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IT BALANCED SCORECARD IMPLEMENTATION TO MEASURE THE EFFECTIVENESS AND EFFICIENCY OF THE CONTRIBUTION PERFORMANCE OF THE USE INFORMATION SYSTEMS IN THE COMPANY

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ABSTRACT. *As we all know that information systems and technology are used by companies to make their business processes run more effectively and efficiently, so as to make a competitive advantage for the company. In this effectiveness and efficiency problem, an appropriate measuring tool is needed to measure the effectiveness and efficiency of business processes after the contribution of technology in the company using the IT Balanced Scorecard (IT BSC). Through a number of perspectives found in IT BSC, further research instruments can be developed that can be used to formulate a number of respondents' opinions through a questionnaire. Data processing of the results of the questionnaire was carried out using an exploratory factor analysis method to reduce a number of independent variables to obtain a new variable, which could then be made a mathematical model that could describe the behavior of information technology performance conditions at the company. From the results of the analysis obtained there are four new factors that affect the resulting model related to the management and use of information technology in terms of competence, service capability, business sustainability and improvement in function. It can be concluded that these factors can affect performance and get good quality from the contribution of information technology to the company's business processes and can be used as a key performance indicator.*

Keywords: Key performance indicator, IT Balanced Scorecard, Effectiveness, Efficiency, Competitive advantage

1. **Introduction.** A public company engaged in shipping, transportation and logistics was originally an agency company and has now developed into a group and is an integrated transportation company, which has several subsidiaries engaged in commercial and domestic ship operators, terminal operators, warehousing, logistics, land transportation, agency, and so on. By looking at the functions, benefits and advantages of information systems and information technology in the company, the company decided to create a special section that handles and focuses on IS and IT as a whole in the company, that part is the information technology. However, in carrying out activities in its business units,

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the IT Division still needs to plan and establish indicators, initiatives or activities that can align and support the company's overall strategy. And to find out these indicators and how big is the role of IT in supporting the achievement of the company's vision, mission and strategy, it is necessary to measure the performance of information technology contributions for the company. At present, the company does not yet have a standard performance measurement method, which only makes a few measurement reports about infrastructure such as how often the server is down, how long is the downtime, what causes the server to be down, how often is the network not connected, how long handling of problems that occur and how many problems are reported each month.

From the existing problems, the problems in this research are tried as follows:

- 1) What key performance indicators are needed to measure the effectiveness and efficiency of business processes after the implementation of information technology?
- 2) What model to measure the effectiveness and efficiency of all of business processes after the implementation of information technology?

And the objectives of the research on IT performance in companies are

- 1) Looking for some of key performance indicators needed to measure the effectiveness and efficiency all of business processes after the implementation of information technology.
- 2) Developing the model to measure the effectiveness and efficiency of all of business processes after the the implementation of information technology.

With the stated research objectives, the research is expected to be of benefit to the company including:

- 1) By knowing the factors measuring IT performance, the company can justify what needs to be done and not done.
- 2) With reference to performance indicators, the process will run in a controlled and focused manner in achieving the targets set.
- 3) The company has a measurement model that can be used to measure IT performance optimally.
- 4) From the results of the study can be obtained what information can be taken into consideration as a basis for the formulation of the company's strategy from the IT side.

With the problems and objectives above, the results of this study are expected to become an alternative solution model for measuring the performance of information systems in a company's operations, through the implementation of the IT Balanced Scorecard method which in turn will make the entire company's business processes more effective and efficient and achieve competitive advantage for the company as a whole.

2. Literature Review.

2.1. Definition of performance measurement. Performance is the success of personnel, teams, or organizational units in realizing predetermined strategic goals with expected behavior [1]. Companies can translate the strategy into determining the right key performance indicators and must be able to implement business strategies in achieving organizational goals [2]. Meanwhile, performance appraisal is needed as a regular determinant of the operational effectiveness of an organization, or part of the organization, as well as employees based on predetermined targets, standards, and criteria [3].

