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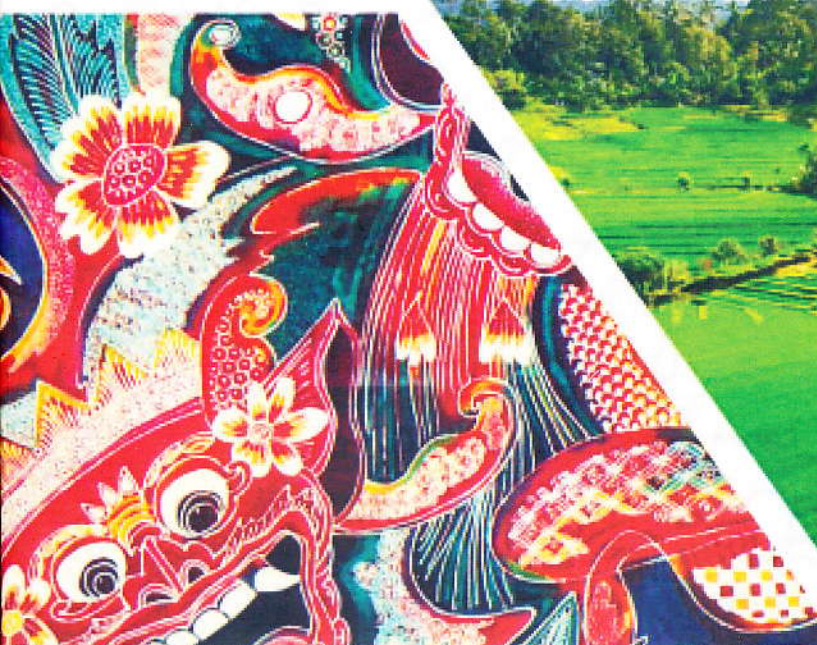
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Communication Constraints and Motivations in the Context of Knowledge Sharing: A Systematic Literature Review

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Abstract - Innovation and product development activities in firms in almost all countries rely on the product development teams comprised of across functions. The members of product development team are those coming from various backgrounds, across departments and across areas of science.

In many product development projects, team members do not always collaborate as expected due to differences in views and poor communication. This Systematic Literature Review explored what factors are inhibitining and motivate product development teams in their communication to share knowledge. Based on the review of 34 relevant articles, this paper presents five factors which inhibit the team members to communicate (functional diversity, homophily, knowledge hoarding, organizational culture, centralization) and five factors which motivate the team members to communicate (reward system, organizational culture, trust, colocated, technology).

Keywords- communication, knowledge sharing, innovation

I. INTRODUCTION

The increasingly competitive business conditions and ever-changing consumer needs require manufacturers to innovate through the creation of products that comply with customer expectations and keep up with the technological advancement. Innovation may mean creating products which are unique and escape the competitors' attention. In the *blue ocean strategy* [1], the competitive edge of producers can be maintained through the uniqueness of their products.

Innovation is not a single event and stands alone, but an activity preceded by a long process involving a lot of individuals. The activities of innovation and product development projects in companies in almost all countries rely heavily on the cross-functional teams comprised of individuals from various departments, with varied backgrounds (experience, education) and perspectives, which sometimes create an excessive diversity of ideas. The diversity of backgrounds and frequency of communication by the product development team have an impact on the success of the product. The lack of positive communication between functions can cause a mismatch between product attributes and consumers' needs [2].

This paper presents a *Systematic Literature Review* (SLR) of a wide range of literature on the role of communication of product development teams coming from across functions in the context of knowledge sharing. Through an in-depth literature review, this paper investigated factors constraining and motivating the product development teams in making communication to share knowledge between each other.

II. LITERATURE BACKGROUND

In the previous studies, Lasalewo, Subagyo, Hartono & Yuniarto [3], [4] found seven phenomena in studies of innovation and product development: (1) shorter product cycles; (2) sensitive to environmental issues; (3) complexity of product development team's communication; (4) effects of information technology; (5) perspective differences among product development teams; (6) chances of product success; (7) increasingly expensive costs for R&D. Through a more in-depth literature search, the studies found a typical relationship among phenomena in which the phenomenon of communication complexity becomes the central issue and has an impact on the product success. These preliminary studies then generate new ideas about the importance of communication in product development teams from across functions. This SLR study investigated more deeply what factors inhibiting and motivating the communication in product development teams in the context of knowledge sharing.

