The Framework of Evolutionary Community of Practice

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【Abstract】At present, knowledge plays substantial roles in the development of every organization. Knowledge is a strategic intellectual asset for organization to deal with global competitive environment. Therefore, the cultivation of organizational knowledge determines organization's success. Many organizations adopt Community of Practice (CoP) to cultivate organizational knowledge for their advantages. However, knowledge cultivation from CoP is a serious challenge. The ability of CoP to contribute and deliver relevant knowledge for stakeholders, institution, and environment depends on its existence. In reality, the lifetime of many CoPs is short. The problem sources of this short lifetime are in the knowledge process implementation, lack of member's participation, and incapability to respond changes intelligently.

Motivated by the problems mentioned, this research proposes a solution to overcome the CoP short lifetime by developing framework of Evolutionary Community of Practice. The research method refers to design science research concept. The framework of Evolutionary CoP has two main components, phase and dimension. The phase in the proposed framework consists of constructive, collaborative, and adaptive phase. CoP dimension, which specifies the characteristics of CoP in each phase, consists of knowledge process, community, and technology. "Evolutionary" refers to gradually development of CoP from one phase to more advance phase by building its community capability. The framework of Evolutionary CoP can be used as an instrument to identify current CoP condition, to analyze knowledge sharing problems in CoP by mapping CoP's value to its objectives, and to identify the future prospects of CoP.

The proposed framework is evaluated by having conducted an observational evaluation on selected case study. Observational evaluation is performed by applying framework of Evolutionary CoP on each chosen sites. Findings from application of the proposed framework are identification of current research group phase, indication of knowledge sharing problems, and formulation of action plan for each research group. According to these findings and the evaluation analysis, this research also proposes feedbacks for framework improvement, which are composing generic value classification on each CoP phase and defining quantitative parameters on each community capability.

【Keywords】 Community of Practice, the Framework of Evolutionary Community of Practice, design science research, CoP phase, CoP dimension

1. Introduction

Knowledge has long been recognized as a strategic intellectual asset for organizations to deal with dynamic competitive environment. Research on organizational knowledge stated the importance of knowledge in organizations. In order to obtain succeed and sustainable competitive advantage, knowledge acquisition alone is not enough. Organizations need to keep their knowledge on the frontline, apply it in daily operations, and spread it across organization.

Many organizations adopt Community of Practice (CoP) to cultivate organizational knowledge. Based on the the works by Wenger et al. (2002) and Ardichvilli et al. (2003), some of those are multinational corporations such as Hewlett Packard, International Business Machine (IBM), Xerox, Shell, and Chevron. The selection of CoP as the prominent knowledge management tools is the fact that most of organizations competitive advantage lays on the collective tacit knowledge of its employees (Hara, 2009; Nonaka and Takeuchi, 1995). Sharing tacit knowledge requires interaction and informal learning processes, such as storytelling, conversation, coaching, and apprenticeship (Wenger et al., 2002). As a group of people who shares the same concern and set of problems about a topic, informal learning and knowledge sharing happen naturally in CoP. Storytelling and conversation disseminate tacit knowledge from one to another. Coaching and apprenticeship enable the sharing of experience, best practice, and skill among CoP members. That kind of interactions in CoP enables collective knowledge building and keeps organizational knowledge on the cutting edge. In addition to tacit knowledge sharing activities, members of CoP codify what they share by producing knowledge documents. The documentation helps

community focus their knowledge process, assists members to sharpen their expertise, and enables broader knowledge dissemination.

With seamlessly knowledge cultivation inside the community, CoP provides an excellence support for organizational performance (Wenger and Snyder, 2000; Hara, 2009). CoP helps employee to develop their expertise and to build social networks. For a new comer, CoP assists them to learn faster and more straightforward. The benefit of CoP at the organization level includes responding more rapidly to customer needs, reducing rework and preventing "reinvention the wheel" (Lesser and Storck, 2001), generating ideas for innovative products and excellence services.

