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Conducting Product Innovation by Using Social Media among Japanese Firms

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FOREWORD by EDITOR-in-CHIEF

We are pleased to present the STIPM Journal Vol 4, No. 2, December, 2019. This issue brings together research findings related to science, technology, and innovation policy and management from Japan and Indonesia.

First article was written by **Djisman Simanjuntak *et al.*** entitled *Exploring the Transition to Eudaimonic Tourism: A Case Study of Bali*. This article discusses innovation in tourism focus on the dynamics of tourism grows. As tourism grows, carrying capacity is stretched or even overstretched in some places and industries. A shift toward more eudaimonic tourism is needed, and the innovative elements of eudaimonia include geographical treasure, biodiversity, and local deep culture.

Taeko Suehiro and Kumiko Miyazaki present an article entitled *Accumulation of Knowledge by Strategic Public Procurement through Public-Private-Partnership for Service Innovation in Japan*. This study focuses on how governments strategically procure public service through Public–Private Partnership (PPP)—or more specifically, Private Finance Initiative (PFI) arrangements.

Erman Aminullah presents *E-Cigarette as Disruptive Innovation: Forecasting of Conventional Cigarette Substitution in Indonesia*. This article intends to forecast conventional cigarette substitution by e-cigarette in the context of disruptive innovation. E-cigarette as disruptive innovation has been driven by technology innovation to create e-cigarette products for global market. The advancement of e-cigarette technology innovation would continue to create smart and less harmfull e-cigarette as alternative tobacco products in future.

Kumiko Miyazaki, Santiago Ruiz Navas, and Ryusuke Sato present the fourth article entitled *Evolutionary Path of Development of AI and Patterns of Knowledge Convergence over the Second and Third AI Boom*. AI has been through several booms and we have currently reached the 3rd AI boom which followed the 2nd AI boom centering mainly on expert systems. The current AI boom started around 2013 and AI is beginning to affect corporate management and operations. AI has been evolving over six decades but it seems that the current boom is different from the previous booms.

The fifth article entitled *Predicting Potential Co-Authorship using Random Forest: Case of Scientific Publication in Indonesian Institute of Sciences* by **Rizka Rahmaida, Asep Saefudin, and Bagus Sartono.** Co-authorship network is one of the proxies to evaluate the emerging research collaborations. Co-authorship that happens for the first time among a pair of author plays an important role as the key of success for their co-authorship in the future.

Finally, **Hiroki Idota *et al.,*** present an article entitled *Conducting Product Innovation by Using Social Media among Japanese Firms*. This article based on a study that attempts to conduct an empirical

analysis of how social media use promotes product innovation in Japanese firms by collaboration with consumers based on survey data from Japanese firms using probit analysis. This study finds that collaboration with consumers by using social media is important for innovation, particularly in developing concepts and devising methods of use.

The STIPM Journal is indexed by Google Scholar, ISJD, IPI, DOAJ, BASE, and OCLC World Cat. This make the journal dissemination wider. We would like to thank all the reviewers for their excellent work and the authors who kindly contributed their papers for this issue. We are also indebted to the *STIPM Journal* editorial office at P2KMI-LIPI and the publishing and production teams at LIPI Press for their assistance in preparation and publication of this issue.

We are expecting that STIPM will always provide a higher scientific platform for the authors and the readers, with a comprehensive overview of the most recent STI Policy and Management research and development at the national, regional dan international level.

Happy New Year 2020 to all of you…

Jakarta, December 2019

Editor-In-Chief

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Conducting Product Innovation by Using Social Media among Japanese Firms

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ABSTRACT

Social media have been spreading throughout the world, and a large number of firms recognize social media as new communication tools for obtaining information on new product development. In spite of the increasing use of social media in reality, academic research on whether or how the use of social media contributes to the promotion of product innovation is as yet insufficient. This study attempts to conduct an empirical analysis of how social media use promotes product innovation in Japanese firms by collaboration with consumers based on survey data from Japanese firms using Probit Analysis. This study finds that collaboration with consumers by using social media is important for innovation, particularly in developing concepts and devising methods of use. Innovative firms evaluate social media as important for the relationship of trust with consumers and recognize word-of-mouth via social media to discover new ideas, and elaborate organizational management through the person in charge of development. Social media thus play an important role in product innovation in such a way that social media support firms by aiding to grasp consumer needs and collaborate with consumers for product innovation.