2.2. Good measurement characteristics. Performance measurement is also defined as the process of accumulation, analysis and reporting of information about the performance of a person, agency/company, system or section. Performance measurement is more defined based on opinions about why performance measures are carried out [4]. And according to [5] the general characteristics to achieve the goals in performance measurement must follow the **SMART** principle, which means as follows:

- 1) **Specific:** The goal must be stated specifically and easily understood.
- 2) **Measurable:** Objectives must be measurable using appropriate measurement indicators to evaluate the success, review, and future corrective actions. Measurements must be able to bring up facts that are expressed quantitatively using numbers.
- 3) **Aggressive, but Attainable/Achievable:** Goals must be realistic and can be achieved through efforts in challenging performance improvement programs.
- 4) **Result Oriented:** Goals must focus on results in the form of achieving performance targets that have been set.
- 5) **Time-bound:** The goal must be achieved within the time limit specified.

2.3. Balanced Scorecard. At first the Balanced Scorecard written by Kaplan and Norton was a performance measurement intended for the private sector. However, in subsequent developments this measurement can also be applied to the public sector. These measurements can review ways government organizations try to involve their customers, stakeholders and employees in performance management efforts that are aligned with the achievement of the organization's mission [6]. The process of balancing performance is emphasized in the Balanced Scorecard not only concerning aspects within the organization but also aspects outside the organization that are no less important as benchmarks. However, because the concept of the Balanced Scorecard was originally intended for the private sector, some adjustments are needed to be implemented in the public sector; actually the orientation of the private sector and the public sector is different. The BSC perceived as the most suitable framework is able to provide significant information pertaining to the organizational internal and external factors that will subsequently contribute to the organization's success [9].

2.4. IT Balanced Scorecard (IT BSC). At Figure 1, the four perspectives adjusted for the IT BSC include the following:

1) *Corporate Contribution Perspective*

The purpose of this perspective is to achieve business contributions to IT investment. Issues discussed in the company's contribution are synergistic performance strategic contributions, business value of IT projects and management of IT investments. Benchmarks used are based on available or determined objective standards and cases originating from external sources [7]. The goal of the company's contribution perspective is controlling IT costs from new IT applications and the business value of the existing IT application functions.

2) *User Orientation Perspective*

The user orientation perspective is focused on evaluating IT performance from the view of customers and internal users (Company Employees) matters discussed in user orientation namely customer satisfaction, IT integration, or business, successful development and service success rate. There are three focuses that need to be considered: being the preferred application provider, working with users and ensuring user satisfaction. It aims to focus on developing business relationships and implementing new IT organizations and IT processes.

3) *Operational Excellence Perspective*

This perspective explains how effective and efficient IT processes are within a company. The IT function must provide high-quality services to users at the lowest possible cost. Operational excellence has an important contribution because it results in two things, namely: product quality and IT cost emphasis. If the above is not considered, the result will be that the workload of IT personnel will be high because the work procedures are chaotic, resulting in many misunderstandings and rework. The factors discussed in operational excellence are rapid response processes, guarantee management and protection and security.

4) *Future Orientation Perspective*

The future orientation perspective discusses the improvement of the ability, the effectiveness of the company's employee management, the development of the company's architecture and research on emerging technologies. The company's plans for the future must be prepared from now on. Companies must be able to read IT trends in the future and anticipate them first by mastering new technologies. Therefore, mastery of the latest IT is an absolute requirement to support future orientation. So the best solution is to always hold IT personnel training on a regular basis so as to improve IT expertise. This is supported by technological factors as well, including conducting information technology research that is always up to date to answer challenges in the future.

