

Variability Model Implementation on Key Performance Indicator Application

Meiliana and Derwin Suhartono

Abstract—Key Performance Indicators evaluate the success of an organization of a particular activity. A case study describes a continuous improvement of key performance indicators' specification process that is updated beginning of each year on Bina Nusantara University. The process is specified based on organization's goal, and will be break down to all existing unit with different specific performance indicator. This specification process will lead to variability indicators in several available roles. Variability model used in this paper was designed from a design pattern as one of variability mechanism that is modeled to reflect metric specification process. Variability occurs as varying degree of metrics entity specification process, which is similar to Key Performance Indicator specification process. Modeling variability on key performance indicator specification process aims to support flexibility on specifying generic goal to specific measurement or indicators. Implementing variability model to key performance indicator specification process is the focus of this paper, with support tool of Key Performance Indicator specification process provided.

Index Terms—Variability model, key performance indicator, measurement software, design patter, software quality management.

I. INTRODUCTION

Key Performance Indicators (KPI) helps an organization to define and measure progress towards organization goals. KPIs are quantifiable measurements to examine the improvement in performing an innovation implementing activity that is critical to the success of a business [1], [2]. Hence, it is important to carefully specify the measurement indicators to guide and indicate performance's progress.

On Bina Nusantara University, KPI specification process categorized organization goals into several perspectives. Each goal will be break into several key performance indicators, which have different measurement for different roles on different organization's unit. Within systematic process of KPI's specification process, variability of indicator entity might occur for each personal's key performance indicator. The variability term used in this paper is probably different from the general concept of common variability that concern about product family or product line with the variation of product's components. Therefore, definition from the previous work [3] will be used throughout the work to guide the understanding of this paper:

"Entity variability is the varying degree of entity specification,

start from the initiation form until the complete form of entity that can be implemented".

From aforementioned definition, varying degree on key performance specification process is referred to a key performance indicator which acted as unit's performance indicator that consists of several other's key performance indicators.

Modeling variability to Key Performance Indicators specification process is a key to manage varying degree of measurement indicators and support flexibility on specifying generic goals into specific indicators. The variability model will be able to reflect refining

The next section described related works which focus on the previous work of variability modeling. Section III defines variability model on Key Performance Indicators specification process. The first prototype of tool support is sketched in Section IV, and on the last section, conclusion and an outlook into future work are provided.

II. RELATED WORKS

From the previous work [3], variability model was designed from a design pattern as one of variability mechanisms that are able to reflect metric specification process. The process of metric specification itself was designed based upon a generic requirement process and Goal-Question-Metric (GQM). Variability model designed is illustrated on Fig. 1, based upon decorator pattern. The decorators allow adding new method or extending the state of the entity, and each decorator has an instance variable for the entity it decorates. Those decorators that are used to wrap the entity will change the specification degree of the entity and cause the variability between entities. The structure can be nested to model a decorator component that can be decorated more with another decorator. One example of similar variability weaving can be found on [4] with different techniques [5].

III. VARIABILITY MODEL ON KEY PERFORMANCE INDICATOR SPECIFICATION PROCESS

A. Key Performance Indicators Specification Process

KPI specification process categorized organization goals into several performance indicators of organization units/divisions. Unit's performance indicator will be distributed to all personal's key performance indicator, wherein each personal's key performance indicator consists of several measurements/indicators. One measurement

indicator for each personal might alike or vary on measurement's score. On the top of all, one indicator of personal's key performance indicator can be act as unit's performance indicator that will be refined later on with several others indicators. This specific indicator has different varying degree of specification that cause a variability of the specification process. Key performance indicators specification process is shown in Fig. 2.

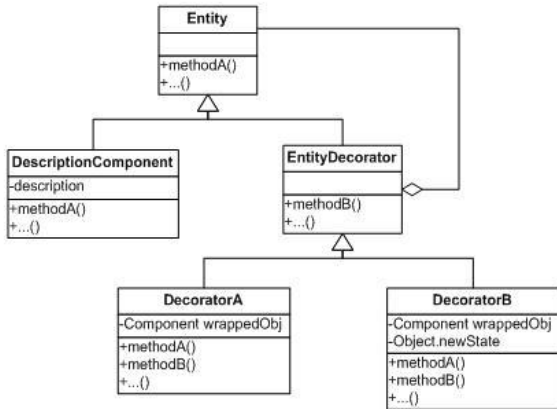


Fig. 1. Information needs model with decorator pattern applied.