I. INTRODUCTION

Social media including social network service/ social network site (SNS), Twitter, blogs (an abbreviation of 'web log'), Facebook, Instagram, and so on have become popular all over the world. Social media were originally handy communication tools aiding individuals to keep in touch with friends or acquaintances, but currently a number of firms have come to recognize social media as new communication tools outside as well as inside the firm. That is, social media are utilized for obtaining information related to consumer needs, markets for developing new goods and services, and for promoting marketing, while these are also used for sharing information on internal company work such as schedules, meetings, and on sales data among colleagues in the office. Firms in the automobile, household appliance, PC, cellular

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phone, airline, and finance industries have come to utilize social media widely not only for the sections of marketing and sales force but also for innovation. Throughout the whole innovation process, such as obtaining the ideas and concepts of products, designing, prototyping, and commercializing, a firm came to collaborate with users. Especially, in the case of final consumer goods, consumers own ideas or evaluate new products, which are essential for product development. Since new products must be accepted by consumers, their decisions are crucial. In the early stage of innovation diffusion theory in the middle of the 1960s, Rogers (2003) pointed out five main factors that influence consumer's adoption of an innovation; relative advantage, compatibility, complexity, trialbility, and observability. New products have to satisfy these, accordingly prior to sales, firms have to decide whether new products meet these requirements, and the best way to accomplish this is to inquire consumers directly. In accordance with the development of ICTs, in particular, social media have become useful for the above purposes.

Prior to analysis, it is better to introduce how social media was actually practiced among Japanese firms. Ministry of Economy and Trades and Investment (METI) selected 42 firms as examples of best practice of social media based on their own surveys and in-depth interviews conducted in March 2016. The selected firms belong to the following industries: manufacturing (9), food (8), retail (8), information and software (2), travel and transportation (4), finance (3), and services (8). The objectives of social media use are (a) marketing, (b) support, (c) product showcase, (d) development of new products. For example: (a) Marketing is a typical role of social media which promote sales and this includes customer relation management (CRM); (b) Support implies assistance of sales such as customer service; (c) replying and advising to customers questions or enquiries; (d) Development of new products is to create new products and services from the customer opinions. The number of firms of each category is;

a) marketing, 18 (42.9%)
b) support, 4 (9.5%)
c) product showcase, 15 (35.7%)
d) development, 4 (9.5%)
e) other, 1 (2.4%)

From this data, social media used among Japanese firms are mostly related to marketing or promotion of sales, and aiming for development is relatively small. Four companies commonly establish the user site to grasp their needs, improvements, pain points, or claims which lead to ideas for new products and services.

Bearing the above data in mind, this paper attempts to conduct an empirical analysis of how social media use promotes product innovation through collaboration with consumers by focusing purposes and types of collaborations with consumers, based on the data collected from our own survey of Japanese firms. To examine these problems, this paper decomposes them into the following more detailed research questions:

RQ1: Whether social media use is effective for developing new products and services
RQ2: If so, what are objectives of social media?
RQ3: How social media are used for collaborating with consumers? What are important factors for collaboration for new product development?

The paper consists of the following sections; the next section presents the survey of previous literature. Section 3 clarifies the framework of the analysis, estimation method used and results obtained. Section 4 discusses the results and implications, as well as provide brief conclusions.

II. LITERATURE REVIEW

A. What are social media

Kaplan & Haenlein (2010) define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content." This concept of Web 2.0 is advocated by O'Reilly (2007), but Web 2.0 itself is not clearly defined. Although the roles of originators and recipients of information were fixed in the previous Web 1.0, in the current Web everyone can become both an originator and recipient of information and the Web has become a more dynamic and interactive means

of communication. Therefore, social media can be defined as a series of services for general users to express their individual interests, concerns, feelings, experiences, and knowledge, etc., as contents created from characters, numerical values, signals, music, as well as photographs, animations, etc., and to exhibit them to the public via the Internet or to share them with specific people over the Internet.

Various services are included in social media. For instance, Kaplan and Haenlein (2010) classifies six types of social media, as shown in Table 1, from the viewpoint of social presence or media richness and self-presentation or self-disclosure such as (1) Blogs and Twitter, (2) SNS (e.g., Facebook and Instagram), (3) virtual social worlds (e.g., Second Life), (4) Cooperative projects (e.g., Wikipedia), (5) Content communities (e.g., YouTube), and (6) Virtual game worlds (e.g., World of Warcraft).