Nevertheless, knowledge cultivation is a great challenge in CoP. The ability of CoP to contribute and deliver relevant knowledge for stakeholders, institution, and environment depends on its existence. In reality, the lifetime of many CoPs is short. The primary causes of this short lifetime are obstruction in knowledge process activities, lack of member's participation, and incapability to respond changes intelligently.

Motivated by the problems mentioned, this research proposes a solution to overcome the CoP short lifetime by developing framework of Evolutionary Community of Practice. The research methodology refers to design science research concept (Hevner et al. 2004). The paper is organized based on the structure of design science research. The first section describes background and statement of problems of the research. Section 2 reviews the literature on the CoP, knowledge process in CoP, the CoP development models, and the community roles. In Section 3, we analyze and define the building blocks of the proposed framework. The Framework of Evolutionary Community of Practice is elaborated in Section 4. We depict the evaluation of the framework in Section 5. Finally in Section 6, we report conclusions of the research.

2. Related Works

The term Community of Practice (CoP) was initiated by Wenger and Snyder to describe a group of people who holds a similar domain knowledge or expertise, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger and Snyder, 2000; Wenger et al., 2002). A CoP can exist as internal part of an organization or independent institution across organizations. In the practical applications, CoP varies widely in the name, style, and form. Despite the variety of forms, a community of practice is combination of three fundamental elements: a domain, community, and set of practices (Wenger et al., 2002).

Regarding knowledge process in CoP, some research groups focused on analyzing knowledge sharing among members of CoP. Ardichvilli et al. (2003) examined the motivation and barriers of employee participation in CoP at multinational corporation Caterpillar, Inc. To promote knowledge sharing, the research indicated the need of knowledge-based trust and institution-based trust, and multiple face-to-face interactions among members. A study from Wasko and Faraj (2000) found that knowledge sharing in CoP flows easily when members view knowledge as public good. The study also suggested organization to develop a community of practice as an implementation of knowledge management strategy and to manage knowledge as public good.

A considerable amount of research works related to how to nurture long-lived CoP has been done as well. For example, Yuecheng Yu et al. (2010) studied the Information System (IS) World communities in Association of Information System (AIS). IS World communities serve as internal CoP since 1994. The study proposed governance action and technological improvement to keep the sustainability of the communities. According to McDermott (2000), creating a mentorship program and routinizing CoP entry can help keep CoP focus on cutting edge issues.

As a dynamic entity, CoP grows and evolves from initial building to closing. Wenger et al. (2002) and McDermott (2000) developed a life-cycle concept to describe CoP progress through five stages: potential, coalescing, active, dispersed, and memorable. The life-cycle model also explains interactions and types of activities on each stage. Another work from Gongla and Rizutto (2001) proposed CoP evolution model and defined characteristics on each stage of evolution model. The evolution model summarizes overall evolution pattern in CoP into five stages: potential, building, engaged, active, and adaptive. According to this model, a community can mature and dissolve at any of the stages.

3. The Building Blocks of Community of Practice

Based on our literatures, prior research, and case studies of selected communities of practice, we synthesize two main components of CoP: dimension and phase. The dimension is the structural elements of CoP. CoP dimension distinguishes CoP with other forms of organization, specifies the characteristic of CoP, and provides

guidance to its development. All communities of practice share the same dimension elements and naturally evolve from one phase to another. Each phase of CoP depicts CoP capabilities and the specification of its dimension.

The dimension elements of CoP are described as follows:

1. Knowledge-process,
   The purpose of community of practice is to build and to exchange knowledge about specific domain. Therefore, a community of practice exists as long as knowledge process occurs. Knowledge process serves as *raison d'être* in CoP live. The outcome of knowledge process provides excellence value and support to CoP's stakeholder. The reason why members involve in CoP because of its knowledge process activities. Members can get benefit and help others at once.

   Knowledge process refers to all knowledge activities in CoP. Members share what they know about specific domain. Other members utilize shared knowledge into contextual application. The application of shared knowledge may create or revise previous knowledge. Combining member's knowledge also leads to knowledge creation. Knowledge creation and knowledge sharing produce knowledge artifact. All knowledge artifacts are saved in knowledge repositories. Recording knowledge artifact ensures its availability and enables dissemination of knowledge throughout community.

