sub functional area of which*n* number of decision criteria (KPIs) and *m* number of alternatives (manufactures) are usedan$n \times m$ matrix is formed.

Figure 3.3 Criteria (KPIs) - Alternatives (Manufactures) Matrix

Step 1: All the values in KPIs should be normalized. For each KPI the following equation can used to achieve the normalized scores for manufactures.

$r_i = x_i / \sqrt{(\Sigma x^2_i)}$

Where,

r_i= normalized score of i^{th} manufacturer for the given KPI

x_i= value of the i^{th} manufacturer for the given KPI

Step 2: The weighted normalized matrix is constructed using following equation.

$V_{ij} = w_j r_{ij}$

Where,

v_{ij}= weighted normalized score of i^{th} manufacturer for j^{th} KPI

w_j= relative importance weight of j^{th} KPI

r_{ij}= normalized score of i^{th} manufacturer for j^{th} KPI

Step 3: The negative and positive ideal solutions were obtained. For positive ideal solution (A*) all the best values of KPIs are selected. If the KPI is a benefit attribute (i.e. more is better) the maximum value is selected (Production efficiency). If the KPI is a cost attribute (i.e. less is better) minimum value is selected (e.g. Labor turnover).

For negative ideal solution (A')all the worst values of KPIs are selected. If the KPI is a benefit attribute (i.e. more is better) the minimum value is selected (Production efficiency). If the KPI is a cost attribute (i.e. less is better) maximum value is selected (e.g. Labor turnover).

Step 4: Separation measures for each manufacturer are calculated.

$S_i^* = [\Sigma (v_j^* - v_{ij})^2]^{1/2}$ i = 1, …, m

$S_i' = [\Sigma (v_j' - v_{ij})^2]^{1/2}$ i = 1, …, m

Where,

S_i^*= separation from positive ideal solution for i^{th} manufacturer,

S_i' =separation from negative ideal solution for i^{th} manufacturer,

v_j^*= j the KPI value in positive ideal solution,

Manufacturers

Key performance Indicators	FAC_1	FAC_2	..	..	FAC_m
KPI_1	…..	…..	…..	…..	…..
KPI_2	…..	…..	…..	…..	…..
KPI_3	…..	…..	…..	…..	…..
..	…..	…..	…..	…..	…..
..	…..	…..	…..	…..	…..
KPI_n	…..	…..	…..	…..	…..

v_j'= J^{th} KPI value in negative ideal solution,

v_{ij} = weighted normalized score

Step 5: Relative closeness coefficients are calculated for each manufacturer

$C_i^* = S'_1 / (S_i^* + S'_i)$ $0 < Ci^* < 1$

Where,

C_i^*= Relative closeness coefficient

S_i^* = Separation from positive ideal solution for i^{th} manufacturer

S_i' = Separation from negative ideal solution for i^{th} manufacturer

3.7. Obtaining the Performance Ranking in Key Functional Area Applying AHP

The output coefficients can be considered as importance scores and input to the AHP.

Manufacturers

Sub functional areas	FAC_1	FAC_2	FAC_3	..	..	FAC_m
S_1	…..	…..	….	…..	…..	…..
S_2	…..	…..	…..	…..	…..	…..
S_3	…..	…..	…..	…..	…..	…..
..	…..	…..	…..	…..	…..	…..
..	…..	…..	…..	…..	…..	…..
S_K	…..	…..	…..	…..	…..	…..

Figure 3.4 Criteria (Sub functional area) - Alternatives (Manufactures) Matrix

Coefficients for all manufactures are multiplied by relative importance weights of sub functional areas. Finally for each manufacturer all

multiplied values are summed up to get the performance score. When the performance scores are arranged in descending order, the performance ranking in the key functional area is achieved.

3.6. Obtaining Ranking for Overall Performance applying AHP

Input to the AHP is the set of performance scores achieved in key functional area level. There is *m* number of such values for each key functional area (from rivals). Therefore, this forms a 3 × *m* matrix. Using simple additive method the performance ranking for each rival is achieved.

Figure 3.5 Criteria (Key Functional Area) - Alternatives (Manufactures) Matrix

Table 3.1Performance Ranking in Sub Functional Area

Manufacturers

Key functional areas		FAC_1	FAC_2	..	..	FAC_m
	Operations	…..	…..	…..	…	…..
	HR	…..	…..	…..	…	…..
	Merchandising &Marketing	…..	…..	…..	…	…..

