IDENTIFY FAQ KNOWLEDGE GAP IN IT HELPDESK USING KNOWLEDGE MAPPING: CASE STUDY HALOSIS BPS-STATISTICS

IDENTIFIKASI KESENJANGAN PENGETAHUAN PADA FAQ HELPDESK TI MENGGUNAKAN PEMETAAN PENGETAHUAN: STUDI KASUS HALOSIS BPS

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Abstract

One important feature of IT HelpDesk, such as HaloSIS, is knowledge base. This feature disseminate knowledge about problem solving knowledge. This knowledge base goals were to assist service desk for giving fast solution to problem reported by user call and to facilitate learning about problem solving for new member of technical support team. To improve problem solving performance, technical support team can update or add this knowledge base with new problem solving knowledge. However, until this day this knowledge base was not updated. This can lead HaloSIS into tacit knowledge problem. There is a tool of knowledge management that can be used for identifying knowledge gap. This tool is knowledge mapping. Knowledge map can be used to representing the incompleteness of the current knowledge network that will enable to attain a sustainable future. This study propose knowledge map building from troubleshooting log in HaloSIS. This study build current knowledge map based on FAQ knowledge and merge it with knowledge found in troubleshooting log. The methodology to build knowledge map was the 6-step method from Kim's research. The data analysis method used is qualitative data analysis method using thematic analysis. However, there are some limitations of this study which only maps the online presence system. For future research, it is necessary to build a knowledge map for all services in HaloSIS comprehensively to maintain, renewal, and seeking for knowledge.

Keywords: Helpdesk knowledge, knowledge management, knowledge mapping, knowledge map, FAQ, HaloSIS BPS-Statistics Indonesia

Abstrak

Salah satu fitur penting dari Helpdesk TI, seperti HaloSIS, adalah basis pengetahuan. Fitur ini mendiseminasikan pengetahuan tentang pemecahan masalah. Tujuan basis pengetahuan ini adalah membantu layanan bantuan untuk memberikan solusi cepat untuk masalah yang dilaporkan oleh pengguna TI dan untuk memfasilitasi pembelajaran tentang pemecahan masalah bagi anggota baru tim dukungan. Untuk meningkatkan kinerja penyelesaian masalah, tim dukungan teknis dapat memperbarui atau menambahkan basis pengetahuan ini dengan pengetahuan pemecahan masalah yang baru. Namun, hingga penulisan penelitian ini basis pengetahuan ini tidak diperbarui. Hal ini dapat membawa HaloSIS ke dalam masalah knowledge management problem. Terdapat alat manajemen pengetahuan yang dapat digunakan untuk mengidentifikasi kesenjangan pengetahuan. Alat ini adalah pemetaan pengetahuan. Peta pengetahuan dapat digunakan untuk mewakili ketidaklengkapan jaringan pengetahuan saat ini yang akan memungkinkan untuk mencapai masa depan yang berkelanjutan. Studi ini mengusulkan pembangunan peta pengetahuan dari troubleshooting log in HaloSIS. Studi ini membangun peta pengetahuan saat ini berdasarkan pengetahuan FAQ dan menggabungkannya dengan pengetahuan yang ditemukan di log pemecahan masalah. Metodologi untuk membangun peta pengetahuan ini adalah metode 6 langkah dari penelitian Kim. Metode analisis data yang digunakan adalah metode analisis data kualitatif dengan menggunakan analisis tematik. Namun, ada beberapa keterbatasan penelitian ini yang hanya memetakan sistem keberadaan online. Untuk penelitian di masa depan, perlu untuk membangun peta pengetahuan untuk semua layanan di HaloSIS secara komprehensif untuk mempertahankan, memperbarui, dan mencari pengetahuan.