2. Community,
   Community refers to group of practitioners who conduct knowledge process, enliven and nurtures community of practice. Membership in community may be self selected or assigned. Members in CoP share roles and responsibilities to keep the community alive. The roles in community grow as the community matures. A new CoP may proceed with only three roles: domain expert, core member, and peripheral member. But, more mature CoP needs more roles to keep the community activities on the right track. The roles in community are summarized in Table 1.

Table 1: Roles in Community of Practice

Role	Description
Domain expert	Members who have comprehensive knowledge about CoP domain. The responsibilities of domain expert are formalizing CoP domain, constructing knowledge base, and verifying knowledge artifacts.
Primary members	The first members who establish community of practice and actively contribute in CoP activities. At the beginning of community, primary members set general rules and norms, identify topic for the community to address, and create community agenda. At the more mature community, primary members serve as legislative authorities who elect community coordinator and as council authorities who provides help and consultation for community coordinator.
Peripheral members	Members of community of practice who participate on community activities, conduct knowledge process, and build social relations.
Community coordinator	Community coordinator performs leadership and managerial functions to develop and nurture CoP, such as: 1. Help domain expert build knowledge base, share best practice, and create knowledge process mechanisms. 2. Evaluate community contribution to stakeholders. 3. Plan community agenda, facilitate community event. 4. Keep the community focus on its purpose 5. Manage relationship with organization and other communities of practice.
Facilitator	As a motivator in CoP, facilitator encourages member's participation, connects new members with domain expert, facilitates discussions, mediates conflict among members, and maintains the community activity engaging.

Role	Description
Community librarian	Community librarian manages knowledge artifacts and knowledge repositories, creates knowledge taxonomy, summarizes discussion, and helps members retrieve explicit knowledge from the repositories.
Sponsor	As representative of host organization in CoP, sponsor serves as top level recognition from organization, provides support for CoP development, and evaluates CoP contribution to organization.
Technical administrator	Technical administrator provides technical support for community members, maintains the technology system in community.
Agent of change	Agent of change identifies potential trend and change in community, organization, knowledge domain, and environment.

3. Technology,
   Technology supports knowledge process activity, helps CoP to form, to enhance, and to develop community capability.

Community of practice is a natural living institution; it forms, grows, and evolves from embryonic community to advanced maturity or termination. We classify the states of CoP development into three phases: constructive, collaborative, and adaptive (as illustrated in Figure 1). A CoP at the constructive phase focuses on CoP formalization, discovers common interest among members, determines its knowledge domain, and forms the identity of CoP. Knowledge process is performed to help members solve their problems and to share ideas. This helping community typically creates forums to facilitate its activities. At collaborative phase, CoP creates more systematically structures and processes about activity in CoP and interaction among members. The community acts as knowledge stewarding community with its primary focus to share, construct, upgrade, and verify relevant knowledge throughout community and host organization. The community also extends collaboration with external parties. At the adaptive phase, CoP improves its capability to a level where it can respond to change intelligently. Members are encouraged to generate innovation. Knowledge process at this phase produces cutting edge solutions. This adaptive community influences and even creates trends in CoP's domain of expertise.

