Performance analysis using Fuzzy Balanced Scorecard-based performance prism

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Abstract. Managing an organisation without strategy is like as being blind in the world of globalisation. An organisation must formulate a new strategy and find out what parts or departments that should be prioritised to be improved more than others. To be able to formulate the new strategy that is adequate to improve employee performance, the company must be able to identify the source of the main problems that could be obstacles in improving employee performance. This paper presents development of hybrid method between Fuzzy Balanced Scorecard (FBSC) and Performance Prism (PP) to analyse performance of a company. This study took place at a multimedia company with big projects mostly from Indonesia and United States. Result of the study showed that the proposed hybrid method could be used to evaluate the company from 4 perspectives that are customer’s satisfaction, finance, internal business process and learning and growth in PP framework. The fuzzy logic was incorporated in an analytical hierarchy process (AHP) to determine weight for every perspective based on experts’ judgement. Result of this study showed that the investigated company has performance score very high that is 9.938, with the lowest score is employee stakeholder factor. With this result, the company would be able to track down the root cause of the problem and an effective strategic plan could be formulated in order to improve employee and overall company performance.

1. Introduction
Managing an organisation without strategy is the same as being blind in the world of globalization. Managers have to focus on their strategy to survive in competitive market [1]. In order to achieve their target, organisations have to improve their strategic plan because the economic condition sometime forces company to save the cost and made the allocation of funds more limited [2]. Therefore, an organisation must formulate a new strategy and find out which parts or departments that should be prioritised to be improved more than others, then allocate their limited resources such as budget, human resources, time and others to achieve the vision [3].

A company must be able to identify how the influence of strategy success or failure directly impacting on the objectives of the company [4]. The company's strategy is expected to focus on the level of performance or improvement as needed, as well as initiatives to get results of the needed program in order to achieve the target [5].

To be able to formulate the new strategy that is adequate to improve employee performance, the company must be able to identify the source of the main problems that could be obstacles in
improving employee performance [5]. If a company able to identify such main problems, then the strategy to improve employee performance could be optimally formulated.

This study took place at a multimedia company with big projects mostly from Indonesia and United States. The main problem that occurs in the company is the lack of satisfaction that felt by most of the employees. The problem comes from the company services and benefit that they gave to the employees felt not fair and uncertain career development path that is supposed to be provided by the company. Besides that, the employee attendance and ambiguous attendance evaluation is also the problem to solve in order to improve the employee and company performance.

One of the methods that could be used to analyse the company and employee performance is performance prism (PP) that is coined by Neely et al [6]. However, improvement for analysis of every side in the PP is still required in order to get comprehensive analysis. In this study, comprehensive analysis owned by Balance Score Card (BSC) is incorporated in the PP so that the stakeholder satisfactions in PP would be analysed based on perspectives in the BSC. Next step are identification of Key Performance Indicators (KPIs) and weighting the identified KPIs. Since the KPIs weighting would be conducted based on experts opinion, then Analytical Hierarchy Process (AHP) was used as the method for KPIs weighting. It is commonly known that experts prefer to use linguistic variables in analysis. Those variables are also could reduce subjective opinion of the experts. However, for engineering analysis, numerical variables are required instead of linguistic variables. Therefore, fuzzy logic could be implemented in the proposed AHP to get quantitative weight of every KPI [7].

There are plenty of researches about BSC that have been done by previous researchers. Agrawal et al [1] used the BSC as the basis for determining the attributes and sub-attributes of the outsourcing organisation's performance appraisal to ensure that the organisation can still make maximum contribution with the use of reverse logistics. Other study was carried out by Lu et al, (2018) that integrated sustainability and BSC became sustainable BSC (SBSC) to evaluate performance of airport development [8].

In PM side, Nogning & Gardoni [9] has implemented PP using company’s social responsibility theory and reflected that the first that must be considered is stakeholders. Previously, Youngbantao & Rompho [10] have conducted a research on the application of PP to measure performance in two companies with different types of culture; those were companies that have a culture of flexibility and a company with a culture of stability. The results showed the same level of performance effect in the two companies with different cultures [10].

