System Performance Measurement Using Web Server Log Files Method and Sink’s Seven Performance Criteria in Multichannel System Architecture

R Asrianto¹, Y Kerlooza²

¹Post Graduate Program, Universitas Komputer Indonesia, Bandung 40132, Indonesia.
²Magister Sistem Informasi, Universitas Komputer Indonesia, Bandung 40132, Indonesia.

Email: rudy.asrianto@gmail.com,

Abstract. The purpose of system of updating population data with a multichannel architecture helps to simplify and streamline population data service procedures. This study builds a model of performance measurement in system processes using a multichannel system. The research method uses quantitative methods. Performance is seen in terms of productivity, effectiveness, efficiency, quality, quality, innovation, quality of work life and profitability in processes and sub-processes in multichannel systems. The results of this study get a critical area; namely the achievement of outputs that are not in line with the very poor product achievement standards, an increase in RnD is not optimal, employee trainees are not in accordance with the target, and work accidents are high. This paper uses multichannel performance measurement by determining key performance indicators (KPI) and performing performance measurements by recording processes on a multi-channel system with the Seven Sink Criteria method to produce standard performance measurements with the system automatically. In conclusion we can measure performance in SIAK using a multi-channel system, by calculating activity in the system. Even though there are two KPIs that cannot be measured by the system, they can still be combined using a weighted average value. Then we get a value that can be compared with the performance of the service unit to determine the performance conditions.

1. Introduction

SIAK is an information system that compiled based on procedures and using special standardization which aims to organize the population administration system so administration is achieved in the occupation sector orderly [1]. SIAK was created to support the performance of the Office of Population and Civil Registry in carrying out recording functions, publishing NIK, validation and verification, also presenting data and information [2]. In its implementation, SIAK have weaknesses including double data indication, data entry that not following the procedure by the operator, and the length of the service process.

In order to solve these problems, a Multi-Channel System was designed. Multi-channel system utilizes three channels in service requests that are manual, SMS, and system. It is expected that the implementation of this multi-channel system can shorten the service time to reach the entire population of Indonesia. Because at this time, the residents still have to come directly to the office and bring the administrative completeness to make a request.
This multi-channel system design has five aspects that will determine the success of its implementation, one of which is the aspect of performance measurement. This aspect is considered important because it is the basis for evaluating each process [3]. Some measurement techniques that have been carried out by previous research are performance measurement methods with the determination of Key Performance Indicators (KPI). KPI is often used as one of the bases of performance measurement. Tatsiana discuss about Identifying the KPIs for the Design Stage Based or The Main Design Sub-Processes. Process performance could define as the degree to measure desired projects output meeting the process by using measurement when projects is on going. To control the process, it needs variability control in each sub process. So, KPI has been used in proposed framework that design stage. After that, it is compared to previous result KPI that was used already validated by expert through interview [4]. In paper titled Application Performance Management: State of the Art and Challenges for the Future by Heger, and friends, they discuss about performance application that has direct impact in business metrics. They apply Aplication Performance Management (APM) to provide the required process and tools. As a objective they want to have an up to date and continuous picture of relevant performance measurement during the operations. As a result they made an overview the state of APM in industrial practice and academic research [5-6]. In paper titled Analysis and Evaluation of Web Application Performance Enhancement Techniques by Jugo and friends, tell us that many new performance enhancement techniques have been create. They want to measure the effectiveness from each techniques when applied in finish product. They analyze the techniques, and calculate the overall efficiency by using weight. They have proved that it is possible, in a controlled environment at least, to significantly enhance the performance of WAs using just a small set of performance enhancement techniques with a total implementation time ranging from 10 to 50 working hours for applications running on one multiple role (e.g. web, proxy, application) server [7-9]. In his research entitled Measurement of Local Government Work Unit Performance in the Value for Money Perspective, Hidayat and Riharjo took a case study at the Surabaya City Education Office. Value for money is a qualitative de-descriptive method using secondary and primary data sources. Value for money can be achieved if the organization has used the smallest input costs to achieve maximum output in order to achieve organizational goals [10].

This study uses the Snorm de Boer scoring system, and weighting using AHP. The result of this research is get critical area; that is achievement of output that’s not accordance with the standard, achievement of high bad product, not optimal RnD improvement, employee trainee that not accordance with the target and high work accident.

