

## KNOWLEDGE REPOSITORY DESIGN FOR A STARTUP COMPANY (CASE STUDY : CV. METRIC DESIGN)

Imelda.<sup>1</sup> and Ganefi Robi Tanzil<sup>2</sup>

**Abstract:** *Startup Company is a company working to solve a problem where the solution is of obvious and success is not guaranteed. For a startup company engaged in the manufacture of software services face a common problem is the loss of knowledge when human resources leave the company once the project is completed. The impact is when there are new employees, the person have to learn from begining. When the employee facing problem they have to track the problem from beginning and it will takes time to solve the problem. Therefore, a knowledge repository needed as a solution. The study was conducted using a tenstep knowledge management road, where the study was limited from the first step to step six. Results of the analysis is the basic needs of the company to the knowledge of employees consists of three categories: technology, library and application in software projects. Business strategy that is used is a combination of personalization strategy and codification strategy. Codification strategy used to complete the personalization strategy that can be generated repository of knowledge that comes from individuals in the company.*

**Keywords:** *Codification Strategy, Knowledge, Repository, Startup Company.*

### 1. INTRODUCTION

Along with the increasing demand for mobile-based software development and website, stimulate the growth of startup company engaged in the manufacture of software services. One of startup company that is engaged in the business is CV. Metric Design. CV. Metric Design data project in 2011-2012 illustrates the increasing demand for mobile software manufacture more than 100% (CV. Metric Design: 2013). Human resources in the CV. Metric Design consists of permanent and contract labor. Losses faced is when workers had completed a contract programmer who worked on the project and left the company, knowledge own by the contract staff will be lost. Solutions for the problems encountered during the project were also missing. This means if other staff face the same problem must track to find solutions to solve the problems faced and will take some time while the project is relatively short. Based on the above issues is company needs repository to hold the loss of knowledge as one of the important assets of the company.

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<sup>1</sup> ST., MT. Indonesia Computer University, Bandung, Indonesia. E-mail: melpangrib@yahoo.com

<sup>2</sup> S.Kom., M.Kom. Indonesia Computer University. E-mail: robi.tanzil.g@gmail.com

### **Objective of the Study**

This research is to identify and design the knowledge repository requirements needed by startup company like CV. metric Design

## **2. LITERATURE VIEW**

### **Knowledge**

According to Davenport and Laurence (Davenport and Laurence, 1998), knowledge is :

“mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information.”

Based on definition above, knowledge is very important for the following reasons:

1. Knowledge is an asset for institution, which determines the type of labor, information, skills and the necessary organizational structures.
2. Knowledge and experience of the company is a sustainable source of competitive advantage compared to the competitiveness of mainstay products and advanced technologies possessed.
3. Knowledge and experience are able to create, communicate and apply knowledge of all things related to achieve business goals.

Knowledge is divided into two types (Tiwana : 2000), explicit knowledge and tacit knowledge, that can be described as follows :

#### ***1. Tacit Knowledge***

Tacit knowledge is personal knowledge. Tacit knowledge is personal and difficult to formulate and difficult to communicate and share to other

#### ***2. Explicit Knowledge***

Explicit knowledge is knowledge component that can be codified with formal language in document form, database and else. This form knowledge could be forward from one person to other person in formal way and systematic.

### **2.1 Knowledge Conversion**

The creation of knowledge is achieved through the introduction of the synergistic relationship between tacit and explicit knowledge. Ikujiro Nonaka and Hirotaka Takeuchi distinguish between tacit and explicit knowledge (Nonaka: 1995), and divide the model into a four-way conversion of knowledge shown in Figure 1.

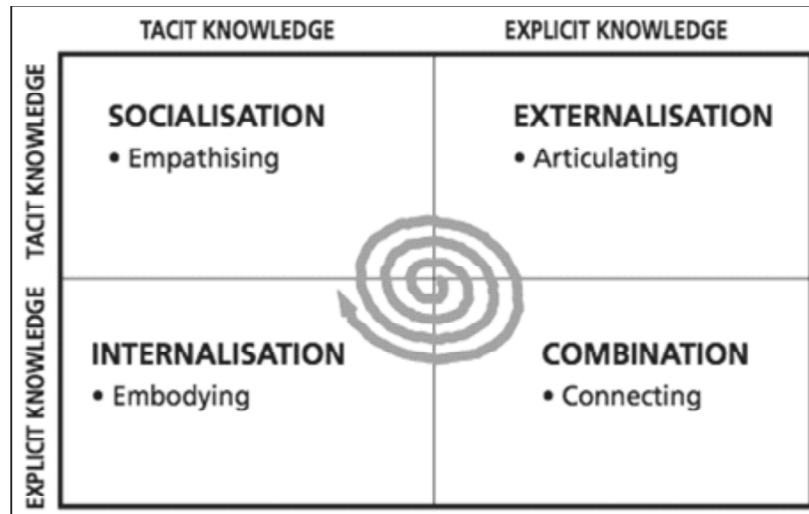


Figure 1: Knowledge Conversion (Nonaka: 1995)

Explanation of each stage of knowledge conversion in Figure 1 :

**1. Tacit Knowledge Sharing (Socialisation)**

Socialisation is a process of converting tacit knowledge so that knowledge can be shared with many people. This tacit knowledge can be a way of thinking, culture, norms and their views about something

**2. Converting Into Explicit Knowledge Tacit Knowledge (Externalisation)**

For an organization to be externalized so that knowledge can be used by others. This means that it must be done the modeling of knowledge into explicit form.

