

The Development Methodology Of Operational Dashboard As A Tool For Organizational Performance Monitoring

(A Case Study: Telkom Polytechnic)

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Abstract— The management needs to monitor and measure the performance of the organization continuously to restrain that business processes aims at the organization's mission and vision. This study assist management to monitor the organization performance continuously to restrain that business processes aims at the organization's goals. Providing the information about the achievement on KPIs that really fit the needs of its users, conveying the information are accurately and timely in the comfortable presentation format that effective. The information comes from various units within organization, so the management can take action or strategic decision-making quickly and precisely targeted for the improvement of the organization. The problems can be solved with information provider tools of the dashboard software. Dashboard software to be built is operational dashboard for the study program. Operational dashboard provides information on the ongoing activities, along with changes in real time to provide awareness to the things that need to be responded quickly, the information presented is very specific to the sufficient depth detail level, it is dynamic because it uses the data with higher frequency real time updates. The methodology proposed by Eva Hariyanti [5] was modified to suitable with environment condition. Her methodology aimed to develop dashboard at strategic and tactical level, while this study to produced operational dashboard. Her methodology concerns in provide data/information, personalized and collaboration among user. The methodology to develop operational dashboard was not cover analytical and trackability characteristic.

Keywords : *monitor, KPI, performance, operational dashboard*

I. BACKGROUND

An organization in running its business certainly needs to maintain its existence and to improve internal performance. The management needs to monitor and measure the performance of the organization continuously to restrain that business processes aims at the organization's mission and vision. The process of monitoring involves data processing to transfer these data into information collected from various units within the organization. Information should be accurate and submitted to the appropriate party, at the right time, so that the management may take some

actions to control, restrain, or take strategic decision to achieve the goals. To meet the criteria for such information, there are three things to do [9]:

1. Delivering the right information so this information is relevant. Information became the main indicator of the process or activity organization, called Key Performance Indicator (KPI).
2. Protecting information from the parties who are not concerned. Information is only given to people who are entitled to use.
3. Conveying information as quickly as possible, so that available when needed.

At this moment, when monitoring the organization, the management collects information from various units from oral and written information. When the study was conducted the same information can come from various organizational units. This condition complicates the management due to the accuracy of the information are low, for example information on the number of active students comes from the financial unit could differ with the information that comes from the academic services. This situation can effect the process to decision-making becomes inhibited and it is not on target. The presentation of information are a centralized and an accurate in the form of an effective, that are meet with organization requirement to monitoring organizations, it will assist management in process of strategic decision-making quickly and precisely targeted. Effective means that information can be perceived accurately by the recipient, according to the purpose of delivering the information to assist decision and restraint.

II. PROBLEM IDENTIFICATION

The problem identifications in this study are:

1. What methodology suitable to present information that effectively to manager and lecturer at Telkom Polytechnic within develop the operational dashboard.
2. In what ways are the information about the KPIs that really fit with the needs of its users provided ?

III. BASIC THEORY

A. Dashboard Definitions

The dashboard is expressed in several different terms in the existing libraries. Shadan Malik [7] uses the term enterprise dashboard to define as a computer interface that displays a lot of charts, reports, visual indicators, and alert mechanisms, which are consolidated into a information platform dynamic and relevant. Enterprise dashboard serves as a live console for managing business initiatives.

Stephen Few [3] uses the term information dashboard, which is defined as a visual display of important information, which is necessary to achieve one or more goals, to consolidate and organize information in single screen, so that organizational performance can be monitored in single sight. The visual appearance here implies that the presentation of information should be designed as good as possible, so that the human eye can capture information quickly and the human brain can understand its meaning correctly.

Daryl orts [10] uses the term dashboard, which is defined as a tool to monitor the organization from day to day. Information is displayed in a single interface, so that decision makers can access the Key Performance Indicators, which is information that can be used to provide active guidance to business performance. Dashboard serves as an executive intranet, a site where all the important information displayed in logical groups.

Wayne Eckerson [2] uses the term dashboard, as a mechanism for the presentation of visual information in the performance management system, which provides critical information about the performance of operational processes in single sight. Wayne Eckerson focuses on the use of dashboard for monitoring the performance of operational processes.