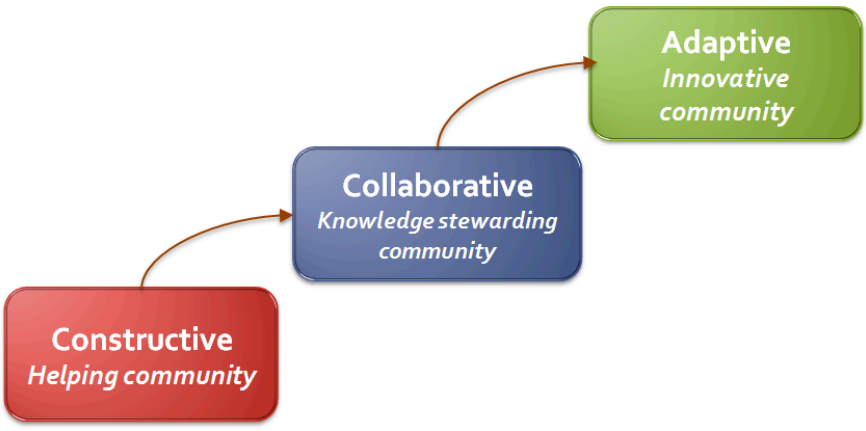

Fig 1: The Phase of Community of Practice

4. The Framework of Evolutionary Community of Practice

We propose a framework of Evolutionary Community of Practice as guidance to help organization and practitioners build and nurture community of practice. The development of the proposed framework is initiated by defining dimension and phase as the building blocks of CoP. The building blocks function as the skeleton of the

framework. Afterward, the framework development is followed by designing the specification of all dimension elements on each phase (as elaborated in Table 2). Detail explanation about the framework of Evolutionary Community of Practice is as follows:

1. The framework specifies the characteristics of knowledge process, community, and enabling technology on each phase. Those characteristics explain the differences between one phase to another.
2. The framework portrays the growing role model in community. The first roles that established along with CoP emergence are domain expert, primary member, and peripheral member. As the community moves into more advanced phase, the role grows as well. At the collaborative phase, CoP needs community coordinator, sponsor, community librarian, and technical administrator to promote and encourage knowledge stewarding activities. Then, the specific role at adaptive phase is required to capacitate adaptive capability.
3. The knowledge process dimension.
   Forming the domain of CoP and best practice sharing are the characteristics of initial CoP. As the domain established, the exchange of knowledge becomes more frequent, producing more and more knowledge artifact. This intensive knowledge sharing may lead into out of topic discussion and may generate junkyard outcomes. At this point, there is an emergence need to organize knowledge process more systematically. The aims of knowledge process shift from helping members to taking knowledge stewardship seriously, building knowledge base, and delivering values for host organization. At the next advanced phase, knowledge process generates innovative solutions and provides adaptive capability.
4. The development of community capability at community dimension.
   The key issue of a new beginning community is to develop sense of community among members. As the CoP evolves, community gathers more members, the interaction among members becomes more complex, and the potential of friction arises. Those conditions may disrupt CoP stability. Therefore, CoP at collaborative phase implements self-governance system to manage its heterogeneous community. That managerial capability is then enhanced at adaptive phase by conducting regular evaluation of CoP performance.
5. “Evolutionary” refers to gradual development of CoP from one phase to more advanced phase by improving its dimension and building community capability (sense of community capability, managerial capability, and adaptive capability).

Table 2: The Framework of Evolutionary Community of Practice

Dimension	**Phase**		
	Constructive	**Collaborative**	**Adaptive**
Knowledge process	1. Forming knowledge domain of expertise (domain of CoP). 2. Knowledge sharing activity aims to solve problems among members. 3. Sharing best practice and practical solutions.	1. Creating more systematically mechanisms for knowledge process. 2. Knowledge sharing activity aims to construct knowledge base and to deliver business values for host organization. 3. Building knowledge map of CoP domain. 4. Documenting knowledge artifact.	1. Fabrication of innovative ideas and cutting edge solution. 2. Contributing to body of knowledge of CoP domain. 3. Building adaptive capability. This capability helps CoP identify internal and external changes, predict future trends, and respond to change intelligently.
Community	Building sense of community capability: 1. Formalizing community's identity. 2. Setting up general rules and norms	Enhancing sense of community capability: 1. Strengthening sense of community among members. 2. Organizing regular community event to	Optimizing sense of community capability: 1. Strengthening sense of community among members. 2. Organizing regular community event to