**3. Systematic Combining Of Explicit Knowledge (Combination)**

Combination is a process conversion of explicit knowledge into a new set of explicit knowledge. An example is the merger in ways that are not standardized, categorization and preparation of knowledge which might create new explicit knowledge. This combination is the key to communication and systematization of knowledge.

**4. Internalising New Knowledge As Tacit Knowledge By The Organisation (Internalisation)**

Internalization of new knowledge is a process where explicit knowledge is converted into tacit knowledge through the organization. Conditions that must be met before is that individuals must be involved in the formation of new knowledge.

## **2.2 Knowledge Repositories**

The final goal of knowledge management is how to make the storage medium of knowledge or also known as knowledge repositories. One common form of knowledge repositories are storage media such as memos, documents, and others where there is knowledge stored inside. Other forms of data storage media is more structured database in which there are rows of data.

There are three forms of storage media or knowledge repositories (Davenport : 1998), are :

1. External knowledge
2. Structured Internal Knowledge such as reports and
3. Internal Knowledge Informat as storage media discussion results

## **2.3 Organizational Learning**

Basically knowledge management leads on how to identify and utilize the collective knowledge within the organization to assist the organization in competition (von Krogh: 1998). The difference between organizational learning with knowledge management lies in its focus. Organizational learning has a focus on knowledge management processes while focusing on the content of the knowledge used by the organization (Easterby-Smith: 2003).

## **3. RESEARCH MODEL**

Research method used is the 6 steps of 10 steps on knowledge management roadmap. The six stages are :

- (a) Analyze the existing infrastructure
- (b) Align Knowledge Management and Business Strategy
- (c) Design the knowledge Management Assests and Systems
- (d) Audit Existing Knowledge assets and System
- (e) Design the knowledge Management Team
- (f) Create the Knowledge Management Blueprint

## **4. DATA ANALYSIS**

### **4.1 Infrastructure Analysis**

Goals of Infrastructure analysis are to find out infrastructure of the company that could be part of repository design. There are two kinds infrastructured had been analyzed are network infrastructure and storage media used by company.

## 4.2 Network infrastructure

Analysis Purpose of network architecture is that knowledge management system that can be designed accordance with the conditions that the network infrastructure is owned by the company today. The following analysis of the existing network infrastructure in the enterprise as shown in Table 1

**Table 1**  
**Network infrastructure analisis**

| No. | Network infrastructure questions   | Yes/No | Comment                            |
|-----|--|--------|------------------------------------|
| 1.  | Company has LAN/WAN Network?   | Yes    | LAN                                |
| 2.  | How Much Network bandwidth capacity?                                     |        | 2 Mbps                             |
| 3.  | Does company network support <i>remote access</i> ?                      | Yes    | Using VNC                          |
| 4.  | Does company using internet?   | No     |                                    |
| 5.  | Does cmpany using ekstranet?   | No     |                                    |
| 6.  | Does company has Operating system Standard?                              | No     |                                    |
| 7.  | Which Operating System used by company?                                  |        | Mac OS, Windows 8, and Linux       |
| 8.  | Does company using cloud technologyor virtual private server (VPS)?      | Yes    | Lintasartha <i>Cloud Computing</i> |
| 9.  | Does company using virtual priate network (VPN)?                         | No     |                                    |
| 10. | Does company using <i>groupware</i> to collaberate and document sharing? | Yes    | Dropbox, Google Docs and Bitbucket |
| 11. | Does companyhas <i>web server</i> or <i>mail server</i> ?                | Yes    | Google Mail Server                 |

## 4.3 Storage Media

Media storage analysis consist of personel storage media collaborate with organization or team. Goals is to find out storage media used by company that could support repository design.