Through the communication for knowledge sharing, a product development team is able to understand the consumers' needs and company's technical capabilities. This exchange of knowledge provides enough information about a right product marketing strategy. When there is good activity of knowledge sharing, the ability of product development will grow exponentially [5].

Communication made by product development teams have a significant impact on the process of knowledge sharing and affect the ability to innovate [6]. A study conducted in 170 companies in Taiwan found the influence of communication in enhancing the ability of innovation, whereby it will encourage individuals to use available knowledge and perform the generation of knowledge, thus improving the innovation capability of individuals within the organizations [7].

The systematic literature review (SLR) in this paper uses the term *knowledge sharing* instead of *knowledge transfer* since both have a different meaning. Knowledge sharing, often analogous to knowledge transfer, can be defined as the process of delivering message (knowledge) from the sender to the recipient. In reality, "transfer" only

involves the active role of the sender, while "sharing" involves the active action of both parties (sender and receiver) for giving and receiving knowledge. Knowledge transfer refers to a process of sending information (knowledge) from the knowledge holder to individuals/group of individuals, while knowledge sharing refers to process where individuals mutually exchange their implicit and explicit knowledge to create new knowledge [8].

III. METHODS

The Systematic Literature Review (SLR) in this paper followed Kitchenham and Charters scheme's [9]. The literature review process was conducted through three main steps, starting with collecting references, selecting the suitability of references based on the inclusion criteria, and choosing the main references to be used in the review. These SLR steps are summarized in Fig. 1.
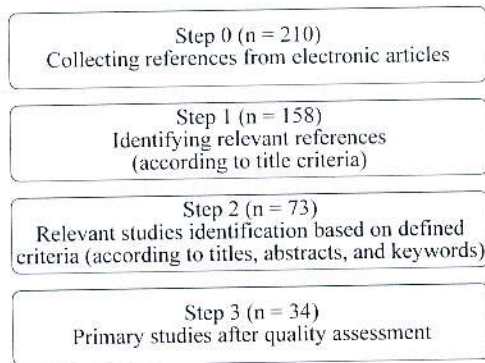

Fig. 1. Steps of Reference Selection

The purpose of this SLR was to answer the following questions:
1) What is the role of communication of product development teams and its impact on the success of innovation?
2) What factors are constraining and motivating the communication of product development teams to share knowledge?

A. Data Source and Searches

Relevant research articles were searched from trusted databases, including ABI/INFORM (ProQuest), ScienceDirect (Elsevier), Springer Link (LNCS), Web of Science (ISI), EmeraldInsight, Scopus and IEEE Xplore (IEE Electronic Library), using the following search terms: *communication, knowledge sharing, innovation,* and *product development*. All search strings are combined using Boolean "AND".

B. Literature Selection Process

The literature selection was conducted to select any sources used as either the primary literature, or comparative or support literature. Articles were eligible in

this review if meeting the following inclusion criteria: (1) published between 2000 - present; (2) written in English and electronically available; and (3) corresponding to title, keyword and abstract.

IV. DISCUSSION

A. Communication Constraints

Some studies have suggested there are constraining factors on the communication of product development teams coming from across functions for sharing knowledge. Table 1 summarizes some of the communication constraints on the communication of product development team.

TABLE 1.
CONSTRAINTS ON THE COMMUNICATION

	Communication Constraints	References
1	Functional Diversity	[10], [2], [11]
2	Homophily	[12], [13], [14]
3	Knowledge Hoarding	[15], [16]
4	Organizational Culture	[17], [18], [19]
5	Centralization	[20], [21]

1) Functional Diversity

Innovation and product development activities in firms in almost all countries rely heavily on cross-functional teams. Based on a survey conducted in 2000, 77% of companies in the United States, 67% in Europe and 54% in Japan used cross-functional teams [10]. Cross-functional teams are generally made up of individuals who come from across all departments/divisions and different areas of expertise, such as product design, production engineering, manufacturing, environment and marketing. The more diverse the background of the teams, the more complex the communication they make [2]. In many product development projects, team members do not always collaborate as desired because of different scientific views, different functional areas and poor communication.