Factory	Inventory Management	Product Dev.	Quality Assurance	Maintenance	Recruitment T&D	Wages & Welfare	Compliance	Marketing	Merchandising	Cut, Make, Trim & Delivery
F_1	7	17	4	14	15	11	3	1	2	2
F_2	9	9	20	22	24	6	25	24	17	12
F_3	11	3	9	20	12	9	5	8	1	13
F_4	2	25	12	15	5	23	13	21	16	3
F_5	17	14	2	24	8	13	18	16	14	24
F_6	13	24	19	21	22	25	11	18	13	22
F_7	18	10	23	23	20	21	19	17	5	16
F_8	10	2	21	16	14	17	20	15	6	20
F_9	6	1	24	12	6	19	17	13	18	8
F_{10}	23	17	10	25	3	3	14	5	4	21
F_{11}	5	15	25	5	9	7	8	22	24	5
F_{12}	1	20	11	10	25	8	15	4	11	7
F_{13}	20	16	7	2	2	22	23	11	20	4
F_{14}	22	11	5	7	4	2	7	19	19	1
F_{15}	19	21	18	9	16	18	16	2	25	6
F_{16}	4	7	17	8	10	16	22	20	3	19
F_{17}	15	3	8	18	18	14	1	6	7	15
F_{18}	14	12	13	11	21	20	2	10	21	18
F_{19}	3	23	14	13	17	24	10	25	15	14
F_{20}	21	13	22	3	13	10	6	7	22	23
F_{21}	24	8	16	19	1	12	21	14	12	10
F_{22}	25	22	6	6	23	5	24	23	23	9
F_{23}	12	3	1	4	7	1	12	3	8	11
F_{24}	8	17	15	17	19	15	4	9	9	25
F_{25}	16	3	3	1	11	4	9	12	10	7

Table 3.2 Performance Rankings (Final)

Factory	Operations	Marketing & Merchandising	Plan & Policy	Overall Performance Score	Overall Ranking
F_1	4	1	7	0.659403	2
F_2	15	23	25	0.482898	25
F_3	8	2	9	0.636507	4
F_4	17	20	18	0.556059	19
F_5	23	14	14	0.556876	18
F_6	24	16	23	0.546252	20
F_7	21	10	24	0.557213	17
F_8	11	8	21	0.587404	13
F_9	10	13	16	0.584146	15
F_{10}	25	3	5	0.596807	10
F_{11}	13	25	8	0.542613	21
F_{12}	6	6	22	0.60575	7
F_{13}	5	15	13	0.597278	9
F_{14}	2	18	2	0.63188	5
F_{15}	12	21	17	0.541379	22
F_{16}	7	11	19	0.592567	12
F_{17}	9	4	4	0.638528	3
F_{18}	14	17	12	0.584171	14
F_{19}	16	24	20	0.508714	24
F_{20}	18	19	10	0.57961	16
F_{21}	19	12	3	0.599837	8
F_{22}	22	22	15	0.513845	23
F_{23}	1	5	1	0.707594	1
F_{24}	20	7	11	0.595351	11
F_{25}	3	9	6	0.62941	6

4. CASE STUDY

25 Sri Lankan garment manufacturers participated in the case study. They were asked to provide the values for all 76 KPI's. To keep the confidentiality of the data, the manufactures would be presented in the form of F_1, F_2, F_3, F_4…….. F_{25} .

After application of above process, the performance ranking obtained by each manufacturer is shown in Table 3.1.

The Table3.2 shows the final results.

Radar diagrams can help analyzing the performance gap in detail. For example, if F23 performance is compared with F14 in key functional areas,It shows that F_{14} is performing nearly equal to F_{23} in Operations and Plan & Policy. But it has a considerable gap with F_{23} in Merchandising/Marketing area. It is the weakest key functional area that needs attention.

Similarly radar diagrams can be used to identify weak KPI's in a Sub Functional area