**Table 2**  
**Company's Storage Media Analisis Perusahaan**

| No. | Pertanyaan Media Penyimpanan                             | Ya/<br>Tidak | Komentar  |
|-----|--|--------------|---|
| 1   | Does company use database to store data?                 | No           |   |
| 2   | Does company use database to store staff knowledge?      | No           |   |
| 3   | Does company use certain tools to store company data?    | Yes          | Dropbox, Google Docs, Bitbucket, Harddisk Eksternal           |
| 4   | Does company use certain tools to store staff knowledge? | Yes          | Microsoft Excel   |
| 5   | Does company use certain tools to manage project?        | Yes          | Mockups Wireframe, Bitbucket, Microsoft Excel and Google Docs |

Results of the analysis focused was done previously described that the company has a strategy that is almost balance. Codification strategy gained as much as 42% while the percentage of personalization strategy to obtain bigger percentage, which is about 58%. Percentage results illustrate that the current strategy of the company tend to use the personalization strategy in which knowledge management focuses more on personal than management knowledge through written documents. Based on these results the right strategy in designing the repository more use personalization strategies were compared using codification strategy. But it is contrary to the needs of the company where the company wants employees personal experience codified into a form document so that it is easier to understand and is not focused on any particular employee. For that, the design repository created will use codification strategy supported by the personalization strategy so that what has been done by the company at this time in terms of sharing knowledge with verbal communication will continue to support documented knowledge

Analysis of individual knowledge carried explained that the data required by the company comes from the knowledge of individual scan be categorized into three parts are technology, libraries, and the use of technology and the library in the project.

#### **4.4 Team Formation**

The team formed is a small team that has task to design, create, and implement the design of the repository. The team consists of stakeholders, analysts, and members who have the technical expertise.

#### **4.5 Asset and System Audit Result**

The purpose of this audit was to determine which knowledge will be saved. Below is analysis to determine knowledge possessed by employees at table 3.

#### **4.6 Knowledge Conversion**

Knowledge Source obtained by the company in knowledge conversion majority derived from electronic media. But not all knowledge is absorbed by the company. The company must first make knowledge selection based on company needs. Once companies make the selection of the required knowledge, the company will create prototypes of products or implement project knowledge. The knowledge that has been implemented in the product or project will be used if the knowledge is considered a success and according to product and project development in the future.

**Table 3**  
**Individual analysis Knowledge**

| <i>Individual Knowledge Analysis</i>                                       | <i>Comment</i>  |
|--|---|
| How shapes of knowledge needed by company?                                 | Companies need the expertise of employees related to technology, third-party libraries, and their use in the project.   |
| How company wants to store staff skill?                                    | Company wants staff store their skills in every project.  |
| What benefits to be achieved by the company with the expertise repository? | With the well-documented skills expected the company would still be able to make the software even though the employee does not work at the company anymore   |
| Describe relation between stored knowledge and project management          | The company currently requires a mediator to facilitate project monitoring measured by a task list created by the project manager. When employees store knowledge of the project, it is expected to be parameters of project task list has been completed or not. |

## 5. DISCUSSION

### 5.1 Adjustment Knowledge with Business Strategy

Knowledge adjustment with business strategy is done through an analysis of the strategies used by companies today in the management of knowledge. The strategy is divided into two, codification strategy and personalization strategy.

Based on analysis the appropriate strategies in designing repository use more personalization strategies than using codification strategy. But it is contra to the needs of the company where the company wants employees' personal experience coded into document form so that it is easier to understand and is not focused on any particular employee. Based on that reason the draft prepared will use codification strategy supported by personalization strategy so that what has been done by the company at this time in terms of sharing knowledge with verbal communication will continue to support documented knowledge.

### 5.2. Team Building

KM team is a small team that will be in charge to design, create, and implement the repository design. The team composition are stakeholders, analysts, and members who have technical expertise.

### **5.3 Audit and System Audit Result**

Form of employees knowledge storage in terms of technology, library, and its application in the project are as follows:

1. Software features must be built using a particular technology. Employee task is to make sure that the selected technology will be in accordance with the needs analysis of the software features. For example, some features will be solved by using Augmented Reality (AR) technology. After determined the technology wich task will use AR technology, employee will keep the description of the technology.
2. Based on the explanation of the technology later employee will lead to what library will be used as a real implementation to resolve certain features. A technology will certainly have more than one library. From available library, employees tasked to do a comparison of the libraries are then choose one library in accordance with the software needs.
3. The final stage after the recording of the technology and the selection of libraries, that employee will write every implementation of the selected library to the software features being built. Recording of the implementation of this library is accompanied by sample code so that when the company gets new software projects with the same features, the employees no longer need to carry out research on technology and library should be used.

### **5.4 Repository**

The data stored include knowledge database, discussion forums, and other digital documents. Based on the analysis of storage media in Table 2 it is known that at this time the company already has a database that is used by software built. The database is located on a VPS with the growing capacity from 20 GB until today is 80 GB. From this condition, the proposed storage media knowledge using VPS. VPS chosen because the access speed is higher than the usual file hosting. In addition the company can change the specifications of VPS depending on requirements such as expanding the capacity of the hard drive, RAM, or replace the processor though. The type of server that is proposed is as follows:

#### ***1. File Server***

Used to store files such as video files of physical knowledge, document files, and presentation file.

