

Maintenance Scorecard Approach And Analytical Hierarchy Process Method For Determining The Weight Of The Key Performance Indicator

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ABSTRACT

Application of MSC in the performance measurement Company X is expected able to describe the vision, mission, and strategy in a clear and measurable work-frame, so we can measure the rate of achievement of strategy implemented. Analytical Hierarchy Process method, it can be seen that the KPI with the most influences or contribution in achieving company's objectives (voice of customer dan voice of business) at all level is: Quality Perspective at level 2 with the global weight 0,453, Percentage of Benchmarks Achieved at level 3 with the global weight 0,347, Percentage of Target Achieved at level 4 with the global weight 0,347 dan Mean Time First Stoppage After Preventive Maintenance (MTFS After PM) at level 5 with the global weight 0,111. From the result of weighing of KPI's it is found that the most influencing KPI's at all levels are Quality Perspective, Percentage of Benchmarks Achieved, Percentage of Target Achieved, and Mean Time First Stoppage After Preventive Maintenance

Keywords: *Maintenance Scorecard, Analytical Hierarchy Process, Measure the performance*

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I. INTRODUCTION

Maintenance Scorecard (MSC) is introduced as a comprehensive approach to develop and implement strategy in the area of asset management. MSC is applied to measure the performance and interpret company's goal into various dimensions or indicators that arranged in six prespective; productivity, cost effectiveness, safety, quality, learning, and environmental. MSC is developed in the application of management indicators known as Key Performance Indicator (KPI), in three levels; corporate, strategic and functional level, for the development and implementation of strategy.

The application of MSC in performance measurement is expected to be able to describe the vision, mission and strategy as a clear and measurable workframe, so in turn, could measure the achievement in strategy implementation. Next, the contribution weight of each KPI is determined using Analytical Hierarchy Process method so enable to identify which KPI has the most influences to the goal.

One of the greatest misconception regarding asset management is the belief that it is a generic managerial function that can merely be transplanted from one industry or company to another. This misconception is behind many of the benchmarking and other initiatives that companies often undertaken. However the application of asset management techniques differs from industry to industry, even within industries it can be vastly different depending on the current operational environment of each company within the industry.

Maintenance Scorecard (MSC) is applied to measure the performance, and interpret the company goal into several dimensions or indicators that are arranged in six perspectives; productivity, cost effectiveness, safety, quality, learning, dan environmental. Company X is maintenance contracted services organization in mining sector. e application of MSC in the performance measurement in Company X is expected able to describe the vision, mission, and strategy in a clear and measurable work-frame, so we can measure the rate of achievement of strategy implemented.

II. METHOD

At the designing process of Maintenance Scorecard which had been performed at previous stage, several KPI are available at individual perspective at all level in company. This KPI is gained as a result of brainstorming with some of senior levels at Company X, and also from literature. In order to see whether the collected KPI is really required and able to drive company strategy, and in order to know is there any other KPI that supposed to be exist at Company X, then the questionnaires are circulated. The respondent of these questionnaires taken from senior levels at Company X. At this first stage consist of five respondents.

From the respondent's answer, the pre-KPIs is gained together with it's total scores. Total score calculation is the sum of weight value given to each KPI by respondents. Examples, for KPI X at corporate level, 3 respondents gave the weight of 4 and 2 respondents gave 5, then total score for KPI X is $4 + 4 + 4 + 5 + 5 = 22$. Minimum score to declares one KPI is acceptable and can be used is 15, number of respondents times "medium" weight value (5×3).

When respondent's chosen KPI is gathered (minimum value is 15), then the next stage is determining the target of each chosen KPI.

Without a target there will be no control or motivation for improvement. Therefore the KPI target is required to be stated. With the existance of target, every person will understand the gap between their current performance and the expected performance. At COMPANY X, the KPI target will be determined by management with considering the company ability to achieve it. Because, unrealistic or a too low target can not represent the actual performance.

The next step is performing research stage II,

which weighing the decision hierarchy. Hierarchy design process is the first step, and that is very significant to solve problem. Arranging hierarchy of problem is the step to define complicated and complex problem hence they become clear and detailed. Decision hierarchy is arranged based on the opinion of the experts. The decision that will be taken as the Objectives then described in more detail elements.

In this research, there are 5 levels, i.e :

Level 1 : Objectives The objectives of this research is to get KPI priority, which has most influence in achieving the company objectives. Level 2 : Perspective at Maintenance Scorecard At this level there are 4 perspective of Maintenance Scorecard.

