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THE EFFECT OF BROADCAST SEARCH AND IDEATION COMMUNITY CONTEST ON FIRMS' INNOVATION: THE MEDIATING ROLE OF RELATIONSHIP QUALITY

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Abstract:

In the modern business world, firms gain enormous success in innovation by using social media. This approach ostensibly reduces firms' cost by decreasing reliance on internal research and development. Organizations often use knowledge from other organizations and customers by using social media for innovation. Therefore, the purpose of this research is to explore the impacts of broadcast search and ideation community contest on innovation. Additionally, this study aims to narrow the gap by investigating the mediating role of relationship quality between the two dimensions of social media activities and innovation, respectively. Employing a sample of 393 manufacturing firms in Malaysia, our results confirm that the broadcast search and ideation community contest dimensions of social media activities are positively associated with relationship quality, but ideation community contest also impact on innovation. Further, the results provide evidence that relationship quality plays a mediating role between ideation community contest and innovation. The central arguments regarding social media activities and their relationship to innovation transcend national boundaries, and many of the policy recommendations are important for Malaysian manufacturing firms.

Keywords:

Social Media, Broadcast Search, Ideation Community Contest, Innovation, Relationship Quality, Malaysia

Introduction

The rapid growth of information technology and the Web 2.0 based communication system such as social media have revolutionized opportunities for organizations to interact with customers for ideas which can be used to enhance their innovative and creative capabilities. These may be utilized to develop innovative products or for new innovations (Palacios-Marqués et al., 2015; Scuotto et al., 2017). It is fundamental for organizations to innovate their products and services in view of reacting to the changing customer demands, and ways of life in order to capitalize prospects offered by the changing technology, marketplaces, and structures. Zahra and Covin (1994, p. 183) recommend that "Innovation is broadly considered as the backbone of corporate survival and development". Innovation can be performed in association with products, services, operations, techniques, and individuals (Baregheh et al., 2009).

In earlier years firms relied on innovation process to be competitive and to bring new product to the market (Chesbrough, 2006), without or very limited interaction with the external environment and consumers which is called the traditional process (Lichtenthaler & Ernst, 2008). In this traditional innovation model, the assumption was that the innovation processes need to be controlled by the firm and heavily depend on its internal R&D (Ramaswamy, 2008). However, in the modern innovation model organization rarely innovate alone. They gather idea and knowledge for innovation process from external source to sustain in competitive advantage in the current world (Ritala & Hurmelinna-Laukkanen, 2013), and that innovation is a result of interactive relationships among producers, users, and many other different institutions (Laursen & Salter, 2006). Due to rapid technological changes taking place, high R&D cost, and other factors of globalization, sticking to this traditional product development process can lead to loss of competitive advantage for a firm. On the other hand, embracing user interaction in the innovation model can result in important strategic innovations providing firms with competitive advantage (Prahalad & Ramaswamy, 2004; Orcik et al., 2013). Therefore, many firms in various industries are trying to build up a relationship with their customers and engaging them in product innovation processes to understand their needs (von Hippel, 2001). The most popular forms of customer engagement for product innovation is social media (Kaplan & Haenlein, 2010). Social media activities give entirely novel and useful customer interaction platforms where customers can share their needs and ideas in the product innovation process (Jussila et al., 2013). The challenge for an organization is to select appropriate and affordable social media platform (Palacios-Marqués et al., 2015). Which have not yet been tremendously explored as a result of the novelty of social media ideas and approaches, and the conceivable outcomes of social media are not completely comprehended with regards to innovation. Prior researchers have found that broadcast search and ideation community contest are significant platforms for interacting with external communities like customer, supplier, and business for innovation process (von Hippel, 2001; Laroche et al., 2012). However, adopting the social media platforms for innovation does not seem to be very easy. So, social media activities may provide customers with a platform that can effectively captivate the interests of users, the terrible word-of-mouth instigation can also put more risks to the reputation of the organization (Tripp & Gregoire, 2011). This is attributable to the belief that innovation is not a discrete event, but a result of the relationship quality existing between diverse actors (Puto et al., 2017). Several authors argue that customers have capabilities for creating and sharing idea that improve firms technical and economic innovation process. However, very few empirical studies were conducted to test, how social media activities dimensions are significantly related to product innovation in manufacturing firms. Therefore, based on Social Capital Theory, the primary purpose of this research is to examine the influence of social media platforms on innovation. Against this backdrop, the current research aims to methodically examine the

variables that were used to influence innovation, and how social media activities can be empowering processes for product innovation. Additionally, this study aims to narrow the gap by examining the mediating role of relationship quality between the two dimensions social media activities and innovation, respectively.

