

THE DEVELOPMENT DESIGN OF KNOWLEDGE QUALITY BASED ON KNOWLEDGE NETWORKING AND CROSS- FUNCTIONAL INTEGRATION TOWARDS SMES' INNOVATIVE PERFORMANCE

Widodo,
Department of Management, Faculty of Economics, Sultan Agung Islamic University (UNISSULA)
Semarang-Indonesia
widodo@unissula.ac.id
Sitty Yuwalliatin
Department of Management, Faculty of Economics, Sultan Agung Islamic University (UNISSULA)
Semarang-Indonesia
Sitty_Y@unissula.ac.id
Endang Dwi Astuti
Department of Management, Faculty of Economics, Sultan Agung Islamic University (UNISSULA)
Semarang-Indonesia
Endang_DA@unissula.ac.id

Abstract :

This study is based on research gap and business phenomena, such as the big amount and varies knowledge quality concepts, study controversy of cross-functional collaboration relations towards performance. Besides, there is no consistency in cross-functional collaboration relations. The findings of the previous researches show that the innovation of SME is still 'follower'. The findings of this research show that the main priority of the development model of SME innovative performance in Central Java by enhancing the intrinsic knowledge quality with the indicators of accuracy, objectivity, dynamism/update and believability.

Keywords: *innovative performance, contextual knowledge quality, intrinsic knowledge quality , follow-up knowledge quality cross-function integration, knowledge networking*

JEL classification: D8, J5, L2

1. Introduction

The existence of knowledge economy has required a creation of new generation of organization which should utilize specific knowledge to acquire global competitiveness (Constantine I. M., 2013). Carmen Cabello-Medina (2011) states that the importance of human capital for innovation becomes the attention of researches, especially dealing with elements and processes which improve the organizational innovation and performance. The study of Hsu (2007) shows that small industries likely to be unable to achieve innovativeness. Organization with skillful and knowledgeable human resource has higher human capital and more likely to generate knowledge, make right decision, and has better innovativeness (Hitt et al, 2006).

Knowledge is the main resource and value source for an organization. The knowledge quality helps the company to optimize the works, products and services development, decrease the expenses and increase the selling. Then, (Dong 2010) explains that the concept of knowledge quality is plenty and varied. However, the organization is acquired to enhance the knowledge quality by cross-functional collaboration.

Cross-functional collaboration is an important component for the continuity of an organization that aims to win the competition by optimizing the functions within the organization meticulously. The study of Song I. M. (2000) concludes that cross-functional collaboration has impact on performance. However, the study of Menon, et al (1999) state that cross-functional collaboration does not impact the performance. Besides, there is no inconsistent on cross-functional collaboration, for instance Tsai (2002) explains that cross-functional collaboration in social interaction, and Lin, et al (2010) conceptualize it as communication, problem solving, and satisfying relation. Therefore, it requires raw understanding about cross-functional collaboration in order to stimulate the enhancement of knowledge quality and innovative performance. Based on the above research gaps and business phenomena, this study examines the development design of knowledge quality based on cross-functional collaboration and knowledge networking towards SMEs' innovative performance.

2. Hypotheses Development

2.1. Knowledge Networking and Cross-Functional Integration

The existence of environment uncertainty forces the Human Resource (HR) to seek for knowledge owned by people outside the organization (i.e. customers, suppliers, distributors, state institutions, or competitors). Working unit may do not have all of the abilities required for the success of the organization, hence the effective knowledge networking is essential. The study of Dong Kyoonyoo (2010) explains that knowledge networking is about how far an organization is possible to acquire usable connectivity through activities.

Knowledge networking increases the organization effectiveness, as it can overcome the complex activities. The growth of knowledge networking will facilitate the processes of conveying essential ideas, insight, and other perspectives for the team (Hoegl, et al, 2003).

The disclosure and communication among functions is needed in order to give responds to the environment. The problem occurs in a function can be helped to analyze and solve by other functions professionally and conceptually. Likewise in some unsolved problems in one party can be discussed and solved through coordination among other parties within an organization. This step requires to be implemented in the company culture, hence the employees will not do reclusion, afraid of taking initiatives and risks. The consequences then are the open-minded and communication within the organization will impact on the respond giving in the environment. Effective coordination among functions is expected to actively mobilize the participation from every field to achieve the general purposes of the company. Thus, it needs effective supports and powerful leadership in coordinating the cross function, support and participation among functional fields, and reliability among functions.