A large number of members involved in a product development team can lead to the diversity of ideas and information overload [2]. The involvement of many individuals makes the product development difficult to control because human involves many variables which are constantly changing and difficult to control than other variables [11].

2) Homophily

Functional diversity of the team members often generates coordination costs and communication problems. Individuals tend to communicate more often and more intensively with other individuals who are considered to have a lot in common (dialect, mental model, educational background and trust system) because it is perceived easier and convenient to communicate. This phenomenon is known as homophily [12].

When individuals assume that others are very different, they will be less likely to build frequent and

intensive interaction, so it will be difficult to build a common understanding. Such a condition results in heterogeneous teams who are often more difficult to integrate goals and a shared view, prone to conflict and less cohesive [12]. Heterogeneous teams are prone to conflict and difficult to achieve collaboration due to interest differences in the product development [13]. Diversity in teams can cause information overload, thereby causing a lot of differences and difficulties of achieving collaboration [14].

3) Knowledge Hoarding

In the communication for sharing knowledge, knowledge hoarding is often found by which the individuals are difficult to accept knowledge from others. This behavior is a natural tendency and difficult to change. Factors causing the knowledge hoarding include: (1) lack of organization's appreciation for the knowledge holder; (2) assumption that thinking is the power of an individual, so that if someone disseminates his/her thoughts, it will make him/her lose personal power; (3) limited time [15]. If individuals assume that power comes from knowledge they have, it will cause knowledge hoarding [16].

4) Organizational Culture

Every organization has a culture, which is a set of norms that collectively make up the character and behavior of individuals within the organization. Organizational culture is a history which reflects the trust of company managers and is the adhesive strength of individuals within the organization [17]. Culture greatly influences the behavior of individuals within an organization.

The Earnest and Young Knowledge Management International Survey (1996) found that 80% of failures of knowledge management implementation are caused by organizational culture. Cultural factors also significantly influence an individual's decision to carry out communication activities to share knowledge [18]. In addition, a sharing culture has the strongest positive impact on the organization performance, and is found in the collective culture in Asian countries [19].

5) Centralization

The characters of organizational culture, which inhibit the development of organizations, include, among others, the centralization and formalization of employment, where individuals (employees) are restricted by a rigid bureaucracy. A formal hierarchical structure in the form of centralization provides a significant negative impact on the activities of knowledge sharing, because centralization can hinder the initiative of employees to share knowledge between areas in an organization [20]. The higher the centralization, the lower the participation of employees in decision making and knowledge sharing, because employees focus more on running commands instead of taking an initiative to make decisions.

Centralization and formalization of the organization negatively affect the ability to share knowledge, because it will create a divided structure and does not encourage employees to face challenges [21]. Conversely, communication which is not limited to a rigid bureaucracy will have a positive impact on knowledge sharing activities. Through a social interaction, individuals accumulate their knowledge, thus gaining new knowledge [20].

B. Communication Motivations

Besides communication barriers, there are also motivating factors for the product development team members to make communication, which are summarized in Table 2.

TABLE 2.
COMMUNICATION MOTIVATIONS

	Communication Motivation	References
1	Reward System	[22], [23], [24], [25]
2	Organizational Culture	[18], [26], [27]
3	Trust	[28], [29], [30]
4	Colocated	[31], [32], [33]
5	Technology	[34], [35], [36]

1) Reward System

Some research suggested that the motivation of individuals to share knowledge is encouraged by the organization's recognition and appreciation of individual achievements. The reward can be either financial (salary/bonus) or non-financial (career advancement, learning opportunities or good treatment/attitudes). A study found that the main factors that shape employee attitudes toward knowledge sharing activity include the formal structure of incentives or reward system [22]. Similarly, another study also found that any activity of knowledge sharing done by employees is motivated by a particular boost, such as incentive system and organizational culture [23].