Literature Review

Innovation

As indicated by Thompson (1965) innovation is the generation, acknowledgment, and usage of innovative thoughts, and products unique to the firm and intended to benefit it and its partners. Likewise, West and Anderson (1996) comparatively characterize "innovation as the viable use of procedures and novel products to the organization and intended to advantage it and its partners" cited by Wong Tjosvold, and Liu (2009, p. 238). Then again, Kimberly (1981) characterizes innovation from a substitute perspective which handles different kinds of innovation. According to Kimberly (1981) innovation can be categorized into three forms. For example, innovation is a procedure; a discrete thing like products, plans or services; and innovation is the quality of firms. Therefore, in the present dynamic environment, innovation has been found to be one of the best inspirations in both public and private organizations to produce sustainable competitive advantage (Subramaniam & Youndt, 2005). According to Baregheh et al. (2009) innovation is now an inescapable factor for companies, which helps to improve and preserve a competitive advantage. Since 1990, the nature of innovation and the way it is observed have experienced significant changes. The source of innovation success has gone beyond a linear process of being productive in Research and Development (R&D), enlightening significant management practices, and bringing new high-quality products, service, technology, and procedures to the market. According to Gertler and Wolfe (2002) innovation through learning today is not exclusively dependent on the discovery of scientific knowledge or formal R&D activities but an interactive process with many feedback loops. Chesbrough (2006) discover that single firms are unable to effectively innovate in isolation. The learning processes nowadays evolve through interaction with a wide range of other organizations, to acquire ideas and resources, like suppliers, customers, competitors, universities, venture capitalists and government agencies in more or less open networks. The new concept of innovation is open thinking which is known as open innovation. The idea of open innovation creates companies to rethink their innovation management process. Based on open innovation theory, knowledge is no longer exploited just only from inside the company but also from outside of the companies' borders, as it is expected that this kind of purposive, inflows and outflows of the knowledge, technology, and resources will consequence in better innovation performance (van de Vrande et al., 2009). Open innovation thrives on the idea that external parties such as customers or users are sources of knowledge for firms (Walsh et al., 2016; Wang et al., 2015).

Social Capital Theory

Several scholars have conceptualized social capital as a strategic resource when companies establish associations with customers. Firms with good links with customers report better innovation activities through social relationships (Atuahene-Gima and Murray, 2007). Anderson et al. (2010, p. 121) defined social capital as a "networking platform of relationship where individuals capture resources which are generated by others or social units so that they can improve organizational effectiveness". Bagley and Hillyard (2014) defined social capital as the relationship between organizations and external institutions, which aids innovation, amongst others and reduce innovation costs tremendously (Lowitt et al., 2014; Eklinder-Frick et al., 2011).

Social capital exists on different dimensions, and that installed relationship between the central organization and their crucial partners who assume an essential role in the company's innovation is especially significant (Yli-Renko & Janakiraman, 2008). Different researchers, however, have embraced a more extensive meaning of social capital, in terms of the standards and qualities of the social relationship (Portes & Sensenbrenner, 1993). Thus, social capital incorporates numerous parts of a social setting, for example, social ties, trust in relations, and esteem frameworks that encourage activities of people situated inside that unique circumstance. Nahapiet and Ghoshal (2000) proposed three elements of social capital: structural (the general example of associations between actors), cognitive (those resources providing shared portrayals, understandings, and frameworks of significance), and relational (the sort of personal connections individuals have created with one another through a background marked by cooperation). The cognitive element of social capital alludes to the resources that give parties a common language, shared vision, interpretations, and systems of importance. In sum, Nahapiet and Ghoshal (2000) proposed that the relational dimension alludes to the individual, relational dimension refers to individual relationships created through a past filled with collaborations, i.e., the degree to which trust, and a standard correspondence exist between the parties.