Based on these explanations, it can be conducted that the term enterprise dashboards, information dashboards, or the dashboard has the same sense, it is a tool for providing a visual display interface, which consolidates and presents the essential information needed to achieve a particular goal, or single view. This study uses the term dashboard because it is easier to write and understand.

B. The Function of Dashboard

Shadan Malik [7] states that the purpose of the using a dashboard is similar to those used in aeroplanes. It is for monitoring and directing a complex and interdependent system. The organization is like an aeroplanes. At the time of operating the plane, pilots need information about the condition of the aircraft, both internal and external. This information is used to make decisions on any actions that must be taken by the pilots when flying the aircraft, in order to successfully arrive at the specified destination in good condition. Similarly, in running the organization, management requires a variety of information to make decisions and organizational strategy, in order to achieve

those objectives. The important information that can describe the condition of the organization is usually the information that became the main indicator of process or organizational activity, i.e. KPI.

Wayne Eckerson [2] states that the dashboard is designed to assist organizations in achieving their strategic objectives. Dashboard is used to measure the processes that have been run, monitor ongoing performance, and predict future performance. These activities allow organizations management to create, assess, adapt, and restructure the strategy that has been made to optimize performance. Wayne Eckerson also finds that the dashboard provides three main benefits, i.e.:

Communicating the strategy. Dashboard is used to communicate strategies and goals made by the executive, to all interested parties, in accordance with the employee's role and level in the organization.

Monitoring and adjusting the execution of strategy. The dashboard is used to monitor the execution of plans and strategies that have been made. Dashboard allows executives to identify critical issues and create strategies to overcome them.

Delivering insight and information to all. Dashboard presents information in single screen using graphics, symbols, charts and colors that allow user to understand and perceive information correctly.

C. Dashboard Characterization

The dashboard has some basic characteristics. Shadan Malik [7] establishes the basic characteristics specific to an enterprise dashboard with a useful acronym S-M-A-R-T (Synergetic, Monitor, Accurate, Responsive, Timely) and I-M-P-A-C-T (Interactive, More data history, Personalized, Analytical, Collaborative, Trackability). A description of these characteristics can be seen in the table below:

TABLE 1 CHARACTERISTICS DASHBOARD

Characteristics	Explanation
Synergetic	Must be ergonomically and visually effective for a user to synergize information about different aspects within a single screen view.
Monitor	Must display critical KPIs required for effective decision making for the domain to which a dashboard caters
Accurate	Information being presented must be entirely accurate in order to gain full user confidence in the dashboard. The supporting dashboard data must have been well tested and validated
Responsive	Must respond to predefined thresholds by creating user alerts in addition to the visual presentation on the dashboard (e.g., sound alarms, e-mails, pagers, blinkers) to

	draw immediate user attention to critical matters.
Timely	Must display the most current information possible for effective decision making. The information must be real-time and right-time
Interactive	It should allow the user to drill down and get to details, root causes, and more
More data history	The dashboard should allow users to review the historical trend for a given KPI. For example, market share may indicate strength within the current time period but a negative trend in a year-ago comparison.
Personalized	The dashboard presentation should be specific to each user's domain of responsibility, privileges, data restrictions.
Analytical	It should allow users to perform guided analysis such as what if analysis.
Collaborative	The dashboard should facilitate users' ability to exchange notes regarding specific observations on their dashboards that serve as a communication platform for task management and compliance control.
Trackability	It should allow each user to customize the metrics he or she would like to track.

These characteristics must be possessed by a dashboard, in carrying out its functions either to measure the processes that have been run, monitor ongoing performance, and predict future performance.

While in other literature, Novell [9] states that there are 4 (four) main criteria that must be owned by a dashboard, i.e.:

- a. Consolidating relevant business information and presenting it in a single holistic view.
- b. Conveying accurate information in a timely manner.
- c. Providing secure access to sensitive information. A dashboard must have security mechanisms, so that data or information not provide to unauthorized parties.
- d. Providing a comprehensive solution. A dashboard can provide comprehensive solutions that handle the problem domain.