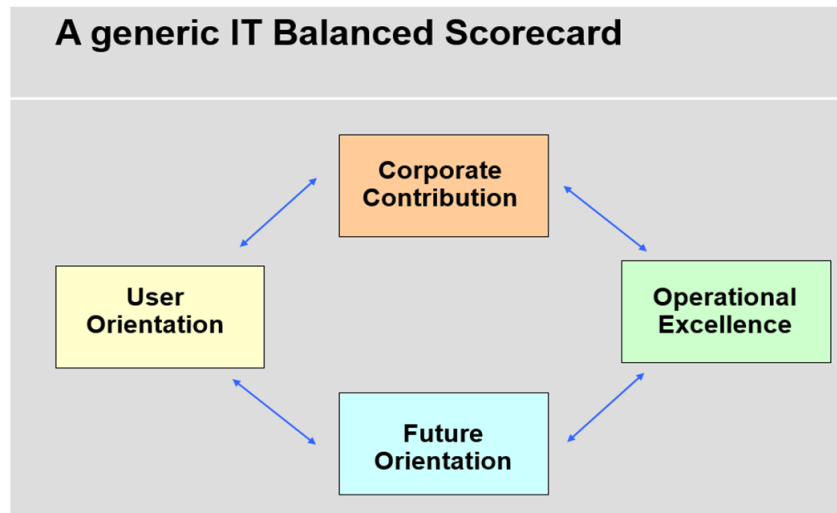


FIGURE 1. IT Balanced Scorecard perspective

This study uses the factor analysis method with several stages as follows [8].

- 1) Make a Reliability Test based on the results of the questionnaire using SPSS software to find out whether the questionnaire is worthy of being used as research data or not.
- 2) Arranging the correlation matrix between each variable by determining the value of the Barlett Test of Sphericity used to determine whether there is a significant correlation between variables, and the Measure of Sampling Adequacy test using Keizer Meyers Oklin.
- 3) Perform factor extraction against a set of variables that are formed so that one or more factors are formed.
- 4) Rotate factors to change factor matrices into simpler matrices so that it is easier to interpret using the varimax rotation method.
- 5) Name new factors that have been formed based on predetermined variables.
- 6) Make factor scores for the needs of further analysis needed in this study.

3. Methodology. Application system is one strategy to remain competitive and continue to develop the company. In carrying out this strategy, the company requires precise measurements to find out whether the strategy is running according to the targets set and running well in the long run. In the context of a frame of mind to build a company strategy in the application of information systems and technology, so all business processes become more effective and efficient and in line with the company's vision and mission. By using the IT Balanced Scorecard framework, we will obtain a level of performance from a system that is applied in a balanced manner from four perspectives at once, namely from the perspective of the company's contribution, customer or user orientation, operational excellence and also future orientation. In this case study factors that have

been determined and derived from the literature study will be used as a way to evaluate the performance of information technology from the perspective of internal users. The data processing is carried out based on the factor analysis method and the factors will be sought what indicators are formed so that the appropriate factors and the right models are obtained to evaluate the performance of information technology in the company.

In this process, to get good measurement results, several stages will be carried out in measuring the performance of information technology using the IT Balanced Scorecard including

1) Formulate problems that occur in the object of research and conduct literature studies to get references and methodologies that will be used in solving these problems.

2) Based on the results of the literature study, continue with the determination of the main factors used in this study which are based on the IT Balanced Scorecard concept, including:

- a) Factors of Corporate Contribution
- b) Factors of User Orientation
- c) Factors of Operational Excellence
- d) Factors of Future Orientation

3) After determining the main factors that will be used, then proceed with the search for indicators for each of these factors using relevant literature studies.

4) Conduct a questionnaire by compiling statements in accordance with predetermined factors and indicators and then distribute to respondents to get primary data for analysis.

5) From the data obtained from the questionnaire, the data is processed and analyzed to get the results of the assessment. At this stage, data analysis is carried out using factor analysis to support the improvement.

6) After the factor analysis process is carried out, the next step is to compile an appropriate and systematic report on the results/conclusions obtained to be useful for further research and provide advice/recommendations to the company.

7) Based on research reports, the company can carry out a planning process for what actions need to be taken to continue to improve the performance of information technology in the company in the future so that it can run better and in harmony in achieving the company's business goals.

4. Result and Discussion.

4.1. Questionnaire respondent data. To obtain significant research results, the questionnaire in this study was distributed to 75 respondents, but the returned questionnaire, the data were complete and in accordance with the research needs were 70 questionnaires. The following is a description of the respondents of this study in terms of gender, department, position, length of work in the company and current IT performance assessment.

4.1.1. Respondent data based on gender. Research data processing from the gender dimension obtained the result that the number of male respondents was 58 out of 70 total respondents and female were 12 out of 70 total respondents. The division of respondent data by gender can be seen in Table 1.

TABLE 1. Respondent data by gender

Gender	# of respondents
Men	58
Women	12
Total	70

4.1.2. *Respondent data based on department.* When viewed from the departmental dimension, in this study it was found that there were 15 participating departments. The division of respondent data by department can be seen in Table 2.