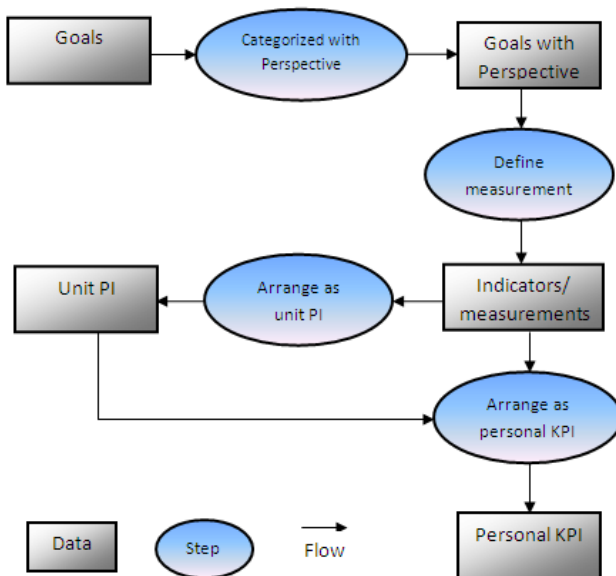


Fig. 2. Key performance indicator specification process.

A potential variability might occur from one or more possibility listed below (within one unit):

- Unit's key performance indicators will be distributed to all personal on that unit. Different key performance indicator for different personal on one unit might lead to variability.
- Different percentage key performance indicator's score for different personal on one unit.
- Personal's key performance indicator score is influenced by unit's key performance indicator score as one of the personal's indicator.
- Unit's key performance indicator score is calculated by all key performance indicators for that specific unit.

B. Variability Model of KPI Specification Process

Variability modeling is a domain specific modeling

technique that helps managing complexity and facilitates reuse, with feature decomposition. The solution variability model based on composite pattern will be presented on this section, as shown on Fig. 3 below. From Key Performance Indicator process in the previous sub-section, there are several main entities on the system; goals, perspective categories, key performance indicator for each individual/personal, unit's performance indicators, and single indicators. Goals are a set of organization's goals that are break down to simplify the measurement and grouping. While perspective is a category that is used for grouping the goals. The core entity is single measurement/indicator as a piece of personal key performance indicator or unit performance indicator. Personal Key Personal Indicator reflect entity of annual personal assessment information that consist of several measurement/key performance indicators, whether it is an single indicator or unit's performance indicator. In addition, unit's performance indicator can be refined by others single measurements/key performance indicators.

Composite pattern can be described as the abstraction from a recurring form that consists of several elements which interact with each other and their context in specific ways [6]. Composite pattern as partitioning pattern will treat individual objects and composition objects uniformly. It is a composite pattern because it can best be explained as the composition of some other patterns. Nodes in a entity hierarchy allow to depend on invariants over their children while permitting user to add new children to any entity in hierarchy anytime.

Structure of composite pattern consist of 3 part; component, leaf and composite. Component is the abstraction for all entities, leaf represent final single object in the composition, while composite represent a composite entity. Composite entity refers to entity that has another entity/component as children. On the key performance specification process, indicator is individual objects or the leaf. Unit's performance indicators reflect the composite entity, as the entity that has another entity which is all indicators of a unit. And component will be used to represent personal Key Performance Indicator as the interface of the whole entities or unit Performance Indicator on other hand. Proposed variability model for Key Performance Indicator application implementation is show on Fig. 3. The proposed variability model will support varying degree of indicator specification process.

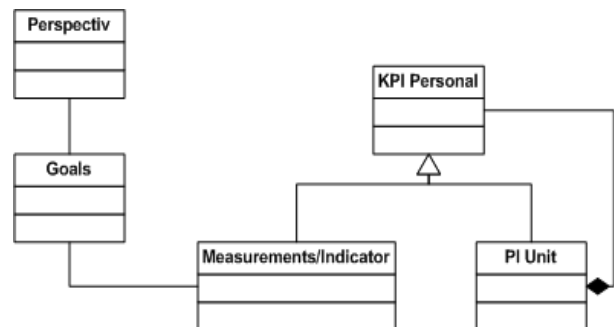


Fig. 3. Variability model of key performance indicators.

IV. KPI SPECIFICATION SUPPORT TOOL

Based on proposed variability model on aforementioned

section, a prototype of support tool to implement key performance indicator specification process is developed, named Smart KPI. The support tool provides a dashboard page to monitor the progress of key performance indicator to achieve organization's goal. This support tool is developing by using PHP as a web application with specific framework, thus will access by all unit with different platform and location. Fig. 4-Fig. 7 are the screenshots of the support tool provided.

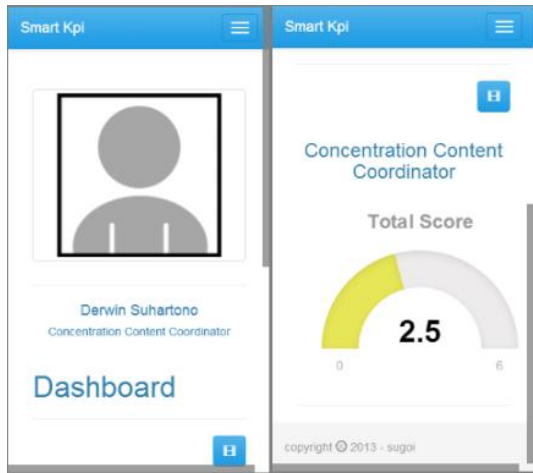


Fig. 4. Tool support–dashboard page on mobile version.

