

**DESIGNING THE 3T FRAMEWORK FOR PERFORMANCE MEASUREMENT
OF
KNOWLEDGE MANAGEMENT SYSTEM (KMS)**

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ABSTRACT

The 3T Framework is a framework for performance measurement of knowledge management system in organization environment through a systematic. Performance Measurement of KMS is one of the main prerequisite before organization makes any improves to increase knowledge management to a certain level of maturity. Performance Measurement will be assist organization in making systematic improvement. So it can be emphasized that the measurement of the performance of KMS is one important factor in implementing knowledge management (KM) in an organization.

The 3T framework design using Design Science Research. Framework consists of the assessment stage, the stage determines KPI (key performance indicator) and determine the stage of maturity. Assessment stage is a stage of identifying the vision, mission, strategies, goals, maps and strategy of program initiatives for knowledge management systems. determine KPIs Stages. This stage to identify the KPIs based on predetermined goals. KPI identification based on 5 KPA (key process areas) is the organization, KM process, KM Team, KM technology and knowledge artifacts. Determine the level of maturity stages were conducted to evaluate the performance of the KMS to determine the level of maturity for the 5 KPA.

Keyword: *Knowledge Management System, Maturity Level, Performance Measurement ,Framework, Design Science Research*

1. INTRODUCTION

1.1 Background

Knowledge management performance measurement is very important in improving the quality of a Knowledge Management System (KMS) in the organization. The importance of performance measurement is reinforced by statements from several researchers including Choy Chong and Tobing. Choy Chong stated that the measurement of knowledge management performance is a critical success factor (CSF) in implementing Knowledge Management. *Knowledge Management in the future depends on the quality of measurement and whether the output generated by these measurements will provide a real added value for the organization* [1]. Tobing states that are pushing the need for performance measurement to knowledge management [2]:

1. Traditional performance indicators adopted by most companies today, still focused on the past, not giving a clear direction or guidance on what to do at this time and the time will come.
2. Performance indicators and measurement results are used by many companies today are very difficult to use for decision-making.
3. So that management can make informed decisions and achieve strategic goals
4. In order to make improvements and continuous improvement.

From the above it can be concluded that the measurement of the performance of KMS is one of the CSFs for implementing KM so that the resulting value indicators in performance measurement can be used to make decisions in conducting continuous improvement and refinement.

At this time there is some research that discuss knowledge management performance measurement such as :

1. Development and Validation of a Knowledge Management Capability Assessment Model (KMCA) by Kulkarani and Freeze [3].
2. Measuring Knowledge Management Performance by Shannak [4].
3. Evaluating Knowledge Management Performance by Minone and Turner [5].

Based on the research that can be identified in a study on knowledge management performance measurement at least equipped with elements of strategy, focus areas and levels of maturity. This research will be the development of performance measurement elements KMS from previous research by producing a framework called 3T Framework. The 3T Framework is a framework for measuring the performance of KMS implementation within the organization systematic.

1.2 Problems

The research questions for this paper are

1. What elements are contained in the KMS performance measurement framework
2. What elements are contained in the KMS performance maturity model and how the model of the KMS performance maturity.
3. How performance measurement framework of KMS.

1.3 Goals

Goals for this paper are

1. Conducting analysis to determine the elements contained in the KMS performance measurement.
2. Conducting analysis to determine the elements contained in the KMS performance maturity and designing model of the KMS performance maturity.
3. Designing the 3T framework.
4. Evaluating the 3T Framework

2. RESEARCH METHOD

The method used to produce 3T Framework adapted from information systems research methods of Hevner, March, Park, & Ram(2004)[6]. There are four steps being taken in designing performance measurement framework

1. Doing construction to define the elements of performance measurement.
2. Designing the framework,
3. Instantiation the framework,
4. Evaluating the framework.