D. Dashboard Type

The dashboard is developed in organizations with different purposes. An organization can have more than one type of dashboard, aimed at a different problem domain. Enterprise dashboard applications may be as diverse and numerous as the challenges organizations face for their strategic, operational, and competitive success.

Shadan Malik [7] groups dashboards into several categories, namely enterprise performance dashboards, divisional dashboards, process/activity monitoring

dashboards, application dashboards, customer dashboards, and the vendor dashboard.

While Wayne Eckerson [2] states that based on the management level a dashboard supports, it can be grouped into three i.e. operational dashboards, tactical dashboards, and strategic dashboards.

Stephen Few [3] also states the same thing, i.e. that a dashboard can be grouped according to management levels it supports, A dashboard used for the levels of operation, analysis/tactics, and strategies.

Based on the explanation above, in general, the dashboard can be grouped according to their level it supports the management, i.e. strategic dashboards, tactical dashboards, and operational dashboards. The characteristics of each type of dashboard can be seen in the table below.

TABLE 2 DASHBOARD TYPE

Strategic Dashboard	Tactical Dashboard	Operational Dashboard
Support the strategic level management.	Support the tactical level management.	Support the operational level management.
Provide information to make business decisions, opportunities forecast, and provide direction achievement of strategic objectives.	Provide information needed by analysts to determine the cause of an event.	Provide information on going activities, and its amendment in real-time to give awareness to the things that need to be responded to quickly.
Focus on high-level performance measurement and strategic goals of the organization.	Focus on process analysis to discover the cause of a particular condition or event.	Focus on monitoring activities and events that changes constantly.
- The information presented is not too detailed. - Information content is not too much and are presented briefly.	The information have more content (comparative analysis, patterns/trends, performance evaluation).	The information presented is very specific, with a fairly depth detail level.
Information is presented with a simple mechanism through the display of "unidirectional".	The media presentation uses of the "intelligent", which allows users to perform analysis of complex data therewith its	Using a simple presentation media. Alert presented in a way that is easy to understand, and able to attract the attention of the user.

	relationship.	
No need for real-time data.	No need for real-time data.	Dynamic, requiring real-time data.
Not designed to interact, in a more detailed analysis.	Designed to interact with the data. With drill-down functionality and navigation is good.	Designed to interact with data, to obtain more detailed information, as well as information on higher-level data.

E. Key Performance Indicator

Key Performance Indicators (KPIs) represent a set of measures focusing on aspects of organizational performance that are the most critical for the success of an organization [11]. They help companies define and measure progress toward organizational goals. Unfortunately, many companies are working with the wrong measures, many of which are incorrectly termed key performance indicators, and very few organizations really monitor their true KPIs.

Basically KPIs are identified, developed, and implemented internally within the organization. The identification process until KPI implementation involves the participation of all parts of the organization. Successfulness of KPI development in the organization, determined by four fundamental factors [11], namely:

- a. Cooperation with staff, unions, key suppliers and major customers.
- b. Transferring power to the front line in the organization.
- c. Integrating the efforts of measurement, reporting and performance improvement.
- d. Linking performance measurement to organizational strategy.

F. Critical Success Factor

Critical Success Factors (CSFs) are the few key areas where ‘things must go right’ for the business to flourish [14]. It is very important to identify them when aiming to obtain a profound understanding of the business. The very act of determining CSFs may help to crystallize objectives and strategies, and certainly to emphasize priority activities. CSFs are important factors that determine the success or failure of processes that that executable by the organization.

The determination of CSFs must only be started when objectives have already been identified. The first stage is to identify CSFs against each objective, then, second, to consolidate them across objectives, since many CSFs will recur (see Fig. 1).