Kata Kunci: Pengetahuan Helpdesk, manajemen pengetahuan, pemetaan pengetahuan, peta pengetahuan, FAQ, HaloSIS BPS

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INTRODUCTION

In the beginning of 2018, BPS-Statistics Indonesia has implemented Information Technology Service Management (ITSM). One of ITSM product is IT helpdesk service called HaloSIS. HaloSIS was managed by Statistics Information System (SIS) Directorate, one of Division in BPS-Statistics. There are three important roles in HaloSIS management namely Service Desk Officer, Technical Support Team Leader, and Technical Support Team Member. Service desk officer task is to receive call from IT user who want to report problem or create request about IT service.

One important feature of HaloSIS is knowledge base. This feature disseminate knowledge about problem solving knowledge. This knowledge was initially created manually by technical support team of each IT service. This knowledge base goals were to assist service desk for giving fast solution to problem reported by user call and to facilitate learning about problem solving for new member of technical support team. This feature also aiming for IT user to finding solution before he/she report problem to HaloSIS service desk officer. To improve problem solving performance, technical support team can update or add this knowledge base with new problem solving knowledge.

The problem solving knowledge documentation process into HaloSIS knowledge base initially conducted simultaneously before HaloSIS launching day. However, until this day this knowledge base was not updated. This can lead HaloSIS into tacit knowledge problem. This tacit knowledge remain in technical support head and not documented to knowledge base.

Undocumented tacit knowledge can bring negative impact to HaloSIS. HaloSIS must seek best solution again if same problem assigned to different people, both service desk officer and technical support team member. Undocumented tacit problem solving knowledge also bring knowledge loss if the owner of this tacit knowledge move out to technical support team because of personnel transfer or retired. Those problem significantly bring performance problem in problem solving process in IT service in BPS-Statistics.

Apart from not updating the knowledge base, the HaloSIS knowledge base display also makes it difficult for the knowledge seeking process. To seek knowledge in HaloSIS knowledge base user, both IT user and HaloSIS officer, need to prepare some keywords to search for knowledge. This makes it very difficult for both users of IT services and new technical support, who have no experience in IT service issue to explore the knowledge base to handle or learn about handling IT service issues.

From these problems it can be concluded that HaloSIS requires a knowledge management tool to simplify the process of identifying new knowledge and facilitate exploration of knowledge bases for users.

To identify new knowledge that was not yet transferred to knowledge base, HaloSIS team need to identify knowledge gap that happen in HaloSIS knowledge base. There is a tool of knowledge management that can be used for identifying knowledge gap. This tool is knowledge mapping. Knowledge mapping is the process, methods, and tools for analyzing knowledge areas in order to discover features or meaning and to visualize them in a comprehensive, transparent form such that the business-relevant features are clearly highlighted (Nijenhuis, 2013). Knowledge map can be used to representing the incompleteness of the current knowledge network in all sectors (manufacturing, agriculture, health, transport, smart communities, energy, etc.) that will enable us eventually to attain a sustainable future (Sinclair dkk., 2019).

Knowledge users usually use one of two strategies to seek knowledge namely: searching and browsing. In the searching strategy, users must have a topic or some keywords in mind. In the browsing strategy they do not search for a specific which is characterized by the absence of planning (Hao dkk., 2014). The speed of finding knowledge...
is an important indicator in the problem solving process and must be implemented in HaloSIS. Knowledge map is a knowledge representation technology that can be used to find sources of knowledge, implement knowledge creation and increase knowledge sharing (Hao dkk., 2014).

According to the explanation of how knowledge map can be solution to identification of new knowledge and facilitation of knowledge seeking problem, research question was formulated to this research. The research question of this research is: “How is a knowledge map design to identify knowledge gaps and to facilitate knowledge seeking in HaloSIS?”.

MATERIAL AND METHODS

Knowledge is a vital organizational resource contributing towards managerial decision-making and enhancing organizational competitiveness (Polanyi, 2009). Knowledge defined as a combination of experience, values, contextual information and expert insight that support the assessment and assimilation of new experiences and information. Organizations focusing on Knowledge Management (KM) tools and techniques have identified that exchange of knowledge within an organization has been marked by increased productivity and sustained competitive advantage. There are three key aspects in this subject: people (organizational and cultural aspects of the use of knowledge), process (methods and techniques for managing the flow of knowledge); and technology (tools and infrastructure that provide access to knowledge) (Irani dkk., 2014).