Stages of the research method can be illustrated in Figure 1

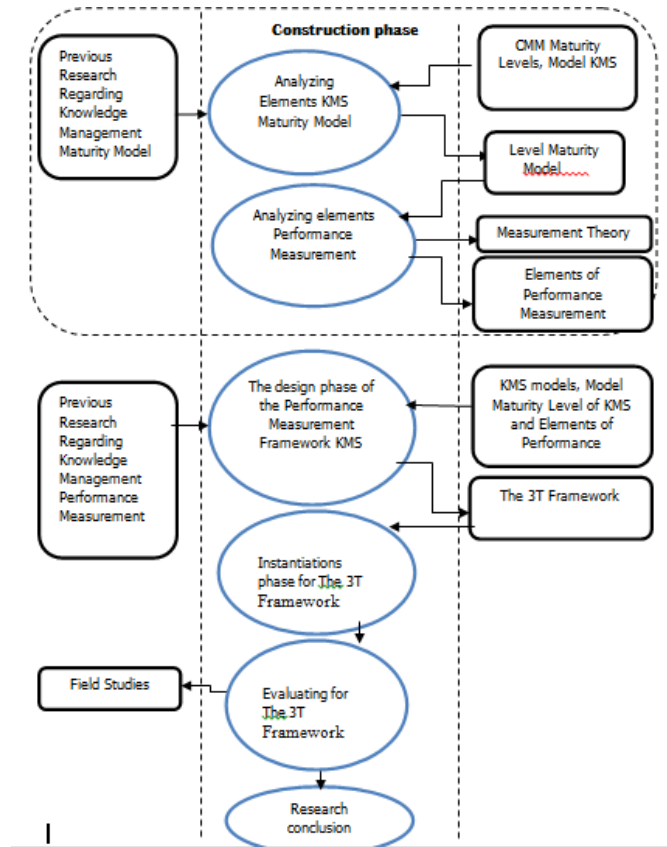


Figure 1. Research Methodology

3. RESULT AND ANALYSIS

3.1 Construction Elements of Performance Measurement and Maturity Model

Stages to design KMS performance measurement framework are the construction elements of performance measurement and KMS maturity model. First, Construction elements of performance measurement is based on an understanding of the most basic and fundamental aspects of performance measurement according of Moehariono and build and implementation of Rohm it can be defined the elements that must exist in the measurement of a performance are: Vision, Mission, Strategy, Strategy Map, objective, performance, initiative and Evaluation [7],[8]. Another stage to design KMS Performance is maturity model analysis. Maturity model analysis conducted to define the maturity model for KMS, by reviewing past research on knowledge management maturity model that can be used to identify elements and relationships forming KMS maturity model. Stages of maturity model development can be seen in the figure 2

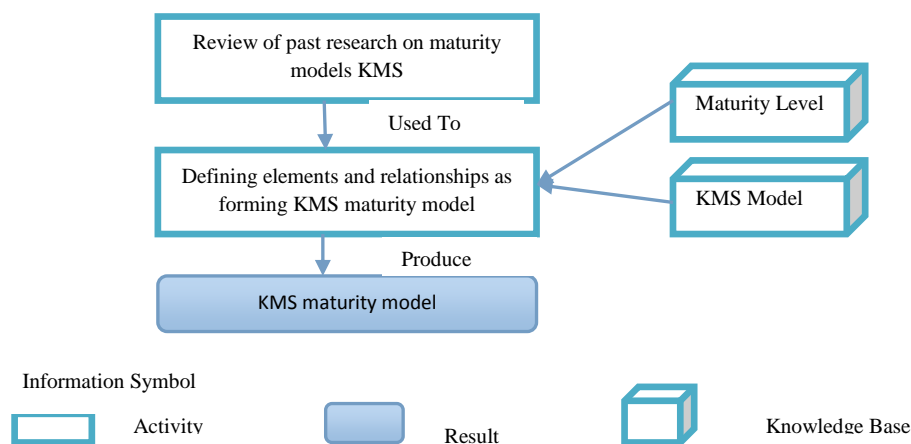


Figure 2. Stages of maturity model development

Previous research study was conducted as a first step in defining the elements and relations of the maturity model KMS. There are three knowledge management maturity model that has been presented in previous research. The research are