#### ***2. Database Server***

Use to store data that already be coded into database structure. The databse server will also store operational data.



### 3. Web Server

Use to store application.

### 4. Mirror Server

Use as a backup server.

### 5. Backup Server

Use as a server that will periodically perform backup of database server.

Below are hardware and software specification requirement

**Table 4**  
**Server Specification of Hardware and Software**

| No. | Hardware            | Current Condition     | Recommendation        |
|-----|---------------------|-----------------------|-----------------------|
| 1.  | Processor           | 2.3 GHz Intel Core i5 | 3.0 GHz Intel Core i7 |
| 2.  | Memory              | 8 GB                  | 32 GB                 |
| 3.  | HDD Backup Server   | 80 GB                 | 3 TB                  |
| 4.  | HDD Web Server      | 80 GB                 | 500 GB                |
| 5.  | HDD Mirror Server   | -                     | 500 GB                |
| 6.  | HDD File Server     | -                     | 1 TB                  |
| 7.  | HDD Database Server | 80 GB                 | 500 GB                |
| 8.  | System Operasi      | CentOS                | CentOS                |
| 9.  | Basis Data          | MySQL                 | Oracle                |
| 10. | Web Server          | Apache                | Apache                |

## 5.5 Repository Feature

Below are repository feature of the repository:

### 1. Search Engine

Search Engine feature used by employees and senior management to seek required knowledge. This feature supported by intelligent agent and adding metadata to stored knowledge to speed up searching

### 2. Task List Creator

Used by project manager to create list of work in a particular project.

### 3. Forum

This feature used by employee and senior management to discuss.

### 4. Profile

This feature content are biographical data user and activities.

### 5. *Virtual Folder*

This feature use as storage media.

### 6. *Chat*

This feature use to facilitate direct conversation between user in discussing particular knowledge.

### 7. *Framework Development*

This feature devote to programmer in developing software. this feature serves to provide rules on each software development. With the standard rules, every new employee could assigned to continue or support particular project and will not require long time to adapt.

### 8. *Library*

Library is a feature used by programmers in software development. This feature serves to record libraries used in software development.

## 5.6 Knowledge Conversion

Conversionis process where by tacit knowledge that comes from employee converted into a structured knowledge that will be stored in the repository. Based on analysis results the following convertible design knowledge will be applied to the repository as shown in Table 5.

**Table 5**  
**Knowledge Conversion Design**

| <i>Knowledge Conversion</i> | <i>Description</i>  |   |
|-----------------------------|---|---|
|                             | <i>Individual Knowledge</i>   | <i>Discussion</i>   |
| Tacit Knowledge Source      | Tacit knowledge is derived from the results of self-learning knowledge and experience of employees.                 | Tacit knowledge derived from discussions results  |
| Capture                     | The process of taking the knowledge derived from their own learning and experience of employees using certain form. | The process of taking knowledge derived from discussions between employees is done by taking a summary or the essence of the discussions. |
| Transform as iPengetahuan   | The process of transformation to the knowledge of individuals who filled  | The process of transformation to the knowledge derived from discussions   |

*Cont. table 5*

| Knowledge Conversion | Description   |  |
|----------------------|---|--|
|                      | Individual Knowledge  | Discussion   |
|                      | <p>out by employees directly using a form structured by adding specific meta data to the knowledge that is stored as the name of the technology, related projects, and implementation of technology in the project. With the metadata in the form of project data related to the knowledge stored will be related with similar projects so that employees do not have to waste more time to learn such knowledge.</p> | <p>between employees is done by storing a summary or the essence of the discussion on the repository KMS. Storage summary is done by adding meta data to a summary of the discussion can be searched as well and used repeatedly. Not only was every existing summaries will be related to the kind of knowledge-knowledge that will be supporting data to knowledge that has been previously saved.</p> |
| Knowledge Formation  | <p>Knowledge formation occurs when there is a body of knowledge that has relevance, for example in terms of types of projects, project features and technology used. The set of knowledge will be formed into a valid and worthy knowledge for reuse in other projects.</p>   |  |
| Knowledge Reuse      | <p>Re-use of knowledge conducted on existing knowledge and has been through validation process. The validation process performed by certain employees who are competent in their field, such as senior programmer. After the validation process is complete, the body of knowledge will serve as a viable new library for reuse in future projects.</p>   |  |

## 6. CONCLUSION

Conclusion of this research are :

1. Company needs to the knowledge of employee consist of three categories are technology, library and its implementation in software development project. These category constitute the knowledge needed by company to be kept by employee.
2. Business strategy used in the design using strategy that combine personalization strategy and codification strategy. Merging the two strategies are aimed at making the culture if sharing knowledge that has been done by company.

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