Knowledge maps have received increasing attention as an important subfield of knowledge management, which play an imperative role. Knowledge map can help an organization to describe how and where to find useful knowledge within an organization (Balaid dkk., 2016). The knowledge map plays important roles in implementing knowledge management. All captured knowledge can be summarized and abstracted through the knowledge map. The knowledge map also gives a useful blueprint for implementing a knowledge management system (KMS).

This article uses six steps methodology for developing knowledge management map by Suyeon Kim (Kim dkk., 2003) because the approach uses a process map as a starting point to gather and externalise explicit and tacit knowledge and emphasizes on the re-iterative building and validation of knowledge ontology. The procedure consists of six steps: defining organizational knowledge, process map analysis, knowledge extraction, knowledge profiling, knowledge linking and knowledge map validation as can be seen on figure 1.

Figure 1. Procedures For Building The Knowledge Map

Thematic analysis is one of processing qualitative data method. Thematic analysis is a method for identifying themes, or meaningful patterns in textual data sets. This thematic analysis is widely used in research to investigate topics, such as understanding experiences and understandings, perceptions, practices, and underlying causes of phenomena (Braun & Clark, 2013).

This study uses thematic analysis by codifying the data in the form of text as a result of interview and document studies to explore the interpretations of these documents.
The stages of thematic analysis in this study are as follows:
1. Transcribe data obtained systematically
2. Make an outline and codify the data
3. Find the theme, pattern and relationship code in the text
4. Evaluate data
5. Analyze interpretations and draw conclusions.

A. Define Organizational Knowledge
Qualitative data were collected using interview and document study to define organizational Knowledge that important for HaloSIS. Because of some limitation this research only mapping knowledge within one IS service in HaloSIS. This service are IS services that manage by IT Management Sub Directorate, one of Statistics Information System Directorate. Document study in this research based on Service Catalogue, SLA and Business Continuity Plan documents. For the interview, this research conduct a dynamic interview to 3 members of IT Management Sub Directorate technical support team. Those interviewees consist of 1 supervisor and 2 technical support member.

B. Process Map Analysis
In this step process map based on IS Service’s business process was developed. This process map consist of key processes of IS Service under IT Management Sub Directorate, process flow, process event, external object and their relationship.

C. Knowledge Extraction
Knowledge that already define on HaloSIS knowledge base was extracted and entered to process map result of step 2 to get the current knowledge map. Problem solving log that stored in HaloSIS database also extracted and entered to knowledge map to get the new knowledge map.

Qualitative analysis was used to classify knowledge extracted from HaloSIS (knowledge base and problem solving log) in the process map. Extracted Knowledge classify to Prerequisite, Used, or Produced Knowledge in the one of process map.

D. Knowledge Profiling
Profiling extracted knowledge was conducted to identify knowledge profile. Knowledge Profile used in this research consist of attributes namely:
1) Ticket number and ID
2) Trouble Title
3) IT Service
4) Trouble request creator
5) timestamp ticket transaction
6) message title
7) message details
8) message sender

This step also used qualitative analysis from knowledge base and problem solving log in HaloSIS.

E. Linking Knowledge / Building Knowledge Map
After extracting and profiling knowledge, knowledge map for extracted knowledge was build. Knowledge map was build based on process map, knowledge extraction result and knowledge profile.

F. Validating Knowledge Map
In this step knowledge map that already build was being validated. Validation process was conducted by confirmation interview with supervisor of technical support team each IS Service.

Result from the analysis of organizational documents as well as the expert opinion collected through interviews, it was helped us to identify, capture and representing organizational knowledge that can be used to develop knowledge map.