1. *Holistic Development of Knowledge Management with KMMM* by Ehms dan Langen. In the research produces KMMM model as the knowledge management maturity model [9].
2. *A Model of Organizational Knowledge Management Maturity based on People, Process and Technology* by Pee and Kankanhalli. In the research produces General Knowledge Management Maturity Model (G-KMMM) as the knowledge management maturity model[10].
3. *A Maturity Model for Quality Improvement in Knowledge Management*, by Paulzen, Perc, Doumi and Roibas. In that research produces Knowledge Process Quality Model (KPQM) as a maturity model on knowledge management[11].

Research conducted on previous research include the level of maturity, maturity attributes and characteristics of maturity. Maturity level of research are adapted from the CMM is a maturity model concept of SEI. The maturity model is typically used to determine the maturity level of software development.

To identify the model elements KMS maturity mapping knowledge management maturity level according KMMM models, G-KMMM and KPQM. Mapping is done in order to comprehensively identify the maturity level to KMS. Mapping can be seen in table 1.

Table 1 Maturity Levels KMS linkage used in research

Maturity Level			Maturity levels are used in research
KMMM	G-KMMM	KPQM	
<i>Initial</i>	<i>Initial</i>	<i>Initial</i>	<i>Initial</i>
<i>Repeatable</i>	<i>Aware</i>	<i>Aware</i>	<i>Aware</i>
<i>Defined</i>	<i>Defined</i>	<i>Established</i>	<i>Defined</i>
<i>Managed</i>	<i>Managed</i>	<i>Quantitatively Managed</i>	<i>Managed</i>
<i>Optimizing</i>	<i>Optimizing</i>	<i>Optimizing</i>	<i>Optimizing</i>

After identifying the maturity level of the next step is to identify attributes of maturity. Maturity attributes found on previous research mapped to elements KMS. KMS element consists of 5 elements. That element are the organization, KM process, KM Team, KM technology and knowledge artifacts [12].

Mapping can be seen in table 2

Table 2 Mapping Maturity Attributes KMS

ELEMENTS KMS	MATURITY ATTRIBUTES		
	KMMM	G-KMMM	KPQM
The Organization	<ul style="list-style-type: none"> • Strategic, Knowledge Goal • Environment, Partnerships • Collaboration, culture 		Organization
KM Team	<ul style="list-style-type: none"> • People, Competencies • Leadership, Support • Roles Organizations 	People	People
KM Process,	Process	Process	
KM Technology	Technology, Infrastructure	Technology	Technology
Knowledge Artifacts	<ul style="list-style-type: none"> • Knowledge Structure • Knowledge Form 		

Mapping in Table 2 done to show that maturity attributes of a maturity model can be based on the forming elements of knowledge management systems. Therefore, to determine the attributes of maturity based on the elements of KMS. After determining the level of maturity and attributes the next step is to determine the characteristics of maturity at KMS. Explanation of the characteristics of the maturity level of the outline can be seen in Table 3

Table 3 Maturity Levels and Characteristics for Knowledge Management Systems

Maturity Level	Maturity Characteristics
1. <i>Initial</i>	There is no knowledge management processes, and environmental management within the organization did not support the existence of knowledge management and therefore will not form a system of knowledge management in organizations (K1).
2. <i>Aware</i>	There is awareness within the organization to manage knowledge, but may not know how to do it (K2)
3. <i>Defined</i>	There is a knowledge management process, management support knowledge management by defining formally as organizational elements, KM team, KM technologies, and to produce artifacts of knowledge (K3).
4. <i>Managed</i>	Knowledge management has been managed well by the organization to form a knowledge management system within the organization and there is a knowledge management system of performance measurement as a process in improving the performance of a knowledge management system (K4).
5. <i>Optimizing</i>	Knowledge Management Systems are well integrated into the organization so that if there are changes in the organization's business objectives, Knowledge Management System can be flexible to adapt to changes without lowering the level of maturity. Performance measurement instruments that have been defined at the level of managed can be combined with other instruments as a tool of strategic control (K5).