B. Social media use in the firm

The diffusion of social media has had a strong influence on the business activities of firms. Previous studies show that while social media brings business opportunities to firms, it may also turn out to be a threat for them, due to the inability of firms to control social media directly. Regarding the former, Rodriguez, Peterson, and Vijaykumar (2012) clarifies that social media use has positive influences on both the sales process and its results. That is, the use of social media provides good opportunities to promote sales, since it is beneficial for firms in learning from consumers as well as establishing a new market segment and long-run positioning. It is also useful for constructing mutual trust with consumers and raising economic value for consumers (Noone, McGuire, & Rohlfs, 2011; Kate & Pavan, 2012). Information that consumers exchange through social media contains useful content for product improvement, new marketing strategies, and the promotion of sales (Haavisto, 2012; Idota, Bunno, & Tsuji, 2017). In other words, social media brings opportunities related to Customer Relationship Management (CRM) (Malthouse, Haenlein, Skiera, Wege, & Zhang, 2013). The so-called word-of-mouth communication in social media becomes an effective means to obtain potential customers, sales improvement, and improvements in brand image (Luo & Zhang, 2013; Hausmann, 2012). Regarding the latter, negative aspects, consumers hesitate to buy products referred to them by social media because of experiences of reading adverse reputations posted in social media, which causes Life Time Value (LTV) to become lower (Malthouse, et al., 2013). Therefore, social media are double-edged swords, but firms tend to endeavour to use social media positively to enhance their businesses.

C. Social media and product innovation

Firms are required to mobilize all managerial resources and networks to correspond to changes in consumer needs and the market and to achieve innovation. The innovation process in this context is postulated as follows: Firms perceive outside information on new technologies or shifts in consumer tastes, assimilate them with existing knowledge and resources inside the firm, and transform new information or knowledge into innovation (Zahra & George, 2002; Fosfuri & Tribo, 2008). Social media is also useful

Table 1.
Classification of social media

		Social presence / Media richness		
		Low	**Medium**	**High**
Self- presentation/ Self-disclosure	High	Blogs, Twitter	Social Networking Site (e.g., Facebook, Instagram)	Virtual social worlds (e.g., Second Life)
	Low	Cooperative projects (e.g., Wikipedia)	Content communities (e.g., YouTube),	Virtual game worlds (e.g., World of Warcraft)

Note; Twitter and Instagram are added by authors.

Source: Kaplan and Haenlein (2010), p. 62 and Twitter and Instagram are added by authors

for searching for leading users and online users in the innovation communities (Brem & Bilgram, 2015; Dong & Wu, 2015). ICT such as social media have been regarded as a tool that not only improves the productivity of firms but also enhances innovation. ICT greatly improves the ability to obtain and share information; it enables the identification of new findings from big data on a real time basis and facilitates the sharing of information among various related entities. These ICT's features lead to innovation, and have become one of the essential bases for promoting innovation (Dodgson, Gann, & Salter, 2006; Lee & Xia, 2006; Idota, et al., 2014). These are examples of ICT use inside the firm, while ICT also supports collaboration with entities outside the firm, such as other related firms, universities, local research institutions, and consumers. In these processes, ICT transmits a much larger volume of information at much faster speeds than face-to-face communications. The information networks thus constructed are referred to as open innovation (Chesbrough, 2003, 2006a, 2006b). In the open innovation process, a strategy for sharing information and resources with other firms located in any segment of the supply chain is required, since ICT can expedite information sharing related to innovation (Tsuji & Miyahara, 2010, 2011).

Particularly, social media have recently been introduced and utilized by a large number of firms. Inside the firm, blogs are used to transmit and share work-related information. Managers, for instance, send messages to their subordinates via social media, which function as a bulletin board for posting administrative reports, in-house rules, employee news, and so on. A working team needs to share specific information such as in a daily report on a project, customers, the market, and technology through social media. Social media can thus activate and enhance in-house communications. It is reported that even the simple use of social media among employees promotes innovation (Idota, et al., 2014, 2015). Moreover, social media can be used for obtaining useful consumer needs for product innovation and enable collaboration with entities outside the firm. As mentioned above, a large number of studies examining the roles of social media in business focus mainly on marketing and the sales force; they analyze how social media are utilized for advertising their products, sampling consumer needs, surveying the reputation of products, and so on (Noone, et al., 2011; Agnihotri, Kothandaraman, Kashyap, & Singh, 2012; Groza, Peterson, Sullivan, & Krishnan, 2012; Haavisto, 2012; Hausmann, 2012; Kate & Pavan, 2012; Rodriguez, et al., 2012; Schultz, Schwepker, & Good, 2012; Luo & Zhang, 2013; Malthouse, et al., 2013). Useful content for product improvement and new marketing strategies are contained in information that users exchange through social media (Haavisto, 2012). Moreover, firms can make contact with opinion leaders by identifying them from the sources of information exchanged in social media. People enable to exchange information through the various network communities based on social media, and thus social media is useful not only for connecting individual users to obtain their needs and ideas but also for groups of consumers in the network community. The latter concept of innovation is recently referred to as consumer collaborative innovation, and those consumers turn to be collaborators. Since the network community is essential for collaborative innovation, as many as members have to commit to collaborative innovation and for this it is important to connect opinion leaders in the community (Dong & Wu, 2015; Ogink & Dong, 2019; Pacauskas, et al., 2018).