Consistent with a relational perspective on favourable competitive position (Hitt et al., 2000), this study used the structural dimension and cognitive dimension as user interaction activities where individuals or groups of participants can share ideas, and knowledge for product innovation processes or develop new products. These activities have been identified as broadcast search and ideation community contest (Piller et al., 2011; Terwiesch & Xu, 2008). The relationship quality variable was developed from the relational dimension (Kühne et al., 2013; Chen et al., 2014). This examination helps fill the limitation in the literature by introducing these dimensions as customer interaction activities for sharing ideas, and knowledge for innovation activities (Piller et al., 2011), and how these dimensions in manufacturing firms are associated with its key customers that enables new knowledge for product innovation. This study contends that the measure of customer knowledge manufacturing firms will acquire from key customers relies upon social media activities. The dimension of social media activities is broadcast search, and ideation community contest. This study also expects that the quality of the relationship in terms of goodwill, trust, and reciprocity will accelerate innovation process by developing strong customer and firm's relationship (Lin & Chen, 2018).

Social Media

The development of social media has empowered firms with various business models and immense marketing strategies which can be used to improve interest forecasts, allowing new administration practices, learning and upgrading development, sharing of information, cooperation and communication (Aral et al., 2013; Bughin & Chui, 2013; Urquhart & Vaast, 2012), while developing new approaches and tools to connect with many aspects of the innovation system (Jha & Bose, 2016). Social media has indeed changed the traditional way of communication, collaboration and interaction with external environment (Carlson et al., 2018; Benitez et al., 2018) and its interactions with the innovation process (Papa et al., 2018; Lin et al., 2017).

Additionally, social media can positively affect firms' networking competencies and customer relationship management (Ghezzi et al., 2016). With these benefits, social media offers firms the possibility of collaborating with consumers, thereby enhancing consumer loyalty (Brodie

et al., 2013; Mount & Martinez, 2014). Through the social media platform, organizations are able to co-create value and collaborate with their users in product and co-development of products (Cheng & Krumwiede, 2018; Pohjola & Puusa, 2016). Using the process of active fan participation in diverse activities, new products can be developed, or existing products can be upgraded (Perlberg, 2015; Williams, 2017). Despite the usefulness of social media, there is a slightly different approach when using social media for core business and management purposes, such as innovation. This approach requires a useful platform. Many firms tend to perceive social media as an additional resource for product innovation, but they do not know how to measure its performance (Atanassova & Clark, 2015). In this regard, firms can utilize the interactive social media environment to obtain customers' feedback and insights, which can be a critical source for future innovations, as in product development (Rathore et al., 2016). Through the feedback, firms can then utilize social media as a strategic tool to improve firm performance, revenues, and their competitive edge (Aral & Weill, 2013; Oh et al., 2017). Kim and Ko (2012) classified social media activities into: entertainment, interaction, trendiness, customization, and word-of-mouth by connecting them to extravagant brands (e.g. Gucci, Burberry, Chanel, Louis Vuitton, Yves Saint Laurent, Tealive, etc.). Seo and Park (2018) has added the perceived risk to these five (5) social media marketing activities in the airline business. Bilgin (2018) has defined social media activities as entertainment, interaction, trendiness, advertisement and customization. However, Lee (2017) explained that the social media activities of companies can be classified into communication, giving information, support for everyday life, advancement and selling, and social reaction and action. Lee (2017) was investigating the significance of companies' social media activities which compared consumers and companies. In another study, Parveen et al. (2015) when examining organization performance, found that, social media can be categorised as advertising and promotion, branding, information search, building customer relations. Piller et al. (2011) identified social media activities as the lead user involvement, toolkits usage, broadcast search, and ideation community contest, when examining social media on the co-creation of innovation. They found a significant positive impact of social media activities on innovation. Keinz et al. (2012) used three activities for the innovation process - lead user involvement, crowdsourcing, and toolkits usage. They found a significant effect of these activities on innovation. Panagiotopoulos et al. (2017) use crowd capabilities to examine the value of social media data in evidence-base policy. In this research, social media activities have been considered as Broadcast Search, and Ideation Community Contest.