Based on previous research studies on KMS maturity model can be concluded that there are three elements formation of KMS maturity model that are:

1. Maturity level: The level of maturity in the maturity model showing the performance of the KMS are initial, aware, defined, managed or optimizing.
2. Characteristics of Maturity: the maturity characteristics represent the performance of SMP conditions in accordance with the level of maturity.
3. Maturity attribute: Maturity attribute indicates that the element is owned by KMS. That element are the organization, the team KM, KM processes, KM technology and knowledge artifacts.

Relation on the elements depicted in the figure 3.

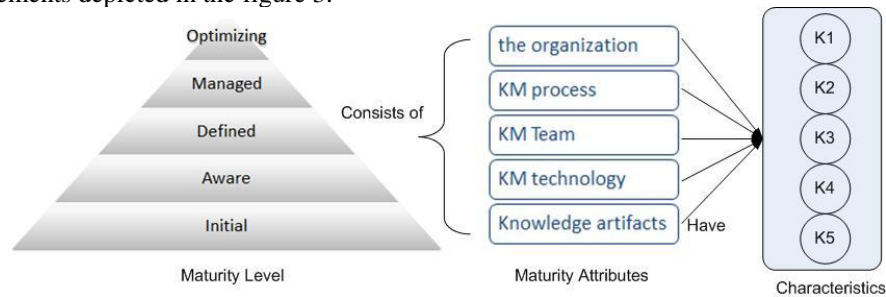


Figure 3 The linkage between the levels, attributes and characteristics Maturity at KMS

KMS maturity model can be visualized from the figure 4.

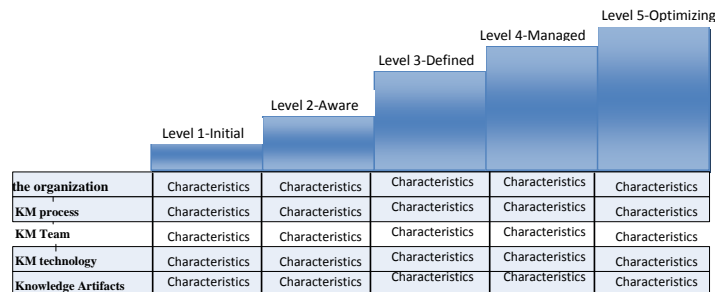


Figure 4. Level Maturity Model for Knowledge Management Systems[12]

3.2 Designing The 3T Framework

Stages to produce 3T framework consists of previous research studies, defining the elements and relationships of the KMS performance measurement. First, **Review of previous research**. There are three research regarding the knowledge management performance measurement:

1. Development and Validation of a Knowledge Management Capability Assessment Model (KMCA) by Kulkarni and Freeze [3].
2. Measuring Knowledge Management Performance by Shannak [4].
3. Evaluating Knowledge Management Performance by Minone and Turner [5].

Based on the research that can be identified in a study on knowledge management performance measurement at least equipped with elements of strategy, focus areas and levels of maturity. Mapping elements of knowledge management performance measurement of some previous researchers can be seen in Table 4

Table 4 Element in Knowledge Management Performance Measurement

Elements	Literature		
	Kulkarni & Freeze, 2004	Shannak, 2009	Minonne & Turner, 2009
Strategy		√	√
Fokus area	√	√	√
Maturity Level	√		√

Another stage to produce 3T Framework is defining elements of the framework 3T. To define the elements of the framework 3T conducting by the development of the measuring element has been defined previously. Development will be done by looking at the elements that must be present in a performance measurement

There are 8 main elements of the framework 3T. The elements are:

1. Vision of a KMS : is a sentence in the hope that an organization wants to achieve with the implementation of knowledge management systems.
2. Mision of a KMS : an effort that will be implemented to realize the vision of KMS.
3. Objectives of KMS: A declaration which states clearly what is to be achieved by the application of knowledge management systems.
4. Strategy of KMS: is a step that is planned to achieve the goal of knowledge management systems
5. Initiatives program of KMS: Designing a program to follow up on each goal
6. Strategy Map of KMS : Is a causal relationship to produce a strategic map.
7. *Key Performance Indicator (KPI)* : Is a measure of performance that can translate the strategy of knowledge management systems into terminology that can be measured. In determining the KPI based on elements from KMS, which was then said to be a key process areas or KPA on performance measurement framework of the KMS.
8. Evaluation: Provide an overview or the results to the organization about how big the successful implementation of knowledge management systems and determine which program initiatives will be undertaken by organizations in order to further improve the performance of the KMS. The success level of implementation of KMS associated with the maturity level.

Finally, Defining relations on elements framework 3T, relations can be described as follows

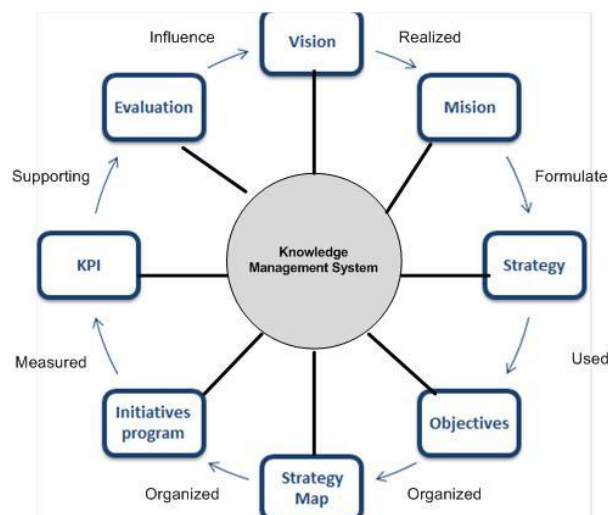


Figure 5 Relation Element Performance Measurement for KMS[12]

To Sum up, 3T framework elements that have been defined above mapped into three phases: assessment, define KPIs and determine the stage of maturity . Explanation of the three stages are as follows

1. assessment phase: Activities conducted at the beginning of the process of defining KPIs, intended to identify the vision, mission, strategy, objectives, strategy maps and program initiatives of the knowledge management system.
2. Determine KPI phase: Activities undertaken to identify the KPI based on a predetermined goal. KPI identification based on five KPA. The KPA is an organization, KM process, KM team, KM technology and knowledge artifacts.
3. Determine the level of maturity phase: Activities undertaken to evaluate the performance of KMS with determining the level of maturity for the five KPA.

The third stage is illustrated in the following 3T Framework. Alignment of KMS with the business strategy that organizations should keep in mind the knowledge management system that was built to be useful to the organization's business continuing. The changes in the business organization will have an impact on knowledge management systems. Therefore, in defining the vision, mission, strategy of KMS, preferably aligned with organizational business strategy