Although most of the above studies focus on how to collect information on consumers and whether information is significant to product innovation, how those information affect innovation is also important, which is related to absorptive capacity of firms originated by Zahra & George (2002). For information to be shared and developed to ideas, domestic market and technological knowledge-processing capabilities (Cheng & Krumwiede, 2018), or social capital to share and discuss such as less organizational hierarchical barriers (Peltola & Mäkinen, 2014; Idota, et al., 2017) are required.

III. METHODOLOGY

A. Questionnaire survey and data

The analysis employs data obtained from the authors' mail surveys on "product innovation and social media use" and "business activities and social media" conducted in February 2014. The questionnaires were sent to 2,000 firms throughout Japan. The firms were selected from industries which are thought to be making use of social media, such as the automobile industry, apparel, electric machinery, consumer electronics, medicine, cosmetics, soap, detergent, beverages, food, telecommunications, software, restaurants, department stores, supermarkets, other retailing outlets, trading, wholesalers, travel agents, transportation (e.g., railways and airlines), construction, banking, brokers, insurance, and others. Among these industries, the number of firms which are successfully implementing the use of social media was not expected to be very large, and thus they were selected from previous surveys on the use of social media and marketing, innovation, and so on. The data contains listed and non-listed firms, and regional quotas were not considered. This study employs probit analysis, which enables the clarification of the above research questions.

Under these conditions, the former survey received 70 (3.5%) valid responses, and the latter received 89 (4.5%). Those two data sets were merged to form data from 46 firms. The summary of replies to specific questions is shown in Table 2. Regarding outcome variables such as "Achievement of product innovation in 2011–2013," if firms achieved the production of entirely new goods and services or they achieved improvements in existing commodities, then the value of the variable is 1, and if there was no such innovation, the value is 0. As for the question "Importance of social media in product innovation", the values 2, 1, and 0 were assigned to firms which responded *yes*, *not decided*, and *no*, respectively.

The characteristics of social media which influence innovation are based on the authors' previous studies (Idota, et al., 2014, 2015) and categorized into the following three groups: 1). Organizational management of social media use of firms; 2). Actions taken for new product development; and 3). Objectives of collaboration with consumers. The detailed questions of each category are shown in Table 3. The summary variables are constructed by assigning the numbers responded to a scale of one to five (Questions 1 and 3) or by adding the number of "yes" responses (Question 2). The aim of the summary variables is to represent the three categories of questions and then to reduce the number of variables.

B. Estimation result I: Full model

This study employs probit analysis, which enables the clarification of the relationships between innovation and the use of social media. As shown in Table 2, however, the number of samples is not sufficient for rigorous regression analysis, and accordingly the number of independent variables used in the estimation is limited. At first, a full model is examined which includes the three summary variables shown in Table 2 as independent variables, that is, the organizational management of the use of social media, actions taken for new product development, and collaborations with consumers, while the explained variable is "achievement of product innovation in the most recent three years." The estimation result is shown in Table 3. The first two variables, organizational management of social media use and actions taken for new product development, are significant, whereas the last variable related to collaboration with consumers, is not significant, implying that consumer collaboration innovation in general is not major force to promote product innovation.

In what follows, three specific models, which include individual questions consisting of three summary variables, are employed for the estimation.

C. Estimation result II: Selected models

1. Organizational management of social media use

Here, we examine how firms which have succeeded in product innovation recognize the use of social media in business. In this case, the