The study of Song M. X. and Dyer B. (2000) explain that the indications of cross-functional integration are: 1) Level of cross-functional involvement dealing with the level of coordination on marketers, R&D, production and finance which analyze the market opportunity as well as potential customers. 2) Cross-functional quality relates to the punctuality and information accuracy on every marketer, R&D, production and financial. 3) Cross-functional relation harmony dealing with the level of coordination (in the aspects of communication, interaction, and collaboration among the marketers), R&D, production and financial which are responsible, and interaction satisfaction.

The theory of resource based (Grant, 1991) explains that productive activities within an organization is essential for the collaboration and coordination among the various resources. The success of the organization is determined by adjusting the process of controlling, coordination, flexibility, and innovation. Failure of an organization is often caused by strategies or silly activities beyond its ability.

The study of Menon et al (1999) concludes that cross-functional integration has impact on strategic creativity. Then, the study of Song I. M. (2000) shows that cross-functional integration positively and significantly impacts on the organizational performance. Conclude that 1) Inter-organizational coordination has interaction with intra-organizational coordination; 2) Inter-organizational coordination

brings effect on planning, efficiency, and performance quality. Based on these previous studies, it can be concluded that there is a cross-functional integration which has characteristics of effective HR involvement, information quality and is supported by the relational harmonization inter-field. Each functional field is able to recognize the pre-eminence and is able to collaborate to other fields effectively. Through cross-functional and cross-field integration, it can be generated a good process synergy and it is supported by good and positive commitment. This process has potential to become a high quality of strategy and better effects, hence it can analyze situation or served with various unique advantages. However, Menon et al (1999) prove that cross-functional integration brings no impact on organizational learning and organizational performance.

2.2. Knowledge Quality

Knowledge quality has become essential issue in creating competitive advantage and relates with rapidly changing business environment (Lee et al., 2002). From knowledge use perspective, knowledge can not only be earned but also be integrated by all different resources from special knowledge (Majchrzak et al., 2004). HRs are willing to spend their time and energy to seek for knowledge if it is likely to have values and is able to bring benefits (Davenport and Prusak, 1998). Defining, explaining, and assessing the knowledge quality is interested for the researcher.

Kulkarni et al. (2006-2007) assume that knowledge quality content is assessed by its use. Soo et al. (2004) explore knowledge quality by measuring the utility frequency and innovation. Rao and Osei-Bryson (2007) develop conceptual dimension of knowledge quality, such as accuracy, consistence, currency, interpretability data, context level, detail level, interest level, utilization sharing, and volatility. Durcikova and Gray (2009) measure the knowledge quality by accuracy, and meeting needs. This study explores the knowledge quality in single dimension. Knowledge, somehow, is a multidimensional development (Nonaka, 1994), and quality which cannot be measured by single dimension. Majchrzak et al. (2004) also explain that there are three criteria to use knowledge for innovation, such as credibility, relevance, and adaptation. In this study, knowledge quality is defined as how far the awareness and understanding of idea, logic, relationship, and appropriate circumstance can be used, relevant, valuable to context, and adaptable.

The study of Dong Kyoonyoo (2010) explains that knowledge quality dimension includes: 1) intrinsic knowledge quality. This means to what extent HR has knowledge quality. This dimension relates to accuracy, reliability, and punctuality of knowledge. This is the basic of knowledge quality, and gives a wide understanding in the activities and relations. Knowledge is defined as a justified belief which improves an entity capacity for effective action (Nonaka, 1994). This means that the members justify the accuracy or reliability of their observation (Erden et al., 2008). Even though knowledge is drawn as belief, opinion, insight, and experience (Nonaka, 1994; Davenport and Prusak, 1998), it should contain fundamental values. 2) Contextual knowledge quality. Intrinsic knowledge quality is a required condition, but still not enough. Knowledge cannot reflect context, and does not have relevance. The same knowledge may have different meaning in different context. Knowledge is specific context (Becerra-Fernandez and Sabherwal, 2001; Nonaka and Takeuchi, 1995) and the different contexts (i.e. time, space, culture, goal, role, or paradigm) appraise quality with different way. The different context may acquire different knowledge management (Becerra-Fernandez and Sabherwal, 2001). Contextual knowledge quality refers to what extent knowledge is considered as duty context. This dimension relates with relevance, appropriateness, and value by understanding the environment where the duty is operated. Contextual understanding should increase the knowledge use efficiency. 3) The follow-up knowledge quality is an action which should be used to fulfill a purpose (Nonaka and Takeuchi, 1995). The follow-up knowledge quality refers to what extent knowledge is spread, adapted, and applicable on duties. Knowledge should be transformed into action in order to realize its use and profitability (Davenport and Prusak, 1998). As knowledge quality depends on the actual use of knowledge. This is followed up by knowledge quality which enables the team to flexibly adapt, develop, and easily apply the

knowledge so it can increase the effective actions. This dimension helps to deal with uncertainty by adapting their knowledge for flexible, wide, and easy situation.