G. Eva Methodology

This methodology is developed by Eva Hariyanti, to refine the methodology is developed by Pureshare [12],

Noetix [8], and Bright Point [4] vendor. The methodology is focused on the phase of requirement identification, planning and design prototypes [5]. These are dashboard development principles, namely:

1. Provide information about the KPIs with specific goals.
2. Synergy the information from different aspects at a single screen.
3. A dashboard is a tool that is responsive and interactive with its users, especially given the alert facility that provides awareness of critical issues. Alert on the dashboard is raised based on a predetermined threshold.
4. Allows three things at once i.e. analysis of the previous conditions, monitoring of current conditions and predict future trends.
5. A dashboard has the personalization factor. Every part of the organization have its own a dashboard. A dashboard can’t be used by all parts of the organization.

A dashboard allows collaboration and communication between divisions within the organization. Communication and collaboration among users of the dashboard through alerts mechanisms and reporting.

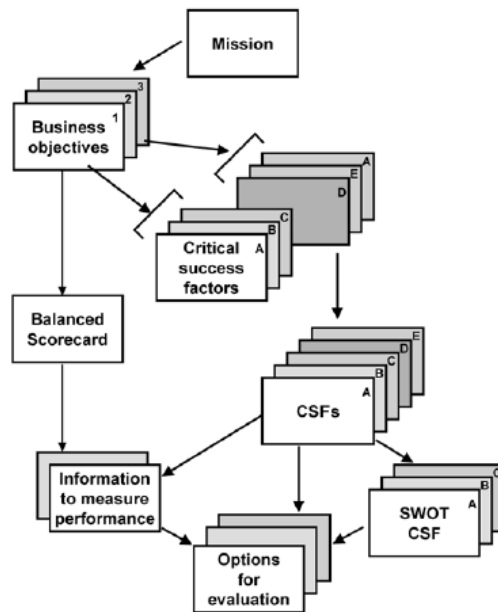


FIGURE. 1 CRITICAL SUCCESS FACTOR BASIC PROCESS [14]

IV. RESEARCH METHODOLOGY

This study produced a product, therefore it was suitable used Research and Development Methodology that proposed by Prof. Dr. Sugiyono [13]. This methodology was integrated with dashboard development methodology that proposed by Eva Hariyanti [5,6] that was modified. The shaded box showed dashboard development methodology. Research methodology is illustrated in figure. 2.

A. Research Design

This study applied Eva Hariyanti's dashboard methodology from stage of requirement identification until dashboard implementation and it was integrated with stage of experiment design.

The stage of identification requirement was modified, because this study was develop operational dashboard. While dashboard development methodology was proposed by Eva Hariyanti aimed to strategic and tactical level, so this study adjusted with which the desired characteristics at Polytechnic Telkom in operational level at academic field. The characteristics dashboard of analytical and tackability was not covered by the operational dashboard, because the operational dashboard cannot be used as a tool to determine the policy, but only as providers of data and information that can be used for strategic level. The modified at identification requirement phase with additional identifying strategic plan of organizational and identifying primary quality indicator at organizational. To identifying KPI for each KPI dashboard,

After implementation process, the operational dashboard must be tested to known performance of it. This study was added stage of experiment plan and design, because it was important to testing performance of the dashboard by expert users. The step of design the dashboard is illustrated in figure. 3.

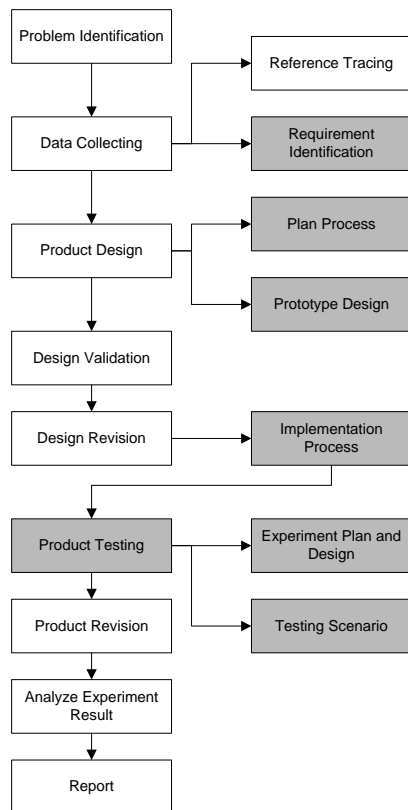


FIGURE. 2 RESEARCH METHODOLOGY

1) Requirement Identification

Phases of the requirement identification were divided into six phases, namely:

- Identifying high-level scenario dashboard

Identifying high-level scenario dashboard is first step in dashboard development process. The identification process of high-level dashboard scenario conducted through interviews. Interviewing Deputy Director I for Academic Affairs, he is person in charge at academic field and he is the authorities in determining academic policies at the Telkom Polytechnic. Based on the interview can be formulated about the objective and scope of the dashboard development.