Table 2.
Descriptive statistics of responses to selected questions

Variables		Obs.	Mean	Std. Dev.	Min	Max
Achievement of product innovation in 2011-2013		34	0.735	0.448	0	1
Years of operation (ln); firm age		46	3.957	0.779	1.609	5.602
Capital (ln) (unit: Japanese Yen); firm size		46	6.941	2.842	2.230	14.29
Industry	Manufacturing	46	0.391	0.493	0	1
	Service	46	0.391	0.493	0	1
	Other	46	0.130	0.341	0	1
Importance of social media to product innovation		45	1.133	0.694	0	2
Summary of the following organizational management of social media use by firms		36	20.78	5.802	6	30
1. Organizational management of social media (scale of one to five)	1.1 Top management has recommended social media use	36	3.583	1.381	1	5
	1.2 Prior to using social media, it is important to consider the ideal situation for the brand across the departments.	36	4.167	1	1	5
	1.3 Employees are recommended to talk to consumers freely using social media	36	2.750	1.204	1	5
	1.4 Organizational culture of promoting the use of social media	36	2.972	1.253	1	5
	1.5 Each employee who is an information originator on social media considers that the brand represents the company	36	3.444	1.403	1	5
	1.6 The importance of building a relationship of trust with consumers through interactive exchanges on social media	36	3.861	1.125	1	5
Summary of the following actions taken for new product development		44	1.364	1.241	0	4
2. Actions taken for new product development (No=0, Yes = 1)	2.1 Ideas for product development are discovered by questionnaire and word of mouth	42	0.524	0.505	0	1
	2.2 Appointing persons in charge of product development who knead concepts of products based on discovered ideas.	42	0.571	0.501	0	1
	2.3 Trial parties or trail usage of a prototype are offered to consumers.	42	0.143	0.354	0	1
	2.4 Consumers soliciting friends, and holding of events and campaigns.	42	0.167	0.377	0	1
Summary of the following collaborations with consumers		40	22.57	6.488	7	33
3. Objectives of consumer collaboration innovation (scale of one to five)	3.1 Developing the concepts of goods and services	40	3.500	1.261	1	5
	3.2 Evaluating the concepts of goods and services	40	3.150	1.075	1	5
	3.3 Decision on the functions and contents of goods and services	40	3.375	1.030	1	5
	3.4 Decision on package design	40	2.775	1.050	1	5
	3.5 Decision on brand name	40	3.325	1.047	1	5
	3.6 Decision on sales price	39	2.692	1.104	1	5
	3.7 Proposal of method of use	40	3.375	1.079	1	5
	3.8 Proposal for easy maintenance in daily use	40	3.075	1.141	1	5
	3.9 Proposal for the method of disposal	39	3.026	1.088	1	5
	3.10 Evaluating PR projects and events	39	3.154	1.089	1	5
	3.11 Evaluation of characters in and talents of actors in advertisements or commercials	39	2.692	1.080	1	5

Note: The summary variable represents all questions included in each category

Table 3.
Estimation results of the full model

Independent variables	Coefficient	S. E.
Summary of social capital for social media use	0.701**	0.41
Summary of actions taken for new product development	2.620*	1.364
Summary of collaboration with consumers	-0.188	0.168
Years of operation (ln)	-2.866*	1.555
Capital (ln) (unit: Japanese Yen)	0.078	0.416
Manufacturing dummy	0.967	1.078
Constant	7.126	5.7
Observations	27	
Pseudo R-squared	0.626	
Log likelihood	-6.149	

Note: *** p<0.01, ** p<0.05, * p<0.1

explained variable is the same as in the previous estimations; "achievement of product innovation in the most recent three years," while the explanatory variables are constructed from the following six questions related to the importance of social media use by firms:

(1.1) top management has recommended social media use;

(1.2) prior to using social media, discuss the ideal situation of the brand in a cross-sectional way;

(1.3) employees are recommended to talk to consumers freely using social media;

(1.4) organizational culture of promoting the use of social media;

(1.5) each employee who is an information originator on social media considers that the brand represents the company; and

(1.6) the importance of building a relationship of trust with consumers by interactive exchanges through social media.

In addition to these questions, (1.) summary of the "organizational management of the use of social media by firms" is controlled, in which the above summed up six questions, namely 1.1 to 1.6, are included. Firm characteristics such as years of operation, industry, and size of firm are also controlled.

Regarding the results of the estimations shown in Table 4, the following variables are significant for "achievement of product innovation in the most recent three years": (1.) summary of the organizational management of the use of social media by firms (0.112, p=0.076); (1.1) top management has recommended social media use (0.420, p=0.094); and (1.6) "the importance of building a relationship of trust with consumers through interactive exchanges on social media (0.653, p=0.040)". In addition to these, Years of operation (ln) (-0.878, p=0.062; -0.803, p=0.099) is also significant. In sum, the factors found to be important for innovation are the leadership of top management and trust between firms and consumers. On the other hand, important factors of organizational management such as organizational culture to make use of social media, the popularity of social media among the firm, and recognition of brand image using social media are not significant, implying social media do not yet spread through the Japanese firms.