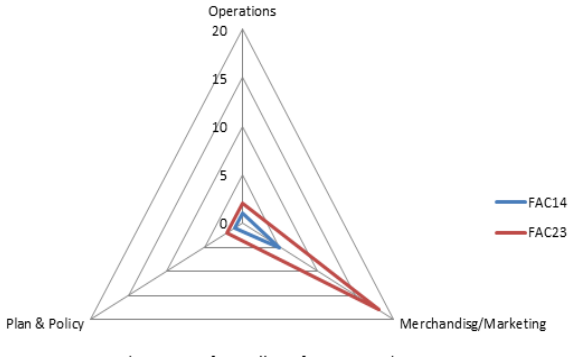

Figure 4.1Radar Diagram Key functional area performaance

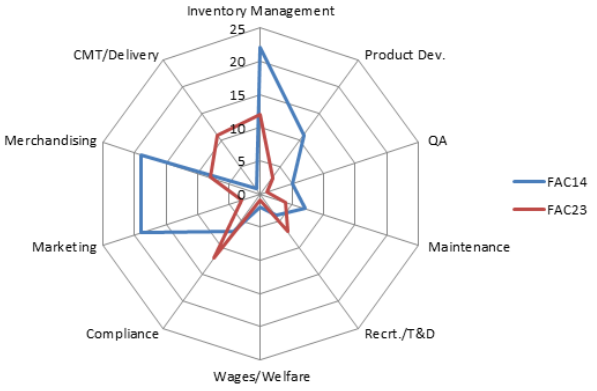

Figure 4.2Radar Diagram – Sub functional areas

5. DISCUSSION AND RECOMMENDATIONS

The purpose of this project is to present a solution to fill up the gap created by absence of a benchmarking tool in the Sri Lankan garment

industry. The project presents a system that enables benchmarking several garment making companies together. The companies can compare their performance against each other in three levels. If an organization is satisfied with the ranking, it should redo benchmarking with another set of organizations since benchmarking is a never ending process.

There might be one difficulty faced when using this model. This is because it uses extensive mathematical operations in finding the performance rankings. There are totally 14 matrixes to be solved by TOPSIS and AHP. To solve this, computer software can be made to perform these mathematical operations. This is one of the future works left by the project.

One of the limitations imposed in this project is that it does not extend to implement action plans and strategies in selected 25 manufacturers based on the benchmarking findings. It illustrates only what areas to be improved for the superior performance. It does not extract best practices from top ranked manufacturers and communicate them to bottom ranked manufacturers. This is completely due to the confidentiality of data gathered during the project. However, it is a responsibility of the manufacturer to develop and implement action plans based on the benchmarking findings.

6. REFERENCES

1. Adimando, C., R. Butler, S. Malley, S. A. Ravid, R. Shepro, R. H. Vernon, J. Willett and J. Zimmerman. 1994. Stern Stewart EVA Roundtable, *Journal of Applied Corporate Finance*, Vol.7 (No.2), pp. 46-70.
2. Anand, G., &Kodali, R. (2008). "Benchmarking the benchmarking models". *Benchmarking: An International Journal*, Vol. 15 (No. 3), pp. 257-291.
3. Asrofah, T., Zailani, S., & Fernando, Y. (2010). "Best practices for the effectiveness of benchmarking in the Indonesian manufacturing companies". *Benchmarking: An International Journal*, Vol.17, pp. 115-143.
4. Balm, G.J. (1996), "Benchmarking and gap analysis: what is the next milestone?" *Benchmarking for Quality Management & Technology*, Vol. 3 (No. 4), pp. 28-33.
5. Belton V. (1986). "Comparison of the analytic hierarchy process and a simple multi-attribute value function". *European Journal of Operational Research*, Vol. 26, pp. 7–21.
6. Bolstorff P. (n.d.). "Balancing Your Value Chain Metrics, Using The Balanced Scorecard to manage value chain performance". Retrieved February 2009, from http://www.etsi.org.
7. Bragge, J.; Korhonen, P., Wallenius, H. and Wallenius, J. (2010). "Bibliometric Analysis of Multiple Criteria Decision Making/Multiattribute Utility Theory". *IXX International MCDM Conference Proceedings, (Eds.) M. Ehrgott, B. Naujoks, T. Stewart, and J. Wallenius*. Springer, Berlin.
8. Brans, J.P., Mareschal, B., Vincke, Ph., 1984. "PROMETHEE: A new family of outranking methods in multicriteria analysis". *In: Brans, J.P. (Ed.), Operational Research _84. North-Holland, New York*, pp. 477–490.
9. Camp, R.C. (1989), *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance*, ASQC Quality Press, Milwaukee, WI.
10. Denkena, B., Apitz, R., &Liedtke, C. (2006). "Knowledge-based benchmarking of production performance". *Benchmarking: An International Journal*, Vol. 13 (No. 1/2), pp. 190-199.
11. GOAL/QPC. (1995). *The Team Memory Jogger*. Madison, WI: Joiner Associated Inc.
12. Goncharuk, A. G. (2008). "Performance benchmarking in gas distribution industry". *Benchmarking: An International Journal*, Vol. 15 (No. 5), pp. 548-559.
13. Gunasekaran, A &Kobu,B. (2007) "Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications," *International Journal of Production Research*, vol. 45, pp. 2819 - 2840.
14. Haponava, T., & Al-Jibouri, S. (2010). "Establishing influence of design process performance on end-project goals in construction using process-based model". *Benchmarking: An International Journal*, Vol. 17 (No. 5), pp. 657-676.
15. Huff, A. & M. Jenkins (eds.) (2003). *Mapping Strategic Knowledge*. Thousand Oaks, CA: Sage Publications.
16. Hwang, C.L., Yoon, K., 1981. Multiple Attribute Decision Making. In: Lecture Notes in Economics and Mathematical Systems 186. Springer-Verlag, Berlin.
17. Jayasuria, S. (2011, October 17). *Apparel industry maintaining dominant role*. Retrieved October 22, 2011, from Sri Lanka Business News Online edition of Daily News - Lakehouse Newspapers.html: http://www.dailynews.lk/2011/10/17/main_News.asp
18. Kaplan, R.S. and D.P. Norton. (2001). *The Strategy-Focused Organization.* Boston, MA: Harvard Business School Press.
19. Kelegama, S. (2005). "Ready-Made Garment Industry in Sri Lanka: Preparing to Face the Global Challenges". *Asia-Pacific Trade and Investment Review*, Vol. 1 (No. 1), pp.51-67.