Reward by organization can be regarded as one of the mechanisms to stimulate individuals to share knowledge and develop new products [24]. This is in line with a study done by surveying 467 employees at four public organizations, which found that rational self-interest in the forms of expected reward, expected association, and expected contribution serves as factors affecting the employees' attitudes over knowledge sharing [25].

2) Organizational Culture

The behavior of individuals within an organization is formed by the culture of the organization. Culture has an effect on the failure of the implementation of knowledge management and the motives for sharing knowledge [18]. In addition, cultural factors also have a positive effect on the ability to innovate and increase organizational performance.

A study conducted on the banking industry in Turkey showed the influence of culture in enhancing innovation capabilities and performance in the forms of profitability,

market share, and market value [26]. An innovative culture can also improve the performance outcomes, including organizational learning, market orientation, value orientation, and creativity of employees [27].

3) Trust

Knowledge sharing activities are driven by mutual trust between the individuals involved. The level of trust will affect the attitude of individuals in the knowledge sharing. The higher an individual's level of trust in the ability and positive attitude of his/her coworkers, the higher his/her belief that the knowledge he/she accepts will be beneficial [28].

In the context of knowledge sharing, a person's level of trust in the ability and the positive behavior of others is directly proportional to his/her belief that the knowledge he/she receives is accurate and useful [29], [30]. With mutual trust, the know-how is often interchanged in informal company activities, for example through conversations in a coffee break or lunch. The exchange of this information enables individuals to build a relationship of trust [30].

4) Colocated

In developing new products, team members who are geographically scattered in various places can be connected using the communication technology. The technological advancement has enabled product development companies to form virtual teams, i.e. those whose members are away from each other, but able to collaborate intensively through communication media such as videoconferencing. The formation of virtual team allows the members to work together on a project, even though they are far from each other [31].

Virtual teams face typical challenges like face to face communication. However, the colocation (gathering in the same location) will create a close interaction, thus establishing common norms and establishing a dialect to communicate on the product development projects. Without colocation, there will be problems associated with activities of building trust and transferring tacit knowledge [31], [32], [33].

A measurement conducted on 80 teams of software developers in Brazil, China, Denmark, France, Germany, India and the US suggested the impact of the spread of individuals on the team performance, in which teams working in the same city will produce the highest performance than working in a different city or country [31].

5) Technology

Advancement of information systems and communication technologies greatly influence the product developm9ent. The use of computer software such as CAD/CAM in product design has reduced both product complexity and processing time. The development of information technology such as the Internet, telephone, telephone conferences and video conferences encourages product development teams to work more effectively.

Technological development affects the behavior of individuals within an organization to share knowledge [34], [35]. The communication of product development teams, which is made by incorporating technological elements such as Computer Integrated Manufacturing, Concurrent Engineering and Knowledge Management, at the Toyota production system is proven to reduce time to market from 30 months to 18 months [36].

V. CONCLUSIONS

From the results of the literature review, it can be concluded that conducting communication to share knowledge is an important activity in organizations, because through such an activity, product development teams coming from across functions can mutually exchange their knowledge about consumer needs and technical conditions of the company, thus generating accurate information of strategy and product marketing time. This condition, therefore, can contribute to developing products which are suitable with the consumer needs and have an impact on the product success.

In sharing knowledge, product development teams often face barriers due to functional diversity, homophily, knowledge hoarding, corporate culture, and company's centralization. However, there are several factors that actually motivate the product development teams to share knowledge, including the organization's appreciation for individuals/employees, corporate culture, mutual trust among team members, colocation, as well as technologies facilitating the communication of product development.

The interesting finding in this review should be further explored in terms of the factors of corporate culture, since it can be either an inhibiting factor or a motivating factor for communication. Errors in managing the corporate culture can result in a communication failure. Conversely, the ability to form a positive corporate culture can improve the ability of innovation and affect the company performance.

Creating a positive company culture can be done through: 1) rewarding individual achievement, such as bonus, raised salary or career opportunities; 2) establishing an conducive and comfortable atmosphere for knowledge sharing activities by changing rigid centralization and bureaucracy into a sharing culture; and 3) increasing the quantity of non-formal meetings. These three steps can create an environment of knowledge sharing, which, in turn, can produce a successful product.

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