2. Actions taken for new product development

Here we analyse the kinds of activities innovative firms are engaged in. The explained variable is again "Achievement of product innovation in 2011–2013," while the explanatory variables are the selected actions taken for new product development indicated in Table 2 and firm characteristics such as years of operation, industry, and size of firm. The following variables are used for estimation based on the questions: (2.) "Summary of the actions taken for new product development," in which the summed up four questions from 2.1 to 2.5 in Table 2, and the following specific questions:

Table 4.
Organizational management of social media use for product innovation

Independent variables	(1)	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
1. Summary of organizational management of social media sue by firms	0.112*						
	(0.0631)						
1.1 Top management has recommended social media use		0.420*					
		(0.251)					
1.2 Prior to using social media, discuss the ideal situation of the brand in a cross-sectional way			0.731				
			(0.449)				
1.3 Employees are recommended to talk to consumers freely using social media				0.391			
				(0.293)			
1.4 Organizational culture of promoting the use of social media					0.499		
					(0.322)		
1.5 Each employee who is an information originator on social media considers that the brand represents the company						0.0920	
						(0.213)	
1.6 The importance of building a relationship of trust with consumers through interactive exchanges on social media							0.653**
							(0.318)
Years of operation (ln)	-0.687	-0.798	-0.878*	-0.803*	-0.648	-0.548	-0.602
	(0.469)	(0.540)	(0.471)	(0.487)	(0.494)	(0.411)	(0.407)
Capital (ln) (unit: Japanese Yen)	-0.0942	-0.0670	-0.0766	-0.140	-0.104	-0.120	-0.0782
	(0.182)	(0.185)	(0.180)	(0.171)	(0.184)	(0.156)	(0.182)
Manufacturing dummy	0.800	0.937	1.180	0.812	0.707	0.705	0.698
	(0.676)	(0.705)	(0.764)	(0.666)	(0.668)	(0.611)	(0.665)
Constant	1.184	2.229	0.830	3.126	2.037	2.730	0.476
	(2.481)	(2.375)	(2.725)	(2.250)	(2.391)	(2.359)	(2.543)
Observations	24	24	24	24	24	24	24
Pseudo R-squared	0.272	0.257	0.273	0.210	0.243	0.151	0.317
Log likelihood	-11.12	-11.35	-11.11	-12.07	-11.56	-12.97	-10.44
Note: Standard errors in parentheses							

*** p<0.01, ** p<0.05, * p<0.1

(2.1) Ideas of product development are discovered by questionnaire and word of mouth;

(2.2) Appointing persons in charge of product development who knead concepts of products based on discovered ideas;

(2.3) Trial parties or trail usage of a prototype are offered to consumers; and

(2.4) Consumers soliciting friends, and the holding of events and campaigns.

Following the estimation in the previous sub-section, one of the four variables is included in the estimation due to the small sample size.

The results are shown in Table 5, in which innovation activities of innovative firms by the use of social media, such as (2.) "Summary of actions taken for new product development" (1.098, p=0.029); (2.1) "finding ideas from word of mouth" (1.310, p=0.029); and (2.2) "elaboration of concepts by the person in charge of development" (2.315, p=0.017) are significant. In sum, the important factors are found to be the method of collecting ideas and the appointment of suitable personnel to guide ideas to innovation.

Table 5.
Actions taken for new product development

Independent variables	(2.)	(2.1)	(2.2)	(2.3)	(2.4)
2. Summary of the following actions taken for new product development	1.098**				
	(0.504)				
2.1 Ideas of product development are discovered by questionnaire and word of mouth		1.310*			
		(0.678)			
2.2 Appointing persons in charge of product development who knead concepts of products based on discovered ideas.			2.315**		
			(0.973)		
2.3 Trial parties or trail usage of a prototype are offered to consumers.				0.358	
				(0.784)	
2.4 Consumers soliciting friends, and the holding of events and campaigns.					0.318
					(0.867)
Years of operation (ln)	-1.042	-0.754	-1.007	-0.524	-0.496
	(0.808)	(0.533)	(0.843)	(0.384)	(0.387)
Capital (ln) (unit: Japanese Yen)	-0.188	-0.219	-0.171	-0.110	-0.114
	(0.215)	(0.186)	(0.251)	(0.144)	(0.144)
Manufacturing dummy	-6.394	-5.710	-7.013	-5.736	-5.623
	(704.3)	(468.2)	(389.8)	(757.4)	(585.0)
Service dummy	-7.067	-6.285	-7.750	-6.418	-6.311
	(704.3)	(468.2)	(389.8)	(757.4)	(585.0)
Constant	11.70	10.37	12.17	9.294	9.113
	(704.3)	(468.3)	(389.8)	(757.4)	(585.0)
Observations	30	30	30	30	30
Pseudo R-squared	0.457	0.271	0.458	0.154	0.152
Log likelihood	-9.954	-13.37	-9.934	-15.50	-15.54
Note: Standard errors in parentheses					

*** p<0.01, ** p<0.05, * p<0.1

The estimation results indicate that the importance of social media which collects ideas of new product development through questionnaire and word of mouth is shared inside the firm and specific personnel for collecting ideas are appointed, whereas the schemes of reaching large number of consumers by trial parties or campaigns are not taken yet.