Based on explanation above, it could be said that PP has successfully implemented to analyse performance of companies in any condition by focusing on stakeholders and still could be integrated with other methods to get better analysis tool. In another side, BSC has been accepted by performance analysis researchers as a comprehensive performance analysis tool. This study tried to incorporate BSC into PP in order to get advantages of BSC to be implemented in PP. Fuzzy-based AHP was also implemented in order to determine weight of every KPIs that have been evaluated by experts using linguistic variables

2. Theory

2.1. Performance Prism
Performance prism is a method of thinking that integrates five perspectives related to each other and provides a structure that allows executives to determine answers to five fundamental questions, those are stakeholder satisfaction, stakeholder contribution, strategy, process and capability [11]. Those five views altogether provide a comprehensive and integrated framework for managing organizational performance and solving organisational-related problems that could build a structured business performance model [12]. PP is currently considered more popular than the BSC, because it is considered to be a more flexible and more focused on stakeholders’ method [13]. BSC’s focus on stakeholders is limited to shareholders and customers only. Other stakeholder, such as employees, is not considered in BSC, hence, that is the advantage for PP because PP covers all stakeholders [14].
2.2. *Balance Scorecard (BSC)*

BSC method coined by Kaplan and Norton as a performance measurement tool for managers to find a quick and comprehensive picture of the company's operational performance [3]. BSC method combines several measurements, such as non-financial performance and traditional financial metrics to get balanced results from organisational performance. This assessment is used extensively to align business activities with the organisation's vision and strategy and to improve internal and external communication as well as monitoring business performance [15]. The success of the BSC depends on clear identification of non-financial and financial variables, accurate and objective measurement of the two variables and the relationship between performance improvement, rewards for performance achievement and penalties for performance violations [8].

BSC is more than just a business model because it able to facilitate performance measurement [3]. The broad multi-dimensionality of models and functions of the BSC system encourages different researchers and practitioners to study and analyse it from different perspectives. When performance evaluation is part of a safe management and control system, the organisation could effectively manage its resources and measure its performance in relation to the goals of the organisation [16].

3. Method and result

3.1. *Hybrid framework design*

Incorporating BSC into PP was carried out by inserted BSC perspectives into PP framework. One of the stakeholders in PP is customer, therefore, customer perspective was incorporated in customer stakeholder. Learning and growth perspective in BSC tries to evaluate ability of a company in learning to grow when answering external industrial challenges. Therefore, it affects to capability of the company. Because of that, learning and growth perspective in BSC was incorporated in capabilities factor in PP. Next perspective in BSC is internal business process, which tries to evaluate quality of business process in a company. This perspective was incorporated in process factor in PP. Actually, finance perspective is not the one and only one factor that could be used to measure performance of a company. However, in traditional performance measurement, finance still being used to measure performance of a company because it is believed that finance could be one of important parameter to justify the health of a company. In the proposed hybrid framework, finance was used as the perspective in the company performance analysis using PP after considering the customer satisfaction, internal business process and learning and growth perspective. Figure 1(a) shows the basic of PP model [17], while Figure 1(b) shows the modified PP model.

![Figure 1a. Basic of PP model](image1)

![Figure 1b. Modified PP model](image2)
3.2. Data collection
The data is collected from year 2016 to year 2018. The first collected is financial data that used to identify pattern of benefit obtained by the company. The next collected data is number of projects that have been handled by the company. Customer satisfaction data was also collected through questionnaires that have been spread out to customers. Data about employee that are their resignation, attendance, satisfaction and productivity were also collected through spreading questionnaires, making in-depth interview and administration data stored in Human Resource department. The collected data were then been processed and mapped into the related perspectives in the modified PP.