Broadcast Search and Innovation

Broadcast search is an idea generation or problem-solving process for innovation where organization broadcast defined problems or product they want to develop to potential solvers and invite participants who seem to be qualified to provide ideas in the form of an open call for solutions (Jeppesen & Lakhani, 2010; Corvello, 2013). Where other authors use the term crowdsourcing to describe the search for solution opportunities related to actual development tasks in the form of innovation (Afuah & Tucci, 2012; Lüttgens et al., 2014). Crowdsourcing is a method to provide a new source of productivity, innovation, and co-creation (Woodcock et al., 2017). However, Gegenhuber and Hrelja (2012) in their study on broadcast search in innovation contests stated that broadcast search is the leading way to generate excellent ideas. According to Mahr et al. (2010) idea generation and problem-solving using broadcast search processes are most different from traditional problem-solving methods as different types of solvers involved in this process. In their study, they found that the broadcast search process is suitable for an organization when they do not have more time to solve the problem. According to Lakhani (2006) the broadcast search is an economically efficient problem-solving mechanism as it is a low-cost solution seekers method compare to internal R&D cost. Several

authors have found that broadcast search for idea generation from external source is positively related to product innovation (Terjesen & Patel, 2017; Trantopoulos, 2017). According to Corvello (2013) broadcast search for innovation accelerates innovation processes because it exploits the knowledge and talent of a considerable number of individuals working outside the boundaries of an organization (Chesbrough, 2006). In this way organization predefined their innovation challenges to external actors (Jeppesen & Lakhani, 2010).

Based on the literature discussed above we identified the solver come in the solving process at the marginal position. Marginal solvers can give perspectives to solve the specific solution or development and if may novel and useful for generating solutions for these problems or develop a new product. Though this process may not always be successful as marginal solvers have limited access to relevant problem information, lack of resources, and isolation. However, Gegenhuber and Hrelja (2012) stated that the context of broadcast search is a potential advantage of marginality. They found that technical and social marginality are statistically related to problem-solving success in a broadcast search setting. Therefore, the further study still needs to empirically analysis to understand how broadcast search processes supported by social media activities for innovation process in the interaction of social relationship between customers and organizations. Therefore, this study examines the effect of broadcast search on innovation in the Malaysian manufacturing industry. Base on the above literature review, the following hypotheses are developed:

Hypothesis 1: Broadcast Search is a significant and positive impact on innovation.

Hypothesis 2: Broadcast Search is a significant and positive impact on relationship quality.

Ideation Community Contest and Innovation

Ideation community contest is being used to impact the early stage of the innovation process (Boudreau et al., 2011). In such a contest, organizations influence online communities to partake with thoughts regarding product improvement challenges, typically compensating the best submissions with financial rewards (Girotra et al., 2010). In this innovation, concept members are not only independently proposing ideas, but they also further develop ideas from other members (Ihl et al., 2012). Ideation community contest depicts a collective and dynamic conduct inside social innovation systems empowering and reaping the inventiveness of every one of its individuals to imagine crisp thoughts for the structure and advancement of new products, procedures, and administrations, or the improvement of existing ones. Basically, dependent on shared excitement and information concerning explicit product spaces and are frequently a virtual gathering place for imaginative users to examine openings and thoughts for new products and their improvement (Kozinets, 1999). According to Johann et al. (2004) ideation communities contest is a potential method for the innovation process, provided individuals are proficient and willing to add to virtual co-advancement. Piller et al. (2005) found that consumer joint efforts in innovation networks enable promising chances to produce an increasingly critical number of profitable thoughts through the fuse of customers' contemplations (thoughts) more rapidly and effectively than utilizing the conventional R&D approaches. In addition, firms that follow this methodology can exhibit a more effective administration of changing customers' needs by including them into the esteem creation process. Autio et al. (2013) found that users attract attention from their peers in the community by coming up with novel and innovative ideas and engaging in technical problem-solving. They observe a positive relationship between ideation community contest and new opportunities. Community members can discover new issues and related solutions and communicate these within the community. Franke and Shah (2003) investigated four independent sports networks and demonstrated that 33% of the community individuals improved or even planned their

product innovations for games gear. These innovations are not developed exclusively from individual endeavors but by joint efforts with other community individuals (Franke & Shah 2003).