3. Objectives of consumer collaboration innovation

This section, "objectives of consumer collaboration innovation" is analysed. As already shown by the analysis in the full model (5.3), the summary variable representing all questions included in this category is not significant, implying that the questions in this category do not influence innovation. It is worthwhile, however, to examine each question in this question in a simple way. Again, "achievement of product innovation in 2011–2013" is taken as the explained variable, while the explanatory variables are listed in Table 2, which are as follows in addition to (3.) Summary of the actions taken for new product development:

(3.1) Developing the concepts of goods and services;
(3.2) Evaluating the concepts of goods and services;
(3.3) Decision on the functions and contents of goods and services;
(3.4) Decision on package design;
(3.5) Decision on brand name;
(3.6) Decision on sales price;

Table 6.
Objectives of consumer collaboration innovation I

Independent variables	(3.)	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)
3. Summary of collaboration with consumers	0.101**					
	(0.0499)					
3.1 Developing the concepts of goods and services		0.814**				
		(0.343)				
3.2 Evaluating the concepts of goods and services			0.473*			
			(0.246)			
3.3 Decision on the functions and contents of goods and services				0.536*		
				(0.279)		
3.4 Decision on package design					0.451	
					(0.309)	
3.5 Decision on brand name						0.426
						(0.312)
Years of operation (ln)	-0.556	-0.617	-0.551	-0.491	-0.633	-0.587
	(0.485)	(0.516)	(0.481)	(0.438)	(0.458)	(0.430)
Capital (ln) (unit: Japanese Yen)	-0.0263	-0.0463	-0.0877	-0.00560	-0.0583	-0.0600
	(0.162)	(0.160)	(0.159)	(0.163)	(0.151)	(0.150)
Manufacturing dummy	-4.684	-4.413	-5.008	-4.853	-4.597	-5.384
	(687.2)	(688.3)	(491.7)	(612.4)	(697.2)	(1,181)
Service dummy	-5.637	-5.547	-5.826	-5.761	-5.522	-6.338
	(687.2)	(688.3)	(491.7)	(612.4)	(697.2)	(1,181)
Constant	5.761	5.583	7.054	6.048	7.072	7.846
	(687.2)	(688.3)	(491.7)	(612.4)	(697.2)	(1,181)
Observations	30	30	30	30	30	30
Pseudo R-squared	0.284	0.361	0.267	0.261	0.214	0.204
Log likelihood	-13.12	-11.72	-13.44	-13.55	-14.40	-14.59
Note: Standard errors in parentheses						

*** p<0.01, ** p<0.05, * p<0.1

(3.7) Proposal of method of use;
(3.8) Proposal for easy maintenance in daily use;
(3.9) Proposal for the method of disposal;
(3.10) Evaluating PR projects and events; and
(3.11) Evaluation of characters in and talents of actors in advertisements or commercials.

In the estimation, only one of the above variables is included in an equation. Other variables of firm characteristics, such as Years of operation, Capital (ln), Manufacturing, and Service industries, are controlled. The results of the estimation are shown in Tables 6 and 7, in which important matters in collaborating with consumers such as (3.) "Summary of collaboration with consumers" (0.101, p=0.043), (3.1) "developing concepts" (0.814, p=0.018), (3.2) "evaluating a concept draft" (0.473, p=0.055), (3.4) "determination of the functions and contents" (0.536, p=0.054), and (3.7) "devising methods of use" (0.777, p=0.033) are found to be significant. Although the summary variable representing all the questions in this category is not significant in the full model, it is significant in the selected model. In addition, collaboration in the forms of developing and evaluating the concepts of goods and services, deciding functions, and devising uses are effective for product innovation. These results indicate that all of objectives of social media use are not necessarily effective to product innovation. Further research is required to identify channels of how social media affect product innovation.

Table 7. Objectives of consumer collaboration innovation (Continued)