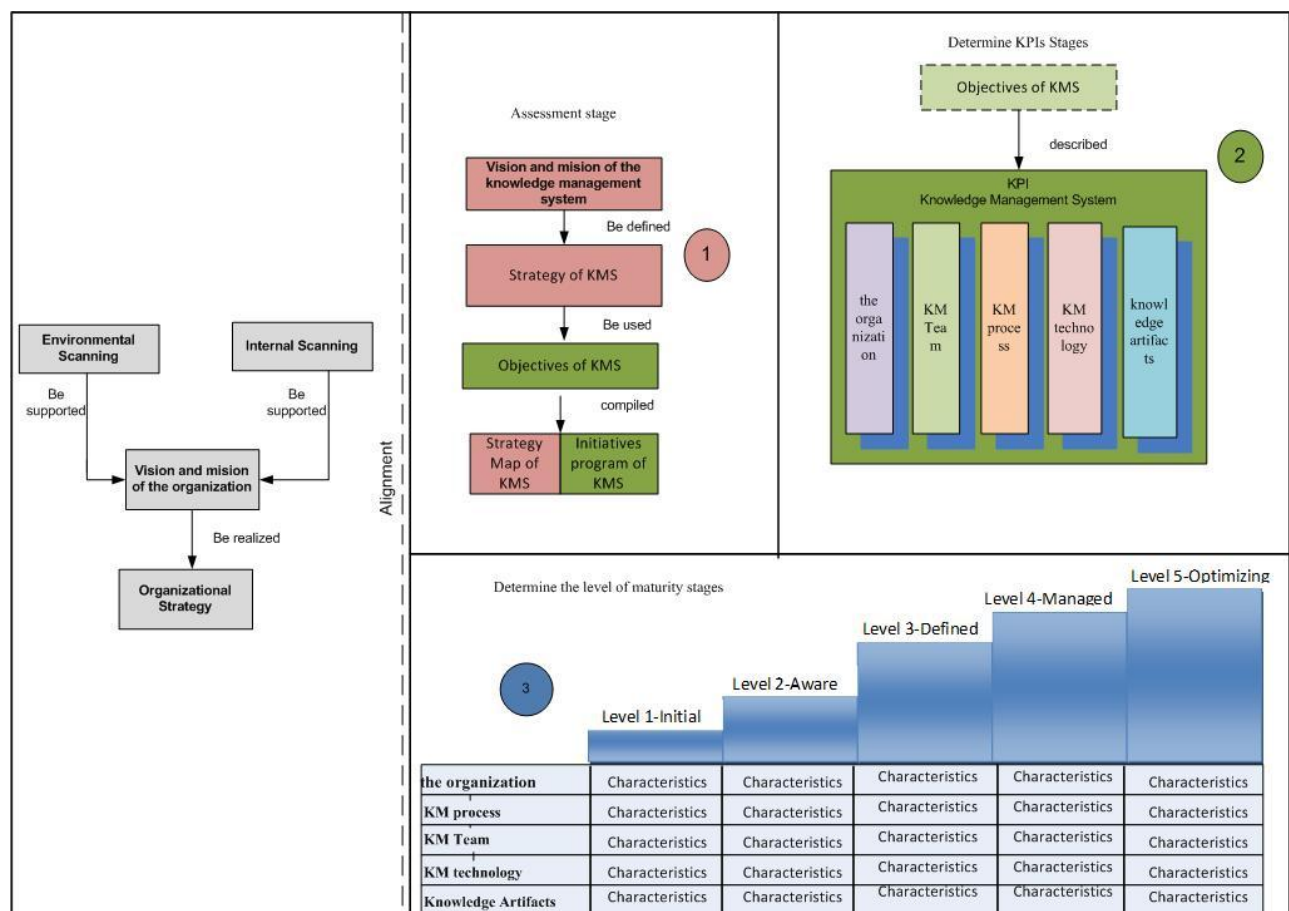


Figure 6 The 3T Framework for Measuring Performance KMS [13]

3.3 Instantiations phase for The 3T Framework

Instantiation stage is a stage show the 3T Framework can be applied in organizations. In the instance of the Framework will be three phases. The phases are [13]

1. Phases assessment KMS done by defining the vision, mission, strategies, goals, strategy maps and program initiatives in the implementation of knowledge management systems.
2. Phases determine KPIs. This stage is to identify the KPIs that derived from the implementation of objective knowledge management system. KPIs can be used to measure the performance organized.
3. Phases determine the maturity level of KMS. This stage is to identify the characteristics of the attributes contained in each maturity at each level of maturity.

3.4 Evaluating for The 3T Framework

Evaluation framework was done by using analytical methods is performed using test validity, reliability of the questionnaire instrument which was made based on the KPI of knowledge management systems and the maturity model of the KMS that has been previously defined. Here is a scenario in conducting performance measurement of KMS.