The resource supplies from outside of new knowledge an understanding are needed in a project. The integration of external resource team allows the team to access the precious knowledge and complement each other skills (Dong Kyoon Yoo, 2010). Therefore, the team can develop their knowledge quality by a punctual integration through knowledge networking. Thus, the hypotheses proposed in this study are as follows:

H1: the higher knowledge networking, the higher intrinsic knowledge quality

H2: the higher knowledge networking, the higher contextual knowledge quality

H3: the higher knowledge networking, the higher follow-up knowledge quality

The study of De Dreu (2007) explains that individuals tend to share valuable knowledge in the context of collaboration where the individuals feel the use of collective knowledge in pursuit of mutual interests. However, it is acknowledged that collaboration behavior enhances mutual understanding among individuals which is the prerequisite for knowledge sharing with many innovative characteristics. Thus, it is expected that collaboration context will generate a high quality of knowledge sharing among team members.

The cooperative learning theory emphasizes on the important of collaboration attitude in maximizing the study result of the team members (Stouten and De Cremer, 2010). Besides, cooperative communication and the relationship among individuals are believed to be able to improve mutual understanding, convince the individuals to be aware of others' needs; hence it can facilitate various valuable knowledge and understandable (Joshi, K.D., Sarker, S. and Sarker, S, 2007). Thus, the hypotheses proposed in this study are as follows:

H4: the higher cross-functional integration, the higher intrinsic knowledge quality

H5: the higher cross-functional integration the higher contextual knowledge quality

H6: the higher cross-functional integration, the higher follow-up knowledge quality

2.3. Innovative Performance

The study of Carmen Cabello-Medina (2011) states that intellectual modal is conceptualized as knowledge and organizational ability understanding, which is one of the most relevant antecedent innovation, that has become the basic of competitive advantage development.

On the other side, the innovation ability of a company is more closely related to intellectual modal rather than the permanent assets. The importance of intellectual modal to innovate has attracted the researcher in determining elements and processes to enhance innovative performance and company performance. Even though the organization can develop three intellectual modal aspects, such as human, social and organizational modal, one of the most substantial ideas dealing with interactional potential among them and how the interaction can increase innovative performance.

The intellectual modal approach considers that human capital can be utilized by other parties to create new knowledge. Although the human capital may be the origin of all knowledge, learning acquires that individuals can do insight sharing, knowledge and mental model, which are the social capital (Senge, 2001). Knowing that innovation basically is part of training in collaboration, the social modal plays the key role either increasing the human capital directly or emphasizing the impact through innovation. Therefore, individual knowledge enhancement and sharing condition creation are deserved to be concerned.