Fig. 4 shows an example for mobile application screenshot of Key Performance Indicator application for dashboard page. It shows graphical presentation of current Key Performance Indicator achievement for each individual access. Web version for dashboard page shown below, where double role for each individual is allow. As the example; Raymond has two roles, senior system analyst and system analyst, and both of the Key Performance Indicator graphical progress for his role is shown.

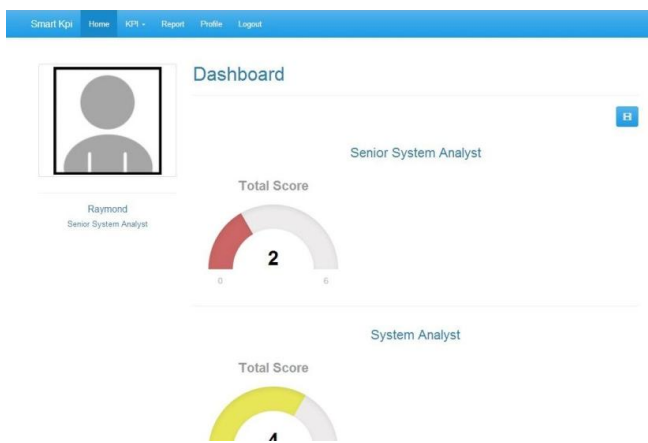


Fig. 5. Tool support–dashboard page on website version.

Fig. 6 is another example of login page of mobile version. User access will be divided into three main actors: administrator, supervisor, and staff, where staff and supervisor.

Key Performance Indicator for each individual will be break down from the goals that are categorized into several perspectives. Fig. 7 shows the example screen shoot of website version of indicator management page.

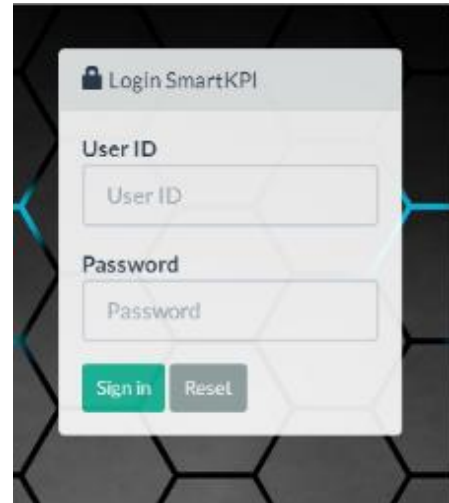


Fig. 6. Tool support – login page on mobile version.

Other highlight features of the Key Performance Indicator application is separated into two part, front end and back end. Front end features consist of Key Performance Indicator management, notification and alert, dashboard, reporting, user profile, KPI history, excel export feature, etc. While back end features consist of division management, position management, user management, perspective management, goal management, indicator management and position user mapping to the specific indicator.

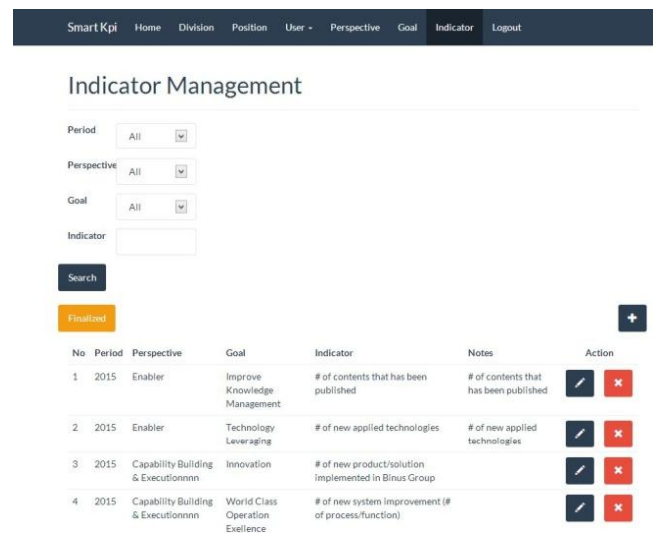


Fig. 7. Tool support – indicator management page on web version.

V. CONCLUSIONS

We introduced a variability model for key performance indicator implementation by using available design pattern; composite pattern and for study case of key performance specification process in Bina Nusantara University. Support variability that occurs from the process is necessary to help organization manage their key performance indicator that happened to be varying for each personal and each different unit. The variability model will enhance the current specification process and support changes indicator in the middle of performance execution.

Nevertheless, the example on this paper is limited for modeling variability on one unit only. The next research will

try to model variability of the whole Key Performance Indicator's specification process of the organization. The final variability model will be design as general model to be used for any implementations of key performance indicators' specification process

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performance.

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