G. Data Collection
Data collection for this study was gathered using interview, document, and troubleshooting log from HaloSIS system database. Interview was conducted to three supervisor wich also as section chief in IT management Sub Directorate. From interview this study acquire information about what services were important to IT Management Sub Directorate. Table 1 is the result of important service interview in IT Management Sub Directorate.
Table 1. Interview Information about Importance Service in IT Management Sub Directorate

| Section Chief                     | Important Service (Knowledge Domain)                                                      |
|-----------------------------------|---------------------------------------------------------------------------------------------|
| Data Recording Section            | Attendance Online System service for BPS-Statistics Indonesia office at Province and District level |
| Software Management Section       | Software Management (office and antivirus) service                                           |
| Hardware Management Section       | Computer (All Device not only PC) repair service                                             |

Because of some limitation this study only use one most important service. This service is Attendance online System. Data for this study also gathered using study documents related to HaloSIS and HaloSIS Service. Document types gathered in this study namely:
1. IT Service Catalogue,
2. SOP document of HaloSIS,
3. BCP DRP document,
4. Service Manual (Attendance online, computer repair etc), and
5. SLA document for IT Service.

Those documents were used to support this study for building process map and knowledge map beside HaloSIS troubleshooting database log.

This study also gathered data from HaloSIS system troubleshooting database log. This log was gathered from Database Development Sub Directorate as HaloSIS system administrator. Some information gathered from this log namely:
1. Ticket number and ID
2. Trouble Title
3. IT Service
4. Trouble request creator
5. Timestamp ticket transaction
6. Message title
7. Message details
8. Message sender

This data was send by Database Development Sub Directorate using CSV Format. Figure 2 below was screenshot of CSV Data log.

Figure 2. CSV Data Troubleshooting Log HaloSIS

Figure 2 data contains several record for each trouble. Before coding this troubleshooting, log record for each trouble must be merge using SQL query. This research can get troubleshooting conversation after query the data. this conversation was extracted and processed to get the know-how knowledge context.

RESULT

1. Define Organizational Knowledge

This study collected several textbooks regarding IT helpdesk and listed all tables of contents as original sources for developing a knowledge map consisting of 3 services that most used in HaloSIS based on interviews. A knowledge workshop on ontology was held to specify the knowledge requirements, analyze input sources, and develop basic taxonomy. We define segment knowledge under 3 categories, shown as Table 2.

| No. | Services               | Sub Category       |
|-----|------------------------|--------------------|
| 1   | Application Development| Attendance System Service Online |
| 2   | Software               | Software Service Management |
| 3   | Hardware               | Computer Service Repair |
2. **Process Map Analysis**

After define organizational knowledge, we then create process maps based on task flow. According to documents study and interview, the process flow of Attendance Online System Service in Figure 3.

![Figure 3. Attendance Online System Service Process maps](image)

From Figure 3, there are four processes flow in Attendance Online System namely:

| No. | Knowledge                                      |
|-----|-----------------------------------------------|
| 1   | Employee Registration/Enrollment              |
| 2   | Attendance Transaction                        |
| 3   | Manage Attendance Transaction                 |
| 4   | Reporting                                     |

3. **Knowledge Extraction**

This research knowledge from HaloSIS database was extracted and analyzed using selective coding to classify and include knowledge to process map for each service. This knowledge was extracted from two sources namely knowledge base/Frequently Asked Question (FAQ) and troubleshooting log.