TABLE 2. Respondent data by department

Department	Respondent
Business Application	3
Corporate Information Systems and Technology	29
Corporate Law	2
Corporate Tax Division	1
Corporate Treasury	1
Finance	5
Human Capital & General Support	1
INA Strategic Business	1
Regional IT	1
IT Departement PT. PSP	4
IT Infrastructure	4
IT Service Department	5
IT Support & Operation	5
Treasury	1
Others	7
Total	70

4.1.3. *Respondent data based on position.* Furthermore, the respondent's data is seen from the position dimension, so in this study it was found that there were 31 positions that participated. The division of respondent data by position can be seen in Table 3.

4.1.4. *Data of respondents based on length of work in the company.* The next dimension is about the length of work in the company. From 70 respondents. 5 respondents worked less than 1 year, 13 respondents worked 1-2 years, 6 respondents worked for 2-3 years, 10 respondents worked for 3-4 years, 7 respondents worked for 4-5 years, 29 respondents worked more than 5 years . Respondent data based on the length of work at this company can be seen in Table 4.

4.1.5. *Respondent data based on current IT performance assessment.* The next dimension is regarding the assessment of current IT performance in the company. This data is the result of a descriptive assessment of the respondents regarding IT performance according to how they feel. The respondent data can be seen in Table 5.

4.2. **Factors that influence IT performance.** One of the processes carried out in factor analysis is data reduction, from which there is a process of "filtering" the components that are worthy of being used as indicators, of course in this study the indicators in question are indicators that can be used to evaluate IT performance. In this study, the new factors formed were interpreted according to the statements of the clustering variables for each of these new factors. The following Figure 2 is an overview of the interpretations of the new factors that were formed.

4.3. **Models used in measuring IT performance.** From the process of processing the performance appraisal data provided by respondents at this time, a further analysis is formed on the value of IT performance, and the results can be seen that the first to fourth factors have the significance value below 0.5%, i.e., 0.000; then these factors are reliable to enter the information technology performance evaluation model. Then after

TABLE 3. Respondent data by position

Position	Respondent
Assistant Manager Alumina Logistics Project	1
Cash Management I Manager	1
Database Administrator (DBA)	2
Finance & Legal Manager	1
Head of Finance Dept.	1
IT Hardware & Networking	1
IT Helpdesk	1
IT Manager	1
IT Service Manager	1
IT Staff	14
IT Supervisor	1
IT Support	8
IT Technical Support	1
Lotus Notes Administrator	1
Mail System Administrator	1
Manager	3
Network Administrator	2
Others	7
Programmer	3
Project Administrator	1
Project Manager	1
Project Officer	1
Regional IT	1
SI & Branch Tax Manager	1
Staff	5
Staff Infrastructure	1
Supervisor	2
System Analyst	2
Technical Support & Operational Head	1
Technical Writer	2
VoIP Administrator	1
Total	70

TABLE 4. Respondent data based on length of service at the company

Length of service	Respondent
< 1 year	5
1-2 year	13
2-3 year	6
3-4 year	10
4-5 year	7
> 5 year	29
Total	70

the calculation process using the regression analysis method to score the formed factor can be seen the first factor value (X_1) is 6.092; the second factor value (X_2) is 3.747; the value of the third factor (X_3) is 3.696; the fourth factor value (X_4) is 4.352; and the constant value (C) is 71.021.

TABLE 5. Respondent data based on the current IT performance assessment

IT performance assessment	Respondent
0-19	0
20-39	0
40-59	3
60-79	47
80-100	20
Total	70