Keinz et al. (2012) expressed that ideation community contest are casual, self-composed (online) systems of users that share data and information about the product of the central maker firm. Rather than contending, users organized within an ideation community contest every now and again communicate and work together around a product of shared interest. As opposed to progressive systems or different types of systems, sharing forms between individuals in ideation community contest are not founded on formal contracts but rather on "relational contracts" in the feeling of trust, shared standards and qualities, and general correspondence (Murray & O'Mahony, 2007). Backing to particular user pioneers from their friend community has been appeared to be an imperative achievement factor (Hienerth et al., 2011; Jeppesen & Frederiksen, 2006) as it takes into account aggregate innovation, that is, expanding on the arrangements of others (Murray & O'Mahony, 2007). Ideation community contest facilitate creative exercises in the ideation stage as well as in later phases of the innovation process (Raymond, 1999). Base on the above literature review, the following hypotheses are developed:

Hypothesis 3: Ideation Community Contest has a significant and positive impact on innovation.
Hypothesis 4: Ideation Community Contest has a significant and positive impact on relationship quality.

Relationship Quality and Innovation

Relationship quality spotlights on the level of suitability of a relationship to satisfy the necessities of the consumer associated with the relationship. Subsequently, relationship quality catches the positive/negative nature of a relationship, which thus gives positive advantages to the customer. For instance, relationship quality has been appeared to improve operational execution and developing new products (Fernandes & Pinto, 2019; Obal & Kannan-Narasimhan, 2016). Wagner and Sutter (2012) demonstrated that excellent customer relationships improve supplier-customer joint innovation execution. Relationship Quality is the quality of the relationship that depicts the degree to which the desires of parties engaged in the relationship are met (Sven, 2004; Fernandes & Pinto, 2019). Some literatures reveal that relationship quality is dependent on fulfilment and trust (Kühne et al., 2013; Chen et al., 2014). Thus, trust is an important element of relationship quality. Trusting relationships are vital in business associations, both between a business and its providers and between an organization and its customers. At the point when trust is built up among firms and their providers, firms are eager to request that providers collaborate during the time spent managing the innovation. Besides, firms with satisfied customers can effectively manage innovations on the off chance that they have superb relationships with such customers (Lin, & Chen, 2018).

Torkildsen (2012) noticed that quality relationships satisfy customers. To establish a superb relationship, organizations are urged by partners and customers to live up to their needs and desires organizations that can effectively address these issues get by rivalry. Relationship quality is the psychological component of social capital which reflects basic qualities, social network, and relationship competitive advantage (Kang & Na, 2018). Past investigations accentuated that increments in quality of relationship with community individuals contribute more than some other illustrative variable to improve organizations' innovation (Landry et al., 2002). Chiu et al. (2012) expressed that a trusted relationship leads to sharing and trading great quality learning for new improvement of the product. In aggregate, the quality of the relationship between an organization and its key customers ought to influence product

innovation since it gives control, increases common comprehension, enlivens trade forms, and energizes opportunity in return. The quality of a relationship between an organization and its vital customer is reflected in the degree to which the two parties create common objectives, standards, and proportional assumptions about the exchange (Nahapiet & Ghoshal, 2000). In the investigation of service quality and customer dedication Giovanis et al. (2015) found that relationship quality completely intercedes the service quality and customer loyalty relationship, while Keating et al. (2011) found that relationship quality partially mediates the relationship between service quality and customer loyalty interaction. In fact, several investigations have loaned support to this statement (Francisco-Maffezzolli et al., 2014; Fernandes & Pinto, 2019). Kim and Cha (2002) found that relationship quality influences the customer-employee relationship where a higher relationship quality between the employee and customer significantly influences service innovation. Base on the above literature review, the following hypotheses are developed:

Hypothesis 5: Relationship Quality has a significant and positive impact on innovation.

Hypothesis 6: Relationship Quality has the mediating role in the relationship between Broadcast Search and Innovation.

Hypothesis 7: Relationship Quality has the mediating role in the relationship between Ideation Community Contest and Innovation.