2. Method

To build the model, this paper using the following steps as follow.

2.1 Key Performance Indicator

Key Performance Indicators (KPI) are used to determine key parameters adopted from the community satisfaction index from KEP / 25 / M.PAN / 2/2004 which contain 14 service elements [11].

1. Service procedure
2. Service requirements
3. Service personnel’s explanation
4. Service personnel’s discipline
5. Service personnel’s responsibility
6. Service personnel’s ability
7. Speed of service
8. Getting fair service
9. Courtesy and friendliness of officers
10. Fairness of service costs
11. Certainty of service fees
12. Certainty of service schedule
13. Environmental comfort
14. Service security
2.2 Sink’s seven Performance Criteria

Sink’s seven Performance Criteria (SSPC) are used to determine the objectives of performance measurement, the purpose of which is the following seven criteria.

1. Effectiveness.
2. Efficiency.
3. Productivity.
4. Quality.
5. Innovation.
6. Quality of Work Life.
7. Profitability / Budgetability.

3. Results and Discussion

3.1 Web Server Log Files

The Web Files log server (WSLF) records activity information when the system user sends a request to the server. The application of web server log files can be classified into 4 parts, as shown in Figure 1.

![Figure 1. Web Server Logs Classification](image)

Based on 4 classifications of logs, the recording of activities in the multi-log system log server can be shown in Table 1 below.

| Table 1. Web Server Log Files |
|------------------------------|
| Web Server Log Files         | Unit    |
| System down                  | Hour    |
| System response at submission| Seconds |
| System determining authorization| Seconds |
| All services complete        | Day     |
| Incoming request             | Amount  |
| Request with the wrong code  | Amount  |
| Application with failed format| Amount  |
| Process in Authorizer        | Seconds |
| Requirements information     | Amount  |
| Total authorization          | Person  |
| Active authorizer            | Person  |
| Amount of Application        | Amount  |
| Requests are not processed   | Amount  |
3.2 Mapping The KPI, SSPC and WSLF

When measure performance with KPI, SSPC and WSLF, there is only 12 out of 14 KPIs that can be measured using system of classification measurements. Then the classification of measurements carried out by the system based on KPI and determination of the assessment range adjusted to the scale in the KEP / 25 / M.PAN / 2/2004 questionnaire. For the unfavorable category given a perception value of 1, it is not good to be given a perception value of 2, both given a perception value 3, very good given a perception value 4. WSLF table for service procedure KPI could be shown in Table 2:

| KPI                 | WSLF     | Unit      | SSPC  | Range |
|---------------------|----------|-----------|-------|-------|
| Service procedure   |          |           |       |       |
| Down system         | Hour     | Effectivity | >6    | ≤ 6   | ≤ 4   | < 2   |
| System response     | Second   | Effectivity | >6    | ≤ 6   | ≤ 4   | < 2   |
|                     | Second   | Productivity | >6    | ≤ 6   | ≤ 4   | < 2   |
| System response     | Day      | Productivity | >6    | ≤ 6   | ≤ 4   | < 2   |
|                     | %        | Productivity | >6    | ≤ 6   | ≤ 4   | < 2   |
| Process in          | Hour     | Quality    | >6    | ≤ 6   | ≤ 4   | < 2   |
| Authorizer          |          |            |       |       |

KPI measurement data for service procedures using the system have 6 system measurements in this KPI. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows:

\[
KPI \text{ Service Procedure} = \frac{L1 + L2 + L3 + L4 + L5 + L6}{6}
\]
3.3 Service requirements

WSLF table for service requirements KPI could be shown in Table 3

Table 3. WSLF for Service Requirements KPI

| KPI                        | WSLF                  | Unit                      | SSPC                        | Range     |
|----------------------------|------------------------|---------------------------|-----------------------------|-----------|
|                            | Helpdesk               | Exist/no                  | Profitability / Budgetability | Not Exist | Exist     |
| Service requirements       | Number of format requests failed |                        |                             |           |
|                            | Amount                 | Efficiency                |                             | >6 ≤ 6 ≤ 4 ≤ 2 |
|                            | Number of requests with the wrong code |                        |                             | >6 ≤ 6 ≤ 4 ≤ 2 |