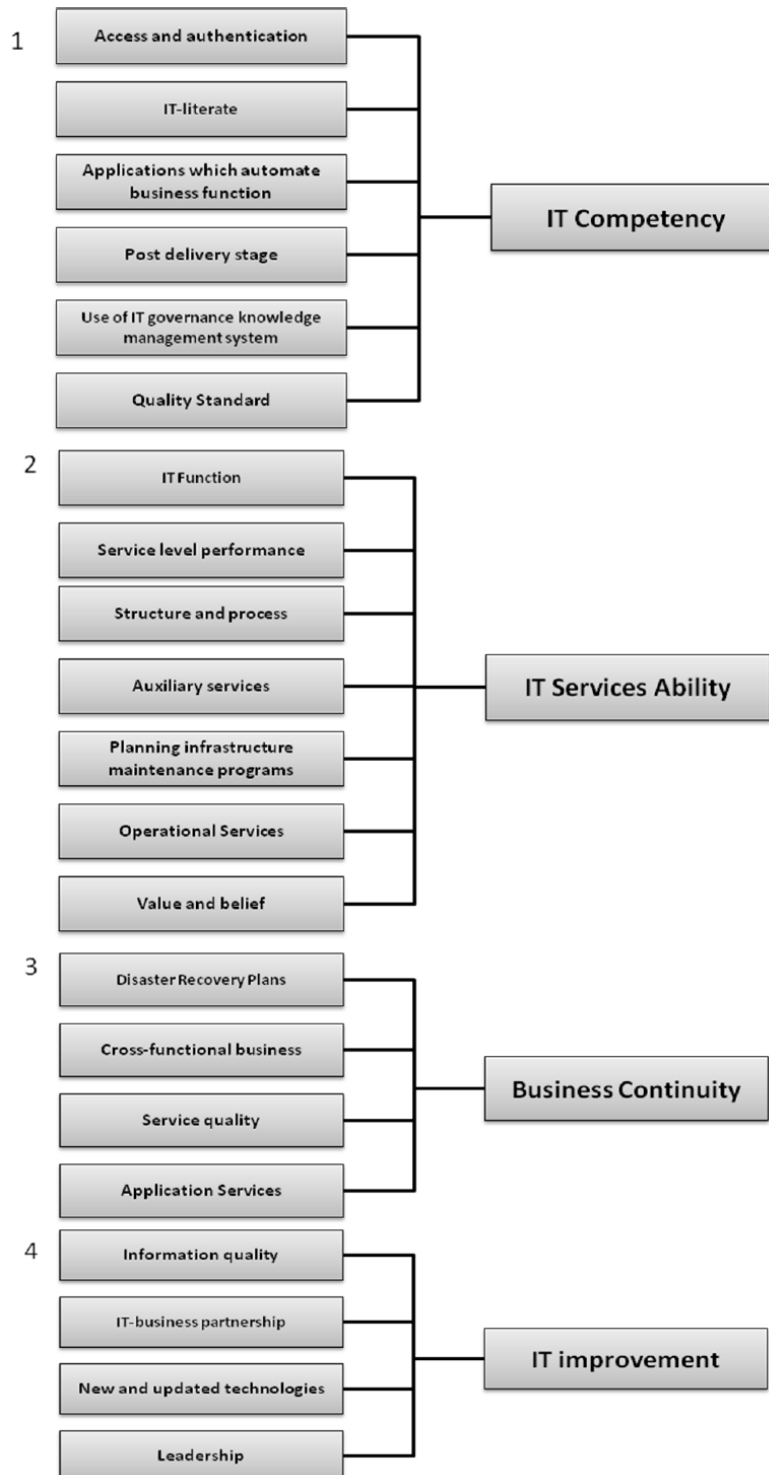


FIGURE 2. Indicators & new factors that can affect IT performance

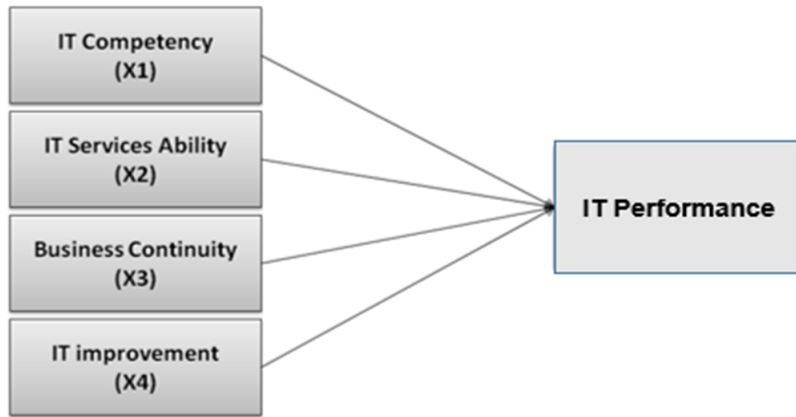


FIGURE 3. Factors used in the IT performance measurement model

The models created by measuring the company’s IT performance are as follows:

$$F(X) = 71.021 + 6.092X_1 + 3.747X_2 + 3.696X_3 + 4.352X_4$$

where $F(X)$ = Performance of information technology contributions for company, X_1 = *IT Competency*, X_2 = *IT Services Ability*, X_3 = *Business Continuity*, X_4 = *IT improvement*.