1. Determining the research object

In evaluating the 3T framework, a case study by conducting a survey in one of the units at Telecommunications Company in Bandung

2. Making a questionnaire

In this study, a survey using the questionnaire method, which consists of two forms of questionnaires, the questionnaire to determine the performance of the KMS and the maturity level of the KMS. Questionnaire formed from five key process areas: organization, KM process, KM team, KM technology and knowledge artifacts.

3. Implementation of the survey in order to collect data.

The data was collected using two sources of data which consist of primary and secondary data

4. Processing the data from the questionnaire

The data processing can be performed using SPSS 16.0 to test the questionnaire instrument validation and reliability and using Microsoft Excel 2007 to calculate the level of performance and maturity level.

3.4.1. Level of KMS Performance

To measure the performance of KMS were calculated using the frequencies used to calculate the number of respondents, who chose the performance levels of low, medium, or high based on each KPA contained in the KMS. From the results of respondents' answers can be recapitulated that illustrates the trend in the level of performance. Recapitulation of the full performance level can be seen in research reports with titles Designing Performance Measurement Framework of KMS created by Fitriasari, N. S.[12]. In figure 7 can be seen Representation on the element Organizational Performance Level.

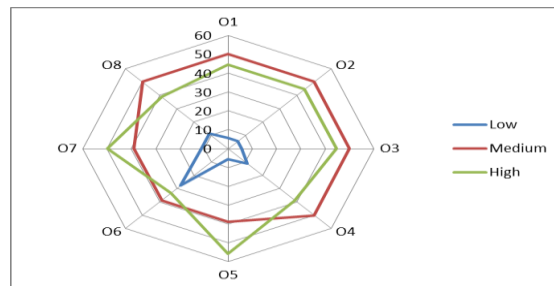


Figure 7 Representation on the element Organizational Performance Level[12]

Figure 7 performance represents an average organizational elements are at medium levels shows that each KPI in the organization element of respondents had achieved enough.

3.4.2. Maturity Value of the KMS

To get a clearer picture of the current maturity value and the expected, rising star charts can be created. The diagram can be seen in the figure 8

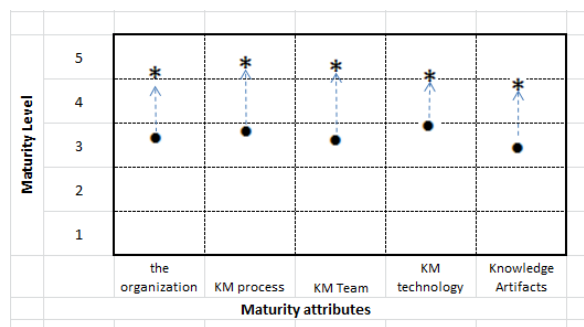


Figure 8. Rising Star Diagram, Maturity Value of the As-Is and To-Be from Maturity Attributes.[12]

Figure 8 Represents the average value of the KMS maturity element currently at maturity level 3 is defined where all elements of SMP has been well documented formal and expectations desired by the respondents for Knowledge Management System is the increased level of maturity up to level 5 or optimizing which means that there is a knowledge management system is expected to be integrated with organizational business processes. Therefore, when there are changes in the organization's business objectives, knowledge management systems will adapt to the flexible.

4. CONCLUSION

1. Based on the analysis that had been done, resulting in that characteristic at maturity level used as a reference to see the level of maturity of the existing KMS and used as a guideline to achieve the expected level of maturity. Characteristics at each level of maturity which describes five attributes of an element of the KMS
2. Based on the results of the design that has been done can be concluded that the performance measurement framework KMS consists of three stages: stages of assessment, determine Key Performance Indicators and determine the level of maturity.
3. Based on the results of an evaluation framework that has been done can be concluded that the KMS performance measurement framework can be used to measure performance KMS based on elements from KMS

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