There are 3 system measurements data for Service Requirements using the system in this KPI. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows:

\[
KPI_{Service\ Requirements} = \frac{L1 + L2 + L3}{3}
\]

3.4 Service Personnel’s Explanation

WSLF table for service personnel’s explanation KPI could be shown in Table 4:

Table 4. WSLF for Service Personnel’s Explanation KPI

| KPI                        | WSLF                  | Unit        | SSPC                        | Range     |
|----------------------------|------------------------|-------------|-----------------------------|-----------|
| Service Personnel’s Explanation | Down system            | Hour        | Effectiveness                | >6 ≤ 6 ≤ 4 ≤ 2 |
|                            | System response to submissions | Second | Effectiveness                | >6 ≤ 6 ≤ 4 ≤ 2 |
|                            | System response to submissions | %          | Productivity                | >6 ≤ 6 ≤ 4 ≤ 2 |

Measurement data for service personnel’s explanation using the system, there are 3 system measurements in this KPI. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows:

\[
KPI_{service\ personnel's\ explanation} = \frac{L1 + L2 + L3}{3}
\]
3.5 Service personnel’s discipline

WSLF table for service personnel’s discipline KPI could be shown in Table 5:

Table 5. WSLF for Service Personnel’s Discipline KPI

| KPI                        | WSLF | Unit        | SSPC | Range     |
|----------------------------|------|-------------|------|-----------|
| Service personnel’s discipline |     |             |      |           |
| System response at submission |     | Second      |      | >6        |
| Process in Authorizer       |      | Quality     |      | ≤ 6       |

Measurement data for service personnel’s discipline KPI using the system has 2 system measurements. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows:

\[
KPI \text{ Service personnel's discipline} = \frac{L1 + L2}{2}
\]

WSLF table for service personnel’s responsibility KPI could be shown in Table 6:

Table 6. WSLF for Service Personnel’s Responsibility KPI

| KPI                        | WSLF | Unit        | SSPC | Range     |
|----------------------------|------|-------------|------|-----------|
| Service personnel’s responsibility |     |             |      |           |
| Ratio The number of requests and requests that have been processed by the authorizer |     | %           |      | >6        |
| System response at submission |      | Productivity |      | ≤ 6       |

KPI measurement data Service personnel’s responsibility using the system have 2 system measurements in this KPI. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows in table 7:

\[
KPI \text{ Service personnel's responsibility} = \frac{L1 + L2}{2}
\]
Table 7. WSLF for Service Personnel’s Ability KPI

| KPI                          | WSLF | Unit | SSPC | Range       |
|------------------------------|------|------|------|-------------|
| Service personnel’s ability  |      |      |      | 1 2 3 4      |
| Ratio of the number of requests submitted to the authorization and those that failed in the authorization process | %    | Productivity | >6  ≤ 6  ≤ 4  ≤ 2 |
| System response at submission |      |      |      |             |
| Second                        |      | Effectivity | >6  ≤ 6  ≤ 4  ≤ 2 |

KPI measurement data service personnel’s ability using the system have 2 system measurements in this KPI. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows in table 8:

\[
KPI \text{ Service personnel's ability} = \frac{L_1 + L_2}{2}
\]

Table 8. WSLF for Speed of Service KPI

| KPI                  | WSLF | Unit | SSPC | Range       |
|----------------------|------|------|------|-------------|
| Speed of service     |      |      |      | 1 2 3 4      |
| All Services Complete | Day  | Productivity | >6  ≤ 6  ≤ 4  ≤ 2 |

KPI Measurement Speed of Service using the system only have 1 system measurement. So for this KPI there is no need for equal distribution, the value recorded by the system goes directly into the performance measurement, show in table 9:

Table 9. WSLF for Getting Fair Service KPI

| KPI                  | WSLF | Unit | SSPC | Range       |
|----------------------|------|------|------|-------------|
| Getting fair service |      |      |      | 1 2 3 4      |
| The ratio of total submission and processed to completion | %    | Effectivity | >6  ≤ 6  ≤ 4  ≤ 2 |