From this formula, it is interpreted in a model that can be seen in Figure 4.

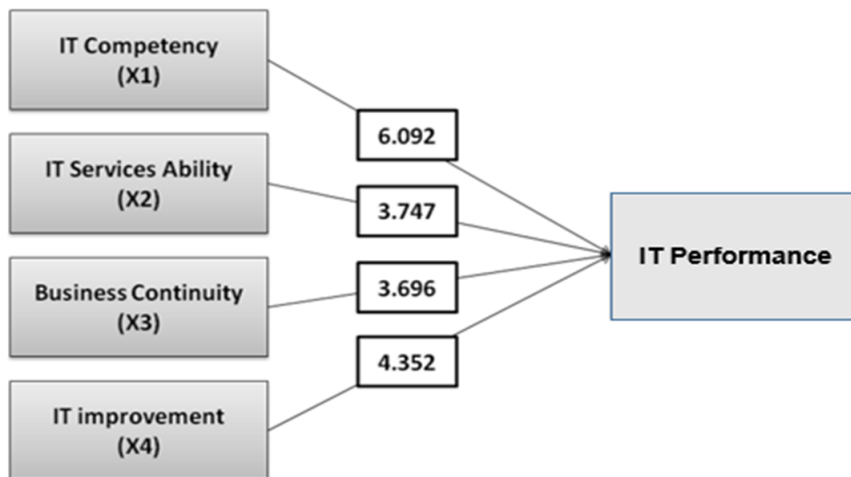


FIGURE 4. Model for measuring IT performance

From the model shown in Figure 4 above, it can be seen that the first factor is positive, namely 6.092, the intention is that if the existing indicators on the IT Competency factor are increased, it will affect 6.092 on improving IT performance in the company. The second factor has a positive value of 3.747, the intention is that if the existing indicators on the factor IT Services Ability are improved it will affect 3.747 on improving IT performance in the company. The third factor has a positive value of 3.696, the intention is that if the indicators on the Business Continuity factor are improved it will affect 3.696 on improving IT performance in the company. The fourth factor has a positive value of 4.352, the intention is that if the existing indicators on the IT Improvement factor are improved it will affect 4.352 on improving IT performance in the company. At the industrial level, through the evaluation of the efficiency of the classification of similar companies, differences in efficiency between different types of companies or within the same type of company are obtained, which favor scientific decision-making of network design and enterprise development plans for themselves [10].

5. **Conclusion.** Four factors are obtained that consist of indicators defined as follows:

1) IT Competency as represented of Access and authentication, IT-literate, Applications which automate business function, Post delivery stage, Governance of knowledge management system and Quality standard.

2) IT Services Ability as represented of Function availability, Service level agreement, Structure and process, Auxiliary services, Planning infrastructure maintenance programs, Operational services, Value and belief.

3) Business Continuity as represented of Disaster Recovery Plans, Cross-functional business, Service quality and Application Services.

4) IT Improvement as represented of Information quality, IT-business partnership, New and updated technologies, and Leadership.

Based on the results of the analysis of the study as well as the various deficiencies and limitations that exist, the suggestions that can be given to organizations are as follows:

1) With the formation of the existing model, now the organization is expected to perform optimal performance calculations.

2) In managing information technology, it is better to focus on issues that become indicators so that they are more directed in taking actions to increase the contribution of information technology to the organization's strategic business support.

3) From the results of data analysis, there are several indicators that are not included in the analysis process whereas based on literature studies, these indicators need to be applied. These indicators are IT's cost-efficiency, Confidentiality, Integrity, Availability, The delivery stage and IT governance training sessions. Therefore in the future the company should pay attention to these things so that IT performance is increasing.

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