Dashboard development objective to assist the management in monitoring the performance of the organization on an ongoing basis in order to control the executable of business processes to achieve those objectives based on the Unit Work Plan (UWP). The information to be displayed is about academic activities. Monitoring will be conducted for students learning process.

The scope of dashboard development aimed for the academic field and was applied to one study program as a pilot project. An units of work-related among other were study program, lecturers, PPM, LA and HR.

Identifying organizational KPIs is aim get organizational KPIs that it related with business process in scope of the dashboard development.

- Identifying strategic plan of organization

The first step in this process was reviewed strategic documents at scope of dashboard. The documents are documents organizational strategic, ad hoc report and quarterly report in 2010. The next step was identified strategic objective. Telkom Polytechnic have plan for four years, it is called RENETA (Rencana Empat Tahun). This year was the first year of RENETA 2010-2013. We can found strategic objective in RENETA that it derived into Management Work Plan (MWP) Telkom Polytechnic. Based on MWP can be defined strategic plan of Telkom Polytechnic was illustrated in the fig. 4.

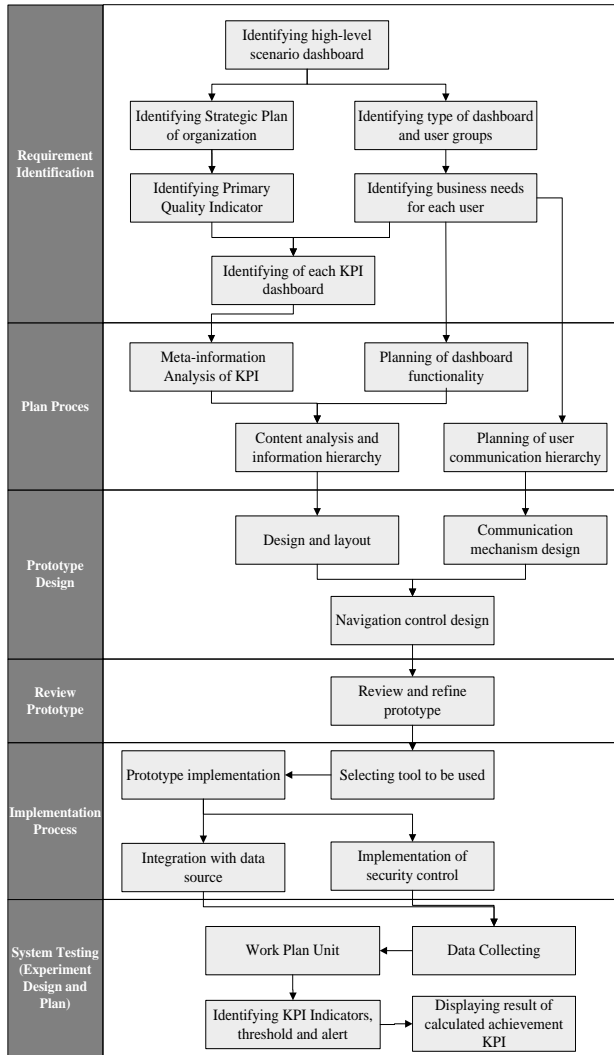


FIGURE. 3 RESEARCH METHODOLOGY FOR DEVELOP DASHBOARD

TABLE 3 RENCANA EMPAT TAHUN (RENETA) 2010-2013 TELKOM POLYTECHNIC

Year	Theme
2010	Road to Quality
2011	Conformity to Customer Needs
2012	Good University Governance
2013	National (International) Achievements

- Identifying primary quality indicator

The next step was identified CSFs. It came from the main objective of institution Telkom Polytechnic. CSFs were derived into information to measure performance that called KPI. KPI is indicator to be used for measure process, while CSFs are important factors that determine the success or

failure of processes that executable by the organization [14]. So, it can be said that KPI is indicator for measure CSF.