3.3. Key Performance Indicators (KPI) identification and validation
The KPI identification and validation consist of few processes, those are:
1. Classifying stakeholders of the investigated company, which are CEO, executive management, client, customer, and employee.
2. Identifying the satisfaction, contribution, strategy, process and capability of each stakeholder.
3. Design KPIs that are adjusted to the business goals of each stakeholder.
4. The KPIs were validated through discussions with competent management. Thus, the KPIs that have been designed could describe actual overall performance of every aspect of the company.

3.4. Weighting and scoring KPI with Fuzzy-AHP method
After validating the KPIs, they would be weighted using Fuzzy-AHP method. This process was performed with online software for fuzzy-AHP, which is Online-Output software. After weight of each KPI was obtained, then each KPI would be scored based on company achievement in an interval of time. Determination of the highest and the lowest value of each KPI were carried out through interview and discussions with relevant management. Table 1 shows result of performance score of each stakeholder using fuzzy-AHP.

| Stakeholders        | Weight | Priority | Performance Value | Average Performance Value | Overall Performance Value |
|---------------------|--------|----------|-------------------|---------------------------|--------------------------|
| CEO                 | 0.373  | 1        | 50.845            | 10.169                    | 5.827                    |
| Executive Management (EM) | 0.084 | 4        | 51.320            | 10.264                    | 0.862                    |
| Client              | 0.200  | 2        | 45.000            | 9.000                     | 1.800                    |
| Customer            | 0.116  | 3        | 52.165            | 10.433                    | 1.231                    |
| Employee            | 0.025  | 5        | 43.580            | 8.716                     | 0.218                    |
| TOTAL               |        |          |                   |                           | 9.938                    |

3.5. Company’s total performance analysis
In order to evaluate total performance of the company, then an evaluation standard has been arranged based on discussion with managers in the company. The performance standard is as follows:
- Performance value 1-5 : underperformed
- Performance value 6-10: adequate
- Performance value 11-15: advance

Based on the overall performance value, which is 9.938, it could be said fairly that performance of the company is adequate and close to upper limit. However, goal of the company is to achieve advance performance, it means that there are several KPIs that should get special attention and be improved according to the company’s target. Besides, from the performance score, it could be seen that the employee stakeholder has the lowest weight and score of overall stakeholder performance. It means that the company should consider the employees to be more important in the role of stakeholders and give more attention to the employees and provide them with various ways to improve their performance.
3.6. Root cause analysis for underperformed KPI

Figure 2 shows the map of root cause analysis for underperformed KPI.

From the Figure 2, it could be seen that main problems that makes the employee performance score is low are un-accommodated needs of employee and lack of training and supervision system from the company to employees. Several suggestions for improvement are as follows:

1. Allocate some capital to have effective employee welfare program, where the employee could share their needs and it will be easier for the company to accommodate the employee needs.
2. Organise trainings and also evaluate how effective the training in terms of improving employee performances. The training could be held periodically, it could be once every semester or once every three months, according to the company’s needs and budget.
3. Implement an effective reward and punishment system in order to improve discipline of the employee. It is suggested to the company to have evaluation form for the discipline that would be filled in by HR department based on the attendance system. The form could be evaluated monthly to decide reward or punishment that should be given to an employee.
4. The team leaders should implement a task-rolling system for their team, in which each of the team members will try to excel one task for few months and then each of them will train the other team members, and let them try to excel another task. While doing that, the leaders should have their own evaluation method in which they will evaluate each performance of the team members, they will have the back up for each task and they shouldn’t be worry anymore of the failure in achieving KPIs.

4. Conclusion

From the discussion above, it could be concluded that the proposed hybrid system, which is incorporated BSC into PP has successfully been implemented to analyse performance of a service industry. Fuzzy-AHP was also successfully used to do scoring for KPIs of every perspective in BSC. The use of fuzzy could reduce subjective opinion from experts because linguistic variables were used.
for evaluation instead of numerical variables. Result of the proposed hybrid system could be continued with root cause analysis in order to identify root problem of underperformed KPIs. Hence, effective actions could be suggested to overcome the root problem and further could improve the overall company performance.

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