Dimension	Phase		
	Constructive	Collaborative	Adaptive
		promote members participation 3. Facilitating mediation to solve conflict within the community.	promote members participation 3. Facilitating mediation to solve conflict within the community. 4. Creating focus groups
		Building managerial capability: 1. Starting self-governance. 2. Organizing roles and responsibilities in CoP.	Enhancing managerial capability: 1. Self-governance. 2. Assessing and evaluating community work periodically.
		CoP establishes collaboration with host organization and other communities of practice.	Expanding collaboration with external organizations.
Community Roles	1. Domain expert 2. Primary member 3. Peripheral member	1. Domain expert 2. Primary member 3. Peripheral member	1. Domain expert 2. Primary member 3. Peripheral member
	---	1. Community coordinator 2. Facilitator 3. Community librarian 4. Sponsor from host organization 5. Technical administrator	1. Community coordinator 2. Facilitator 3. Community librarian 4. Sponsor from host organization 5. Technical administrator
	---	---	1. Agent of change
Technology to support knowledge process	1. Online forum 2. Mailing list / listserv	1. Online forum 2. Mailing list / listserv 3. Wiki 4. Knowledge repositories	1. Online forum 2. Mailing list / listserv 3. Knowledge repositories 4. Document / library management system 5. Analytical and decision support tools
Technology to support managerial capability		1. Electronic meeting system 2. Groupware system	1. Community portal 2. Collaborative software system

The benefits of the proposed framework are described as the following:

1. An instrument to analyze the current state of CoP.
   Analyzing the current state of CoP helps community coordinator discover CoP weaknesses and potential nuisances.
2. The defining characteristics of each CoP phase provide guidance for practitioners, organizations, and CoP members about how to build and nurture community of practice.
3. As practical reference for formulating strategy to improve CoP performance.

5. Evaluation

The proposed framework is evaluated by having conducted an observational evaluation on selected case study. According to Hevner et al. (2004), observational evaluation aims to study the usefulness of the applicable artifact (outcome). Observational evaluation can be performed on site, which has similar characteristics with the proposed artifact. For this work, we observed three Research Group in Bandung Institute of Technology (ITB), Indonesia. The research groups in ITB serve as CoP because their characteristics comply with CoP concept. The selected research groups were Research Group of Informatics, Research Group of Astronomy, and Research Group of Ecology and Biosystematics. Observational evaluation is conducted by applying framework of Evolutionary CoP on each research group. We describe our observational evaluation as follows:

1. Conducting data gathering to obtain factual condition about knowledge process, community, and technology utilization of each research group. The methods used for data gathering are semi-structured interviews with members from each research group. The semi-structured interview use pre-determined open-ended questions to collect qualitative data. This kind of interview does not limit the interviewee's answer and allows new questions to be brought up by the interviewer in order to explore further about specific themes. The pre-determined questions for this evaluation is described further in Appendix A.

Table 3: Summary of Data Gathering

Category	**The Observed Research Group**		
	Informatics	**Astronomy**	**Ecology and Biosystematics**
Knowledge Map	1. Established collaboratively by community member throughout formal meetings. 2. Revise annually.	1. Established collaboratively by community member throughout formal meetings. 2. Revise annually.	1. Established collaboratively by community member throughout formal meetings. 2. Based on member's competency and research track record. 3. Revise annually.
Knowledge Sharing Activities	1. Weekly formal meeting. 2. Informal discussion. 3. Journal publication.	1. Weekly formal meeting. 2. Informal discussion. 3. Apprentice of new member.	1. Weekly formal meeting. 2. Informal discussion.
Scope of the research's participants	1. Members of the research group. 2. External research group. 3. Local government. 4. Private company.	1. Members of the research group. 2. Local government. 3. Bosscha Astronomy Observatory.	1. Members of research group. 2. External research group. 3. Local government. 4. Local society.
Research management	Attached to university's management.	Attached to university's management.	Attached to university's management.
Member Roles	1. Chairman/chairlady 2. Member	1. Chairman/chairlady 2. Member 3. Advisor	1. Chairman/chairlady 2. Member
Supporting technology	1. Research group website. 2. Digital repository.	1. Research group website. 2. Digital repository.	1. Research group website. 2. Digital repository.

2. The summary of data gathering result is provided in Table 3. The question about knowledge map, knowledge sharing activities, and scope participants are intended to assess the knowledge process dimension. We also observed research management, member's role, and supporting technology on each research group for assessing community and technology dimensions.
3. Assessing the current state of each research group by mapping the result of data gathering to the proposed framework.
4. Based on our framework, all research groups are in the state toward collaborative phase. All research groups have written procedures related with knowledge process activities, create and evaluate knowledge map annually, record knowledge artifacts, and conduct formal meeting periodically. The management on each research group is performed by a chairman/chairlady and a secretary based on formal regulation from host organizations. All research groups have organized joint research with another research group or other external organizations.