FIGURE. 4 PYRAMID OF STRATEGIC PLAN OF TELKOM POLYTECHNIC

Reference for each KPI was taken from UWP Study Program and Badan Akreditasi Nasional-Perguruan Tinggi (BAN-PT).

TABLE 4 CSF AND PRIMARY QUALITY INDICATOR AT ACADEMIC FIERLD

Objective	CSF	Primary Quality Indicator	Person in Charge
Road to quality	Accreditation Study Program	a. Accredited minimum B for each Study Program	Study Program
	Quality of lecturers	b. <i>Jabatan Fungsional Akademik (JFA)</i>	HR
	Quality of teaching and learning process	c. Good Faculty Competence d. Students pas on certification international e. Average of Cumulative GPA ≥ 2.75 (scale 4)	Study Program, Lecturer, Students
	Increase satisfaction Lecturer, and student	f. Students satisfaction	Study Program

- Identifying type of the dashboard and user groups

This stage done to known needed dashboard type of organization, and parties that used it. This was done through a review of the structure of labor relations Study Program with other units within the organization.

At this stage of identification of the dashboard type and the user group through reviewing the existing interests in the Study Program level, such as implementation of lectures, monitoring teachers, monitoring the status of student, reporting of student to parents and accreditation courses. These items were grouping into six categories namely academic, lecturer, student, marketing, PPM and HR.

Each dashboard consist of some dashboard, it presented more detailed information for each field of Study Program performance. The dashboard can be access from the main dashboard through drill-down facility.

User groups involved into the study program quality assurance is Heads of Study Program and lecturers. The hierarchy of dashboard user groups can be used to decided authority from each dashboard user. This mean was the Head of Study Program could accessed lecturer's dashboard.

- Identifying the business needs of each user

Identifying the business needs of each user was done to each user of dashboard. The identification was through interview with presentation of each user. The aimed got data and measure that became basis on decision making or business action. There are three main questions at interview such as: What CBQ can be answer in the dashboard? What data and information can be used to answer its CBQ? How the way analysis to answer its CBQ?

The output of this phase is user business needs documents. CBQ from each user groups will be used to decided information that presented at dashboard type that used by user.

- Identifying of each KPI dashboard

Mapping organizational KPIs with needs of each user dashboard, it aimed got KPI will be alright needed by each user group dashboard. Identifying of KPI dashboard was done with mapping the primary quality indicator with CBQ from each dashboard user groups.

2) Plan Process

Plan process done aimed to analysis more depth about data that got from requirement identification phase. KPI dashboards for each group will be analyzed to identify the meta-information it contains. While the identification of the needs of business users will be analyzed further in order to plan and organize the dashboard functionality of communication inter the dashboard user.

Phases of the plan process were divided into fifth phases, namely:

- Meta-information Analysis of KPI

Meta-information analysis done aimed found information elements that include at each KPI such as KPI priority, data source, granularity, measure, formula, threshold and alert.

Each KPI have a priority. The priority of KPI divided use scale 1-3, namely: scale 1 means "very important", scale 2 means "important" and scale 3 means "ordinary". To establish priority of each KPI, it should look into the main objective of institution Telkom Polytechnic.

- Planning of dashboard functionality
Planning of dashboard functionality based in business needs for each user. The output CBQ from requirement identification became basis decided dashboard functionality.
- Content Analysis and information Hierarchy
This stage used to decided information content and scenario of information presented at each user groups. The presentation of information at main screen dashboard was result of summarize calculation from achievement each indicator. KPI Polytechnic Telkom otherwise in different value, such as %, piece, scale, month, etc. For accommodation presentation at dashboard, then each indicator was standardized through the conversion process. The value of each indicator was converted into index scale 0-3. If index < 1 , then the indicators have status has not been reached or critical condition. If $1 \leq \text{Index} \leq 2$, then the indicators have status achieved, and if $\text{Index} \geq 2$, then the indicators have status exceeded.