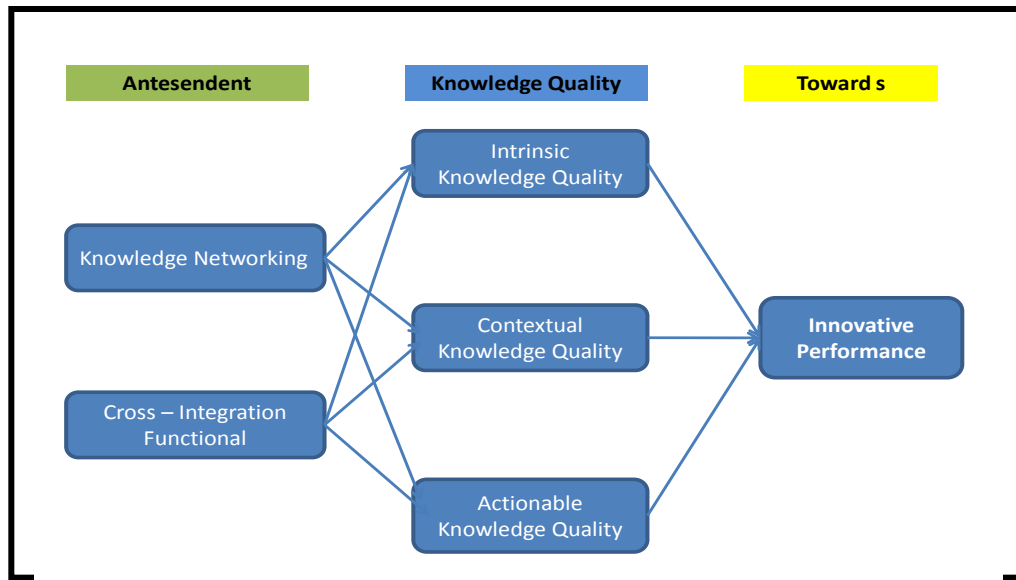
Regarding to the close relationship between the company member's knowledge, products and services, it is clear that the company's ability to generate new products and other organizational ability has close relationship with the human resources. The approach of human capital, value, and knowledge unives are the most relevant fitures for innovation. Value refers to potention to improve the company's efficiency and effectivity, exploit market opportunity and/or netralize the potential thread. Valuable knowledge generates high returns in the market, which enhances the ratio of benefits for the customers

towards the costs . Dealing with the innovation, employees with positive and valuable knowledge and abilities relate with innovative performance, because they contribute in identifying the new market opportunities and willing to experiment and implement new procedures (Label 2002). Subramaniam and Youndt (2005) show that among all people within an organization, there is diversity in abilities. This HR is the most flexible in acquiring new abilities which are able to improve the company's innovation performance.

This unique HR generates a competitive differentiation as it is valuable, besides its ability is competitive parity source (Barney, 1991). On the other hand, knowledge contributes for the development of new ideas and products (James, 2011). Unique knowledge is the source of innovative activities. Therefore, new knowledge quality of a company is eligible to compete; hence knowledge quality is an intangible resource which can trigger the innovation performance of the company. Thus, the hypotheses proposed in this study are as follows:

- H7: the higher intrinsic knowledge quality, the higher innovative performance
- H8: the higher contextual knowledge quality, the higher innovative performance
- H9: the higher follow-up knowledge quality, the higher innovative performance

2.5. Empirical Design



The diagram illustrates the empirical design, showing the relationship between Antecedents (Knowledge Networking and Cross – Integration Functional), Knowledge Quality (Intrinsic, Contextual, and Actionable), and Innovative Performance. The flow is from Antecedents to Knowledge Quality and then to Innovative Performance.

3. Method

3.1. Respondent

The population of this study is all small Batik Industries in Central Java-Indonesia which number is 1201. The purposive sampling technique is used as the sampling method, based on population characteristics, such as the area or location. Then, the sample size refers to Hair, et all (1996), who state that the sample size is the indicator multiplied to 5 to 10 or minimum 100 respondents. In order to optimize the generalization, then the sample of this study is as many as 150 respondents.

3.2. Variable and Indicator

The variable in this study covers innovative performance, knowledge networking, cross-functional collaboration, intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality. Then, the indicators of each variable are presented as follows:

Table 1: Variable and Indicator

No	Variable	Indicator	Source
1	Innovative Performance	<ul style="list-style-type: none"> • Introduction to new product technology which has been developed. • The frequency of products replacement which significantly change. • The proportion of new product technology • Management renewal 	Muammer Zerenler (2008)
2	Knowledge Networking	<ul style="list-style-type: none"> • Easiness in acquiring knowledge • Easiness in accessing external resource • Having usable contact • External feedback 	Dong Kyoonyoo (2010)
3	Cross-Functional Collaboration	<ul style="list-style-type: none"> • Involvement • Quality • Harmony 	Song, M. X and Dyer .B (2000)
4	Intrinsic Knowledge Quality	<ul style="list-style-type: none"> • Accurate • Reliable • Objective • Update • Believable 	Dong Kyoonyoo (2010)
5	Contextual Knowledge Quality	<ul style="list-style-type: none"> • Adding value for decision making • Adding value on operational team • Giving competitive advantage • Relevant with the duties 	Dong Kyoonyoo (2010)
6	Follow-Up Knowledge Quality	<ul style="list-style-type: none"> • Adapt • Improving duties • Providing capacity to react towards the circumstance 	Dong Kyoonyoo (2010)

3.3. Analysis Technique

To analyze the data, Structural Equation Modeling (SEM) from AMOS Software 5.0 is used in this research. According to Ferdinand (2000), there are some steps in SEM, such as 1) theory-based development design, 2) diagram path development, 3) evaluation on Goodness-of-fit criteria, and 4) evaluation on design suitability through a review towards various Goodness-of-fit criteria.