**Table 3. Current FAQ Know-How Knowledge**

| No. | Knowledge                                      | Process                  | Classification  |
|-----|-----------------------------------------------|--------------------------|-----------------|
| 1   | How to login system                           | Employee Registration/   | Prerequisite    |
|     |                                               | Enrollment               |                 |
| 2   | How to do device management                   | Employee Registration/   | Prerequisite    |
|     |                                               | Enrollment               |                 |
| 3   | How to manage employee                        | Employee Registration/   | Used            |
|     |                                               | Enrollment               |                 |
| 4   | How to rooster management                     | Attendance Transaction   | Used            |
| 5   | How to access menu process                    | Reporting                | Prerequisite    |
| 6   | How to set handkey machine time automatic for | Employee Registration/   | Prerequisite    |
|     | each time zone                                | Enrollment               |                 |
| 7   | How to set employee as admin on handkey       |                          |                 |
|     | machine using system                          |                          |                 |
| 8   | How to propose local holiday                  |                          |                 |
| 9   | How to use password for attendance verification|                          |                 |
| 10  | How to propose night shift                    |                          |                 |
| 11  | How to propose new shift (different from HQ)  |                          |                 |
| 12  | How to synchronize employee data from         |                          |                 |
All HaloSIS FAQ know-how knowledge was mapped to all process of attendance online system. Most of FAQ knowledge distributed in Employee Registration/Enrollment process, which were 7 knowledge. Figure 4 below was FAQ knowledge distribution in attendance online system.

![Figure 4. FAQ Knowledge Distribution by Process](image)

To identify knowledge gap of current FAQ and future FAQ, this research also extract knowledge from Halosis troubleshooting log and merge them to current FAQ knowledge. Table 5 below was the result of future FAQ from merging FAQ and troubleshooting log in HaloSIS.

### Table 5. Future Recommendation Knowledge

| No | Knowledge Source | Process                | Classification |
|----|------------------|------------------------|----------------|
| 1  | How to login system | Employee Registration/Enrollment | Prerequisite |
| 2  | How to do device management | Employee Registration/Enrollment | Prerequisite |
| 3  | How to manage employee | Employee Registration/Enrollment | Used |
| No | Knowledge | Source | Process | Classification |
|----|------------|--------|---------|----------------|
| 4  | How to rooster management | FAQ    | Attendance Transaction | Used |
| 5  | How to access menu process | FAQ    | Reporting | Prerequisite |
| 6  | How to set attendance machine time automatic for each time zone | FAQ    | Employee Registration /Enrollment | Prerequisite |
| 7  | How to set employee as admin on attendance machine using system | FAQ    | Employee Registration /Enrollment | Prerequisite |
| 8  | How to propose local holiday | FAQ    | Attendance Transaction | Prerequisite |
| 9  | How to use password for attendance verification | FAQ + LOG | Attendance Transaction | Prerequisite |
| 10 | How to propose night shift | FAQ    | Manage Attendance Transaction | Prerequisite |
| 11 | How to propose new shift (different from HQ) | FAQ + LOG | Manage Attendance Transaction | Used |
| 12 | How to synchronize employee | FAQ + LOG | Manage Attendance Transaction | Used |
| 13 | How to move employee registration data | FAQ + LOG | Employee Registration /Enrollment | Prerequisite |
| 14 | How to handle duplicate ID | FAQ + LOG | Employee Registration /Enrollment | Prerequisite |
| 15 | How to manually entry attendance transaction | FAQ    | Attendance Transaction | Used |
| 16 | How to process attendance data before showing report | FAQ + LOG | Reporting | Prerequisite |
| 17 | How to manage attendance machine memory capacity | FAQ + LOG | Manage Attendance Transaction | Used |
| 18 | How to check and solve no record data on system | LOG    | Manage Attendance Transaction | Used |
| 19 | How to check machine log data for employee | LOG    | Manage Attendance Transaction | Used |
| 20 | How to exchange ID two employee | LOG    | Employee Registration /Enrollment | Used |
| No | Knowledge | Source | Process | Classification |
|----|------------|--------|---------|----------------|
| 21 | How to get trainee attendance data from HQ | LOG | Manage Attendance Transaction | Used |
| 22 | How to handle change on web system | LOG | Employee Registration | Prerequisite |
| 23 | How to handle forget system password | LOG | Employee Registration | Prerequisite |
| 24 | How to handle no employee data in system | LOG | Employee Registration | Prerequisite |
| 25 | How to import machine log data transaction to system | LOG | Attendance Transaction | Used |
| 26 | How to inactivate Retired or passed away employee | LOG | Manage Attendance Transaction | Used |
| 27 | How to Register and enroll new Employee | LOG | Employee Registration | Used |
| 28 | How to register and enroll PPNPN employee | LOG | Employee Registration | Used |
| 29 | How to reset password for admin account in system | LOG | Employee Registration/Enrollment | Used |

**Figure 5. Future Recommendation Knowledge Distribution by Process**

In Figure 5, the knowledge frequency of the future recommendation knowledge in each process was change except in reporting process. The most knowledge was also on employee registration/enrollment process.