Level 3 : KPI at Corporate Level At this level there are several KPI at each perspectives. Level 4 : KPI at Strategic Level KPI at level will support the achievement of KPI of corporate level. By knowing the weight of each KPI, then the KPI with the most influences or contribution to KPI of corporate level can be identified. Level 5 : KPI at Functional Level

KPI at level will support the achievement of KPI of strategic level. By knowing the weight of each KPI, then the KPI with the most influences or contribution to KPI of strategic level can be identified.

When the decision hierarchy had been formed, the next step from AHP method is weighing the criterias at decision hierarchy using pair comparison. The second questionnaire is then made and circulated to the respondent. This questionnaire stage II is a closed questionnaire hence respondents can not give additional option. The respondent at this stage is the same respondent with previous stage, 5 persons.

When every respondents have given the weight for each KPI (questionnaire II), then the next step is checking the consistency of the respondent's answer. The valid consistency is 90%, hence the acceptable inconsistency in maximum 10%. For paired items with inconsistency more than 10%, then responden is requested to re-do the weighing till the inconsistency is less than 10%. The inconsistency checking was done using Expert Choice 2000 software.

The data processing results of questionnaire II is the comparison of significancy rate between KPI

III. RESULT

The result of MSC design process is in form of KPI which is arranged into three levels of company. In this articles the KPI will be shown in two perspectives, quality and productivity. When documenting process is done, then the next step is the weighing process of available KPI, hence the the KPI that has most influence in achieving the objectives can be identified. Table 3 shows the KPI with the biggest global weight at each level.

Table . Priority Weight

Level	Element Description	Global Weight
Level 2	<i>Quality Perspective</i>	0.453
Level 3	<i>Percentage of Benchmarks Achieved</i>	0.347
Level 4	<i>Percentage of Target Achieved</i>	0.347
Level 5	<i>Mean Time to First Stoppage After Preventive Maintenance (MTFS After PM)</i>	0.111

The table shows the result of weighing process on Maintenance Scorecard perspectives (level 2). The heaviest weight is 45.3% for quality perspective. With the good quality offered to customer, COMPANY X as contracted service company is expected to provide an optimum support to customer's production process. This, in short term, will deliver to the customer satisfaction, and in long term will maintain customer loyalty. Besides,

there is a demand to have the balances among perspectives since each perspective has their own goal and supporting each other mutually.

At level 3, the KPI Percentage of Benchmarks Achieved has the heaviest weight in achieving company's goal, i.e. 34.7%

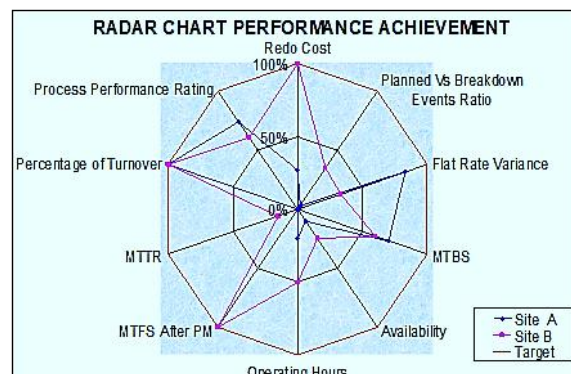
At level 4, the KPI Percentage of Target Achieved has the heaviest weight in achieving company's goal, i.e. 34.7%.

At level 5, the heaviest weight in achieving overall company's goal is Mean Times to First Stoppage (MTFS) after Preventive Maintenance (PM) by 11.1%, This means the maintenance operation is very crucial to perform hence the company's target, which has been specified for core operational, can be achieved. Evenmore benchmark is expected to be achieved also.

MTFS after PM is an indicator for the purpose of to see the quality of scheduled maintenance work. The expected result from one PM to the next PM is there is no unscheduled breakdown. So that production process will not be disturbed. For company, unscheduled budget can be minimized in order to get a maximum margin.

From all above it can be concluded that a good work quality by operational section will give a good impact to company as overall. A good achievement in quality perspective will give a good impact to all other perspectives.

To make it easier to see the company performance based on existing KPI, a radar chart is given in below. Radar chart can make it simple to see what KPI that has achieved it's target and what KPI has not.



Picture Radar Chart Performance achievement

From the measurement result, it could be concluded that the company's performance is not optimum. It requires some more effort and continual improvement process in order to get specified target.

IV. CONCLUSION

From the KPI weighting process by applying the Analytical Hierarchy Process method, it can be seen that the KPIs that have the most influence or contribution to achieving company goals (voice of customer and voice of business) at all levels are: Quality Perspective at level 2 with a global weight of 0.453, Percentage of Benchmark Achievement at level 3 with a global weight of 0.347, Percentage of Target Reached at level 4 with a global weight of 0.347 and Mean Time First Stoppage After Preventive Maintenance (MTFS After PM) at level 5 with a global weight of 0.111.

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