4. Result and Discussion

4.1. Validity

In this research, validity is tested using convergent validity. Convergent validity can be seen from Structural Equation Modeling (SEM) by observing every coefficient indicator of every construct which has two times higher value in every standard error. It has shown in Figure 1 that convergent validity can be fulfilled since every indicator that has critical ratio is two times higher than standard error.

4.2. Reliability

Based on the measurement of Table 1, it can be seen that there is no reliability which is smaller than 0,70. So as in variance exact test, there is no value which lower than 0,50. This result shows that all indicators on the construct are used as observed variable for the construct, or the latent variables are able to describe the construct or the latent variable formed.

Table 2: Reliability Test and Variance Extract

No	Variable	Construct Reliability	Variance Extract
1	Knowledge Networking	0.82	0.67
2	Cross-Functional Coordination	0.79	0.72
3	Intrinsic Knowledge Quality	0.87	0.75
4	Contextual Knowledge Quality	0.77	0.66
5	Follow-up Knowledge Quality	0.71	0.69
6	Innovative Performance	0.81	0.67

4.3. Full Model Test of Knowledge Quality

Based on the analysis through confirmatory factor, each indicator in the suitable model can be used to define the latent construct, so the full model of SEM then is able to be analyzed. The data processing result is presented in Figure 2.

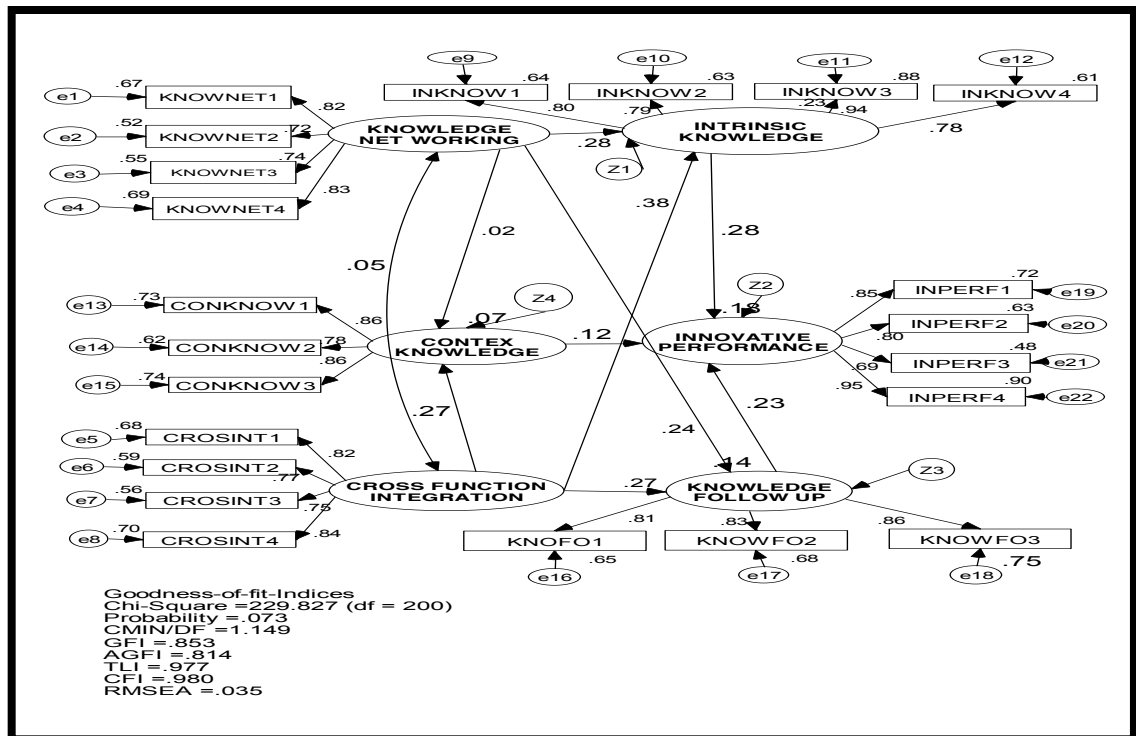


Figure 2
 Full Model Test of Knowledge Quality

Figure 2 shows that this model is suitable to the data used in this research. It proves that Chi-Square, Probability, CMIN/DF, and TLI are in the range of the expected values although GFI and AGFI are marginally accepted.