KPI Getting fair service using only have 1 system measurement. So for this KPI there is no need for equal distribution, the value recorded by the system goes directly into the performance measurement, show in table 10:
Table 10. WSLF for Certainty of Service Fees KPI

| KPI                        | WSLF          | Unit     | SSPC  | Range  |
|----------------------------|---------------|----------|-------|--------|
| Costing in the system      |               |          |       |        |
| according to information   |               |          |       |        |
| Exist/no Effectivity       |               |          |       |        |
| Matching Not matching      |               |          |       |        |

KPI Measurement Data Certainty of service fees using the system only have 1 system measurement. So for this KPI there is no need for equal distribution, the value recorded by the system goes directly into the performance measurement. Following at table 11:

Table 11. WSLF for Certainty of Service Schedule KPI

| KPI                        | WSLF          | Unit     | SSPC  | Range  |
|----------------------------|---------------|----------|-------|--------|
| System response at submission |               | Second   |       |        |
| List of application lists   |               | Exist/no |       |        |
| Effectivity >6              |               | ≤ 6      |        |        |
| ≤ 6                         |               | ≤ 4      |        |        |
| ≤ 2                         |               |          |        |        |

Certainty KPI measurement data Service schedule using the system contains 2 system measurements. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows in table 12:

\[ KPI \text{ Certainty of service schedule} = \frac{L_1 + L_2}{2} \]

Table 12. WSLF for Environmental Comfort KPI

| KPI                        | WSLF          | Unit     | SSPC  | Range  |
|----------------------------|---------------|----------|-------|--------|
| Environmental comfort      |               | Exist/no |       |        |
| Using System               |               | Innovation |     |        |
| Not comfortable            |               | Very comfortable | |        |

Environmental Comfort KPI Measurement Data using the system only have 1 system measurement. So for this KPI there is no need for equal distribution, the value recorded by the system goes directly into the performance measurement, show in table 13:

Table 13. WSLF for Certainty of Service Security KPI
KPI service security have 3 system measurements. So to adjust the measurement results of the system with performance measurements from KEP / 25 / M.PAN / 2/2004 using equal distribution as follows:

\[
KPI_{Service\ security} = \frac{L1 + L2 + L3}{3}
\]

The KPI value is calculated using the "weighted average value" of each KPI. [12]. In calculating KPIs with 14 elements, each KPI has the same weighing formula as follows:

\[
Weighted\ average\ weight\ value = \frac{\text{Number\ of\ weight}}{\text{Total\ KPI}} = \frac{1}{14} = 0.071
\]

To obtain a service unit KPI value, the weighted average value approach is used as follows:

\[
KPI = \frac{\text{Total\ of\ the\ System\ Measurement\ Value}}{\text{Total\ KPI\ that\ the\ System\ can\ Measure}} \times \text{Weighing\ Value}
\]

To facilitate the interpretation of the KPI assessment, which is between 25 - 100, the results of the valuation above are converted to a base value of 25, using the following formula:

\[
KPI\ Value\ after\ Converted = KPI \times Basic\ Value
\]

The calculation results will be adjusted to the perception value to determine the performance of the service units in the Table 14:

| Perception value | KPI interval value | Conversion interval value | Quality of service | Performance of the service unit |
|------------------|--------------------|---------------------------|--------------------|---------------------------------|
| 1                | 1.00 – 1.75        | 25 – 43.75                | D                  | Bad                             |
| 2                | 1.76 – 2.50        | 43.76 – 62.50             | C                  | Quite bad                       |
| 3                | 2.51 – 3.25        | 62.51 – 81.25             | B                  | Well                            |
| 4                | 3.26 – 4.00        | 81.26 – 100.00            | A                  | Very good                       |

Perception value and performance of unit service is standard value that we will compared with our calculation. This standard was mentioned in Kepmenpan no KEP/25/M.PAN/2/2004, so we will stick to this regulation. The thing that we try to modified is the
If in Kepmenpan using questionnaire to collect the data, we measure it by calculated the activity when using SIAK multi channel system.

4. Conclusion

This paper has presented a standardized measurement of performance by using the Web Server Log Files Method method to determine the performance of the system and using the Sink’s Seven Performance Criteria method as a classification of system performance measurement criteria. The merging of the Web Server Log Files Method method with the Sink’s Seven Performance Criteria method is able to automatically measure performance by the system by recording all processes and subprocesses that occur in the multichannel system population data updating system.

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