Independent variables	(3.6)	(3.7)	(3.8)	(3.9)	(3.10)	(3.11)
3.6 Decision on sales price	0.262					
	(0.25)					
3.7 Proposal of the method of use		0.777**				
		(0.365)				
3.8 Proposal for easy maintenance in daily use			0.139			
			(0.238)			
3.9 Proposal for the method of disposal				0.272		
				(0.27)		
3.10 Evaluating PR projects and events					0.542	
					(0.33)	
3.11 Evaluation of characters in and talents of actors in advertisements or commercials						0.236
						(0.282)
Years of operation (ln)	-0.514	-0.568	-0.503	-0.539	-0.601	-0.632
	(0.409)	(0.532)	(0.383)	(0.416)	(0.481)	(0.473)
Capital (ln) (unit: Japanesme Yen)	-0.0914	0.0137	-0.119	-0.113	-0.0822	-0.14
	(0.148)	(0.183)	(0.146)	(0.149)	(0.162)	(0.157)
Manufacturing dummy	-5.619	-4.401	-5.508	-5.551	-5.484	-5.508
	(481.3)	(1,019)	(589.4)	(659.4)	(719.9)	(663.6)
Service dummy	-6.463	-5.009	-6.263	-6.381	-6.382	-6.401
	(481.3)	(1,019)	(589.4)	(659.4)	(719.9)	(663.6)
Constant	8.286	4.855	8.657	8.54	7.636	9.217
	(481.3)	(1,019)	(589.5)	(659.4)	(719.9)	(663.6)
Observations	30	30	29	29	29	29
Pseudo R-squared	0.179	0.326	0.175	0.195	0.24	0.156
Log likelihood	-15.05	-12.36	-14.82	-14.45	-13.65	-15.16

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

IV. DISCUSSION

This study shows, among leading Japanese firms, how the use of social media stimulates new product innovation through collaboration with consumers. Those firms understand the value of social media as enabling collaboration with consumers in the process of product development and upgrading, and they also aim to collaborate with consumers closely to develop the concepts of new goods, evaluate draft concepts, determine the functions and contents of goods and services, and devise methods of use. In such firms, top management has recommended social media use and understands the importance of building a relationship of trust with consumers through interactive exchanges using social media. The results of this study are similar to the authors' previous research on Japanese firms (Idota, et al., 2014, 2015), although the objectives of social media are either speed of innovation or the promotion of sales, respectively. Therefore, together, these three papers become a comprehensive study on social media. One of findings is that social media use for new product innovation is not better diffused in general among Japanese firms than in other economies, which is common to most of ICT use. This is due to the Japanese management which places face-to-face communications on the first priority (Tsuji, Idota, & Bunno., 2015).

The results show that the recognition of the importance of social media is greater in the types of business which provide goods and services

for final consumers. However, the firms which achieve successful product innovation by positive use of social media are not conducting product development by consumer initiative, but by their own initiative in wishing to obtain ideas for product development through questionnaires, word of mouth, and so on. Employees in charge of development knead those ideas according to their own technology and know-how. In such firms, employees in charge of development place value on the consumer creation of the concepts of commodities by incorporating these into their own ideas as professionals in product development. Social media are therefore important for firms that have already established such an innovation process.

It is important to recognize that simply using social media is not sufficient to consumer collaborative innovation, but it is necessary to connect and participate actively in the network community, not to individual consumers. The network community has two merits for consumer collaborative innovation; one is to communicate and obtain other members' supports, and another is to connect or access to experts outside the community who own information related to innovation (Granovetter, 1973; Krackhardt, 1992). Japanese firms should connect not only to active individual members but also general members in the network community for new product development.

V. CONCLUSION

In this paper, the use of social media is found to be effective for innovation through the analysis of the results of a questionnaire survey. In addition, this paper also examines how firms recognize social media, and what kinds of activates they engage in when collaborating with consumers. Moreover, the fact that the use of social media plays an important role in the innovation process is clarified from the results of the analysis, despite the number of valid responses to the questionnaires being small.

From the analysis, the following tentative conclusions are demonstrated:

- Innovative firms which succeeded in product innovation highly evaluate the role of social media in the innovation process;
- Collaboration with consumers by the use of social media is important for innovation, particularly in developing concepts, and devising methods of use;
- Innovative firms which evaluate the use of social media place importance on a relationship of trust with consumers; and
- Innovative firms which use social media discover ideas from word of mouth, the person in charge of development later elaborating concepts.

Social media thus play an important role in product innovation. The cooperation of consumers via social media is also indispensable for effective social media use. This study mainly focuses on firms, but how consumers voluntarily participate in consumer collaboration innovation is another issue, that is, motivations of consumers, for example, also matter to new product innovation. Motivations which consist of intrinsic and extrinsic motivations for fame become significant to creating ideas for new product development. Monetary rewards may be required for all types of collaborative innovations, which is a topic to analyze for future study.

This study has some limitations. First, because of the web survey, this data may have biases since it does not cover people who do not use the Internet. Second, our data is restricted to Japan. Similar research in other countries will be required in the future to identify success factors of consumer innovation.

Social media has been thought as a strong tool to collect consumers or users needs in the large scale rapidly with small costs. On the other hand, new phenomena have been witnessed; firms have been shifting from using social media to establishing their own applications in the Internet to collect the consumers information. This is an interesting research question which will be analyzed within the same framework of this paper.

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