After we identified CoP phase for each Research Group, we discovered potential knowledge sharing problem. We then formulated action plan by referring to the defining characteristics and capabilities of CoP phase in our framework.

6. Conclusions and Future Research Consideration

The ability of community of practice to contribute and deliver relevant knowledge for stakeholders, institution, and environment depends on its existence. We develop framework of Evolutionary Community of Practice as the solution to overcome the following problems that lead to CoP termination:

1. Problems in knowledge process implementation;
   Knowledge process is the main purpose of CoP existence. As long as knowledge process continues, CoP can deliver excellence values to its members, host organization, and other stakeholders. The disruption in knowledge process may cause to CoP failure. The proposed framework ensures the continuity of knowledge process by defining knowledge intermediary roles (facilitator and community librarian) and the characteristics of knowledge process from the initial community to more advanced community.
2. Lack of member participation;
   The framework explains the characteristics of community from beginning to advanced phase. Those characteristics imply the required action to promote members participation. For instance, organizing community event at collaborative phase aims to connect members, build social relations, reduce potential friction, and encourage member's contribution.
3. Incapability to respond changes;
   The framework proposes adaptive capability and agent of change concept to help community respond to change. Where innovation and ideas generation are the fundamental activities, a community of practice can respond to change intelligently and even influence trends.

The Evolutionary Community of Practice framework provides guidance for practitioners, organizations, and members of CoP to build and sustain community of practice. The guidance implies from the defining characteristics of each CoP phase. Another usage of this framework is to assess the CoP current state. Analyzing the current state helps community coordinator to find potential problems. This framework also can be used as practical reference to formulate action plan.

Future Research Consideration

In this work, we have successfully identified building blocks and designed a structured framework of community of practice. However,there are several limitations in this study. Since the evaluation was conducted on homogenous case studies from one organization, further investigation is required to study the general applicability of the proposed framework. Secondly, we identified CoP current state by mapping its factual condition with the defining characteristics in our framework. For future research, defining quantitative parameters on knowledge process and community dimensions would be valuable to assess CoP current state more definite. Another consideration for future research is to compose generic value classification for each CoP phase. Identifying the value helps CoP coordinator to set appropriate strategy for CoP development.

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Appendix A

The semi-structured interviews were conducted on June 4 – 9, 2010 with three research group in Bandung Institute of Technology (ITB), Indonesia. The selected research groups were Research Group of Informatics, Research Group of Astronomy, and Research Group of Ecology and Biosystematics. There were nine participants (interviewees): the chairman/chairlady and two members from each research group. Each session of semi-structure interview presented one participant and took approximately 45 minutes. The data gathering used the pre-determined questions on Table 4.

Table 4 The Pre-determined Question for Semi-Structured Interview

Dimension	Question
Knowledge Process	1. What is the research group knowledge map? 2. How does research group construct the knowledge map? 3. How does research group set research priorities? 4. In term of stakeholder involvement, what kind of research is conducted at research group? ☐ The research within internal research group ☐ Collaborative research with other ITB's research group ☐ Collaborative research between research group and local society ☐ Collaborative research between research group and industry ☐ Collaborative research between research group and international partner Brief Summary: …… …… 5. How does the evaluation of research work take place? 6. Does the research group conduct research apprenticeship program for new member(s)? 7. How does research group document all research activities? 8. How does research group administer research publications? 9. What are the general topics of the research work? ☐ Problems or prospect in the knowledge area of research group? ☐ Problems in society? ☐ Problems in industry? ☐ Prospect identification or innovation in industry?
Community	10. What is the membership structure of the research group? 11. What roles are there in the membership structure? 12. How does the implementation of research management in research group? 13. How does research group resolve conflict among its members? 14. What kinds of social events are held in research group?
Supporting technology	15. What kind of technology does research group utilize to support its activities?

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