4. Knowledge Profiling

After matched the knowledge with process map based on interview and reviewed knowledge extraction data. Then determine unidentified and duplicate knowledge and
confirm the final knowledge profile to the expert. The knowledge profile is composed of several attributes, such as title, creating date, author, expert, location, and a brief description. Examples of knowledge profile shown as Table 4 below.

| Knowledge ID | Title                          | Location       | Expert                |
|--------------|--------------------------------|----------------|-----------------------|
| KP-001       | To start Online Presence Application, users can use the browser by accessing the address “http://10.0.36.41/woowtime”. To log in to this application a username and password are required, by default logging in Regency / City BPS: Username: bbbbbbb and Password: password. Please enter the username and password above to enter the main page of the Woowtime application | HR Division    | Bektiningruism Sumarno |

### Table 4. Knowledge profile “How to login system”

| Knowledge ID | Title                          | Location       | Expert                |
|--------------|--------------------------------|----------------|-----------------------|
| KP-001       | To start Online Presence Application, users can use the browser by accessing the address “http://10.0.36.41/woowtime”. To log in to this application a username and password are required, by default logging in Regency / City BPS: Username: bbbbbbb and Password: password. Please enter the username and password above to enter the main page of the Woowtime application | HR Division    | Bektiningruism Sumarno |

5. **Knowledge Linking**

After profiling knowledge, knowledge maps were build. This study create two knowledge maps namely current knowledge map and future or recommendation knowledge map. Current knowledge map was build based on FAQ knowledge. Future or recommendation knowledge map was build based on current knowledge map merge with LOG knowledge.

**Figure 6. Current Knowledge Map**

Figure 6 above was current knowledge map. This study propose to divide knowledge domain attendance online system into 5 sub domain namely:
1. Login,
2. Device Management,
3. Device-System Synchronization,
4. Employee Management,
5. Attendance Transaction Management,
6. Rooster Management, and
7. Reporting.

From current knowledge map, this study build recommendation knowledge map by merging current knowledge map with knowledge from troubleshooting log in HaloSIS.

**Figure 7. Future Recommendation Knowledge Map**

Figure 7 above was the recommendation map in this study. Know-how knowledge that printed by color red was knowledge that discovered by mapping troubleshooting log knowledge.

6. **Knowledge Map Validation**

After building map and identify knowledge recommendation to be included to HaloSIS knowledge base, knowledge map was
validated by technical support supervisor. In this process recommendation to update knowledge which found in both FAQ and troubleshooting log also was proposed and validated using interview with technical support supervisor.

**CONCLUSION**

An increasing amount of knowledge may limits access to knowledge of users who may be lost in space due to their lack of understanding of relations and connections of stored knowledge. The way to manage increasing knowledge is to create relations of knowledge by connecting and explaining related materials using association values to consider knowledge contents. This study conducted using the six step Kim’s methodology to build knowledge map, it’s used to identify the gap between current and future knowledge map of HaloSIS. The results, discovered 15 new know-how knowledge and 7 know-how knowledge that recommend to be updated.

**DISCUSSION**

The contribution of this study is twofold. Practically, it provides an integrative picture of Knowledge Map in HaloSIS. By this procedure of Knowledge Map building HaloSIS can continually update FAQ/Knowledge Base according to new knowledge from troubleshooting log. For academic, researchers can also replicate this study using a different source of data and/or a different time frame for data collection to address any possible resulting from the study. However, there are some limitations of this study which only maps the online presence system. For future research, it is necessary to build a knowledge map for all services in HaloSIS comprehensively to maintain, renewal, and seeking for knowledge.

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