4.4. Hypotheses Testing

Based on the test through confirmatory analysis and structural equation testing model of knowledge quality, this model can be accepted. Then, based on the suitable model, it will be implemented hypotheses testing which were proposed in this research. It is presented in Table 3.

Table 3: Standard Estimate and Critical Ratio

Hypothesis	Impact	Std. Estimate	Critical Ratio	Explanation
H ₁	<i>Knowledge Networking</i> → <i>Intrinsic Knowledge</i>	0.280	2.945	Sign.
H ₂	<i>Knowledge Networking</i> → <i>Contextual Knowledge</i>	0.024	0.238	Non.Sign.
H ₃	<i>Knowledge Networking</i> → <i>Follow-up Knowledge</i>	0.241	2.396	Sign.
H ₄	<i>Cross-Functional Integration</i> → <i>Intrinsic Knowledge</i>	0.377	3.826	Sign.
H ₅	<i>Cross-Functional Integration</i> → <i>Contextual Knowledge</i>	0.271	2.610	Sign.
H ₆	<i>Cross-Functional Integration</i> → <i>Follow-up Knowledge</i>	0.275	2.710	Sign.
H ₇	<i>Intrinsic Knowledge</i> → <i>Innovative Performance</i>	0.281	2.923	Sign.
H ₈	<i>Contextual Knowledge</i> → <i>Innovative Performance</i>	0.121	1.280	Non.Sign.
H ₉	<i>Follow-up Knowledge</i> → <i>Innovative Performance</i>	0.229	2.364	Sign.

Table 3 shows that in the endogenous and exogenous estimation parameter, the value of CR ≥ 2.00 with the significant value 0,05 (5%). Thus, 2 hypotheses are rejected and 7 of them are accepted.

Hypothesis 1 is the higher knowledge networking, the higher intrinsic knowledge quality. The result indicates that to increase the intrinsic knowledge quality, knowledge networking should be developed. Knowledge networking regards with how far an organization is able to obtain usable connectivity through activities or programs. Knowledge networking improves the organization effectiveness as it can overcome complex activities. The development and growth of knowledge networking will facilitate the processes in order to convey important ideas, insights, and perspectives for the team. Besides, intrinsic knowledge quality describes how far the HR has knowledge quality. This dimension relates to accuracy, reliability, and punctuality of knowledge. The integration of external resource team enables the team to access valuable knowledge and complementary skills. Therefore, the team member can enhance their knowledge quality by punctual integration through knowledge networking.

Then, Hypothesis 2 is the higher knowledge networking, the higher contextual knowledge quality. The result indicates that enhancing the intrinsic knowledge quality is not be affected by knowledge networking. This condition is caused by the dominant networking quality on working routine.

The Hypothesis 4 proposed in this result is the higher cross-functional collaboration, the higher intrinsic knowledge quality. The result indicates that to increase the intrinsic knowledge quality, cross-functional collaboration is built. In general, individuals tend to share their valuable knowledge in the context of collaboration where they feel that using collective knowledge together generates an improvement on mutual understanding among individuals, which is a requirement for knowledge sharing with innovative characteristic. Thus, it is expected that the context of collaboration can result a high quality of knowledge sharing among the team members.

Then, Hypothesis 5 is the higher cross-functional collaboration, the higher contextual knowledge quality. The result indicates that cross-functional collaboration is built to enhance the contextual knowledge quality. The cooperative learning theory emphasizes on the importance of collaboration/cooperation in maximizing the learning result of the team members. Besides, cooperative communication and relationship among individuals are believed in increasing mutual understanding,

making the individuals aware of others' needs, hence facilitating knowledge sharing becomes more worthwhile and understandable.

Hypothesis 7 describes that the higher intrinsic knowledge quality, the higher innovative performance. The result indicates that intrinsic knowledge quality is developed to improve the innovative performance. Intellectual modal, such as knowledge and recognizing organization's abilities, is one of the most relevant antecedents of innovation which has become basis to achieve competitive advantage. Unique knowledge is the source of innovative activities. Thus, new knowledge quality of a company can compete. Hence, knowledge quality is an intangible resource which triggers innovative performance of the company.