20. *KPI*. (n.d.). Retrieved March 24, 2011, from www.investopedia.com: http://www.investopedia.com/terms/k/kpi.asp#axzz1cW5ovGZ6
21. Köksalan, M., Wallenius, J., and Zionts, S. (2011). *Multiple Criteria Decision Making: From Early History to the 21st Century*. Singapore: World Scientific.
22. Magretta, J. (2002). "Why business models matter". *Harvard Business Review*, Vol.80 (No.5).
23. Mehregan, M. R., Nayeri, M. D., &Ghezavati, V. R. (2010). "An optimisational mode lof benchmarking". *Benchmarking: An International Journal*, Vol. 17 (No. 6,), pp. 876-888.
24. Neely A., Gregory M., &Platts K. (1995), "Performance measurement system design: A literature review and research agenda," *International Journal of Operations & Production Management*, vol. 15, pp. 80-116.
25. Parthiban, P., &Goh, M. (2011). "An integrated model for performance management of manufacturing units". *Benchmarking: An International Journal*, Vol. 18 (No. 2), pp. 261-281.
26. *Performance indicator*. (n.d.). Retrieved June 12, 2011, from en.wikipedia.org: http://en.wikipedia.org/wiki/Performance_indicator.html
27. *Performance measurement model*. (n.d.). Retrieved July 21, 2011, from http://www.threesigma.com: http://www.threesigma.com/Perfmeas_model.html
28. Pulat, M. (1994, March). "Benchmarking is more than organized tourism: implementing benchmarks". *Industrial Engineering*.
29. Rappaport, A. (1999). "New thinking on how to link executive pay to performance". *Harvard Business Review*. pp. 91-101.
30. Rigby, D. (2001). "Management tools and techniques: a survey". *Califonia Management Review*, Vol. 43 (No. 02), pp. 139-160.
31. Rucci, A.J., S.P. Kirn and R.T. Quinn. 1998. "The employee-customer-profit chain at Sears". *Harvard Business Review*, Vol.76 (No.1), pp. 82-97.
32. Sanker, R. A. Benchmarking Key Result Areas of Textile Industry. (n.d.). Indian Textile Journals. Retrieved October 01, 2010 from http://www.indiantextilejournal.com/articles/FAdetails.asp?id=777
33. Saaty, T.L. (1980). *The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation*. New York: McGraw-Hil.
34. Stewart G. (1997), "Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management", *Logistics Information Management*, Vol. 10 No. 2, pp. 62-7.
35. Stoeberl, P. A., Joo, S. J., &Fitzer, K. (2009). "Measuring and benchmarking the performance of coffee stores for retail operations". *Benchmarking: An International Journal* , Vol.16 (No. 6), pp. 741-753.
36. Team, L. R. (2011, April 4). *Sri Lankan garment industry struggles to attract women workers*. Retrieved October 21, 2011, from http://www.oxfam.org.au: http://www.oxfam.org.au/blogs/category/behind-the-seams/Sri Lankan garment industry struggles to attract women workers.html
37. Vaziri, H. K. (1992). "Using competitive benchmarking to set goals". *Quality Progress*, Vol.25 (No. 10), pp. 81-85.
38. Wever, R., Boks, C., Marinelli, T., &Stevels, A. (2007). "Increasing the benefits of product-level benchmarking for strategic eco-efficient decision making". *Benchmarking: An International Journal*, Vol. 14 (No. 6), pp. 711-727.
39. Zimmerman, J. (1997). *Accounting for Decision Making and Control*. Burr Ridge, IL: Irwin-McGraw-Hill.