The conversion formula:

$$\text{index} = \begin{cases} \frac{\text{nilai}}{T1} & , \text{jika nilai} < T1 \\ \left(\frac{\text{nilai} - T1}{T2 - T1}\right) + 1 & , \text{jika } T1 \leq \text{nilai} \leq T2 \\ \left(\frac{\text{nilai} - T2}{T2}\right) + 2 & , \text{jika nilai} > T2 \end{cases}$$

T1 = minimum target, T2 = maximum target

3) Prototype Design Process

Operational dashboard cannot be used as a tool to determine policy or do not directly result in policy. But, only to present information that can be used for strategic level. Designing operational dashboard used prototyping. This stage including process, namely:

- Designing a dashboard layout, which included determining the number of dashboard screen, the number of frames on each screen, the composition and sequence information content, structure and sequence of information elements in a frame.
- Defining and designing the presentation of media types for each element of information in the specified frame.
- Designing color design and animation, which includes a combination of color dashboards, an appropriate

resolution for visual clarity of graphics, text proper form, the form of animation that are relevant to strengthen the user's visual perception.

- d. For dashboard interface will use the drill-down user interface that is a conceptual design of the application interface, so users can access information in a hierarchical, ranging from general and can be dug down to a level more detailed and extensive.
- e. Designing mechanisms to facilitate communication between users of alerts and reporting mechanisms.
- f. Selecting and designing appropriate forms of navigation controls in terms of color and design.
- g. Conduct a review of design, including: testing the navigational controls, examine the results of the overall design internally and by involving users, improving the prototype in accordance with input from the user.

4) Implementation

This stage used to select the tool to be used develop operational dashboard. The tool used to develop the dashboard is a web-based, programming language namely PHP. Data source will be managed using the DBMS MySQL.

5) Experiment Scenario

After implemented the dashboard with the data source, the dashboard should test to known its performance. The step in this stage consist of:

1. The collection of data through questionnaires and interviews.
2. Design of experiments by lowering the Management Work Plan (RKM) to Key Performance Indicators (KPI) and then calculated its response time for each KPI.
3. Defining/selecting indicators that can be used as benchmarks in the achievement of performance in each work unit, the size of the unit / score.
4. Requires justification of the user who will use the dashboard, whether in accordance with their expectations? It through questionnaires.
5. The processes that will be tested include: the activation process student status, academic process to graduate students, Drop Out, learning achievement of students, faculty performance (attendance, assessment, student satisfaction) and the needs of lecturers.
6. Scenario testing:
 - i) How to create a test that can prove that management can quickly and accurately in making decisions? Write down the type of policy, the necessary data, the (existing) and the validity of the data (accurate).
 - ii) How easy management of test scenarios about monitoring? Using the example in the preparation of quarterly reports.

V. CONCLUSION

This study modified methodology that develop by eva to adjust the methodology with which the desired characteristics. The modified at identification requirement phase with additional identifying strategic plan of organizational and identifying primary quality indicator at organizational. The methodology was modified because adjusted with condition at Polytechnic Telkom in operational level at academic field. After implementation process, the operational dashboard must be tested to known its performance. This study was added stage of experiment plan and design, because it was important to testing performance of the dashboard by expert users.

The methodology in this study used to develop a type of operational dashboards for study program, because the dashboard was not just aimed at a strategic level management but to the operational level. The dashboard provide information on activities going on, along with changes in real time to provide awareness to things that need to be responded quickly, the information presented is very specific to the sufficient depth detail level, be dynamic because it uses data with a more real-time update frequency.

Operational Dashboard cannot be used as a tool to determine the policy, but only as providers of data and information that can be used for strategic level.

VI. FUTURE WORK

For future work, it is need to implementation the methodology of dashboard development to develop operational dashboard at various units at Telkom Polytechnic or other organization.

The data source may better if getting via data warehouse. The DBMS proposed using Oracle or Ms SQL Server, because they provide more facilities to cover scheduling to provide data for the operational dashboard.

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