Hypothesis 8 is the higher contextual knowledge quality, the higher innovative performance. The result indicates that enhancing innovative performance is not effected by contextual knowledge quality. The condition is caused by the operational limit of working unit of each SME.

The Hypothesis 9 is the higher follow-up knowledge quality, the higher innovative performance. The result indicates that follow-up knowledge quality should be built in order to increase the innovative performance. Intellectual modal, such as human, social capital, and organization, is one of the most substantive ideas relating to interaction potential and how interaction can increase innovative performance. Knowledge quality contributes to ideas and new products development. Unique knowledge is the source of innovative activities. Thus, the quality of new knowledge is able to compete.

5. Conclusion

Various significant supports from hypotheses testing had answered the research problems which resulted 5 developments of knowledge quality that can realize advanced innovative performance, such as: **First**, steps of the development design of innovative performance were done by enhancing intrinsic knowledge quality with indicators of accuracy, objectivity, dynamics/up-date, and trustable. **Second**, steps of the development design of innovative performance were done by increasing follow-up knowledge quality with indicators of adaptation, applicable to improve duties and provide capacity to react with the circumstances. **Third**, steps of the development design of innovative performance were done by cross-functional integration through knowledge quality (i.e. intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality), with the indicators of cross-functional collaboration involvement, cross-functional collaboration quality, and cross-functional collaboration harmony. **Fourth**, steps of the development design of innovative performance were done by knowledge networking through knowledge quality (i.e. intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality), with the indicators of easiness in acquiring knowledge, easiness to access external resource, having usable contacts and external feedbacks. **Fifth**, steps of the development design of innovative performance were done by enhancing contextual knowledge quality with the indicators of adding value in decision making, adding value in team operation, giving competitive advantage, and relevant with the duties.

Managerial Implication

Based on the findings in this research, the managerial implication priorities of development design of knowledge quality based on cross-functional collaboration and knowledge networking towards SMEs innovative performance are as follows: 1) Knowledge Networking. The indicator 'easiness in acquiring knowledge' has the lowest index among other indicators. Thus, the management develops the networking quality by realizing the quality of communication, trust, and commitment on the consensus. By that process, it will trigger the easiness in acquiring knowledge required. 2) Cross-Functional Integration. The management quality of cross-functional collaboration requires disclosure and communication inter function in an attempt of giving feedback to the environment. Problems exist in a function can be helped to analyze and solve by the other functions professionally and conceptually. So as for unsolved problems of a party can be discussed and solved through coordination among functions within a company. This step needs to be implemented in the company culture, so the employees will not

be introvert, afraid of taking initiatives, and afraid of taking risks. 3) Knowledge Quality. Accuracy in knowledge requires a high learning orientation, shown by: a) knowing new things, b) training, c) getting feedback from customers, and d) continually doing development. Learning orientation is used as a self-control strategy which is able to help the development of HR's skills and abilities as well as knowledge that can improve the performance. 4) Innovative Performance. The frequency of product replacement requires transformation of innovation core in the external networking because production network with superior knowledge which transfer mechanism among the users, suppliers, and creators will be able to beat the production networking with less effective knowledge distribution routine. To create new/better products, the company should relocate the resource, combine new resource/existing resource both inside /outside with new ways.

Limitation and Future Research Agenda

The result of full model SEM showed that the model was suitable/ fit with the data used. However, there were 2 suitability testing that marginally accepted, such as Goodness of Fit Index (GFI= 0.853), and Adjusted Goodness of Fit Index (AGFI = 0.814). The result of AMOS Software testing showed that in the leverage of knowledge networking and cross-functional integration towards contextual knowledge quality, the Squared Multiple Correlations was 14 %, and then in the leverage of knowledge networking and cross-functional integration towards contextual knowledge quality, the Squared Multiple Correlations was 7,5 %. In the innovative performance which is influenced by intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality, Squared Multiple Correlations was 18,2 %. The three Squared Multiple Correlations have low qualification.

The Future Research Agenda. Organizational culture is an integrated pattern of human behavior which relates to problems in adaptation and integration of internal and external conditions. Therefore, organizational culture takes role in the development process of knowledge quality in an attempt to enhance innovative performance. Thus, further study about organizational culture in the development process of innovative performance in an interesting research area. Then, based on the limitation of the three Squared Multiple Correlations which have low qualification is a black box and an interesting research area.

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