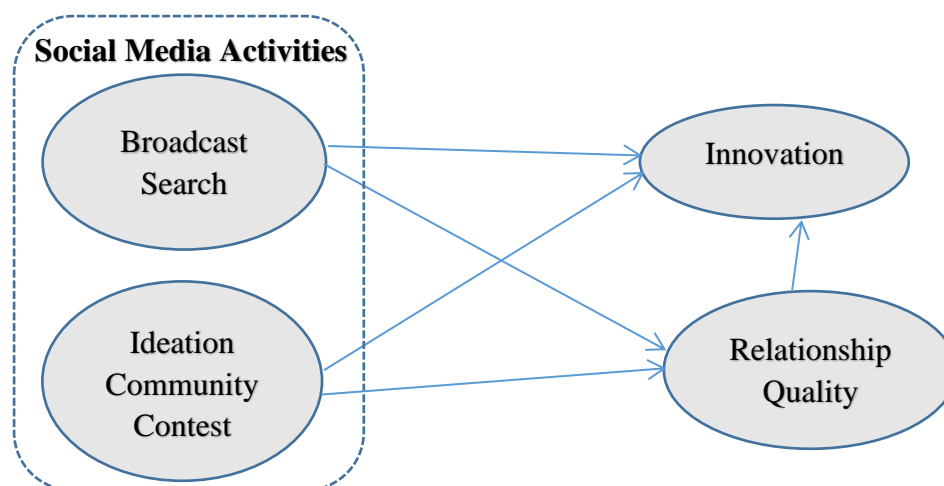


Figure 1: The Research Framework

Methodology

Sampling Method and Unit of Analysis Technic

We conducted a survey on 393 manufacturing firms located in Klang Valley, Malaysia. We focused on manufacturing firms, a significant economic contributor in Malaysia, because they have been thought to be most affected by key external relationships (van de Vrande et al., 2009). The population of this study comprised of employees (at least assistant managers, management team and/or owners) who are directly involved in the product operations and product development processes. The high-technology industry is chosen because it is appropriate for many reasons – it is knowledge-driven (Hatzichronoglou, 1997); its R&D expenditures, patents and new products play a role in innovative performance (OECD, 1997); and rapid changes in market and technological developments in this industry make knowledge acquisition in exchange relationship particularly salient (Shan et al., 1994). To confirm that the sample firms are involved in technology creation, we checked their business profile from the

Federation of Malaysian Manufactures (FMM) directory. A total 2,400 manufacturers, exporters and service companies' comprehensive profiles are listed in this directory. The manufacturing firms short-listed, through random, were contacted by telephone and after an initial inquiry, appointments were made for questionnaire distribution; and explanation was provided wherever needed. Each respondent represented one manufacturing firm. Therefore, we managed to a good response rate.

A pilot study has been conducted on 55 firms. The pilot data were entered into SPSS® v. 22 and analysed for reliability of measurements. The result of Cronbach's alpha for all the variables is above the .70 threshold, thus confirming reliability of the measurements used in this study. As indicated by Nunnally and Berstein (1994) Cronbach's alpha of more than 0.7 is sensibly solid. Therefore, the same measurements scales were used on the actual collected data. In total, 536 questionnaires were distributed by online and personally; 405 respondents were returned from various industries. A total of 393 usable responses, from 393 firms, were considered "clean" and used for data analysis. The response rate is 68.23%.

Measurement of Variables and Data Analysis Techniques

The concepts and measurement of broadcast search were developed based on the study conducted by Lakhani et al. (2007) and Lakhani (2006); for ideation community contest constructs were adopted from the study conducted by Laroche et al. (2012). Innovation was measured by using a five-items measurement scale, which was developed by Grawe et al. (2009). The measurement items for Relationship Quality constructs were adopted from well-established instruments in the previous study conducted by Chu et al. (2016) and Singh (2008). The final measurement items in *Appendix I*. All these scales were in a five-point Likert scale (1 = strongly disagree; 5 = strongly agree, where a rating of 3 = neutral). Respondents were approached to demonstrate their extent of agreement with proclamations regarding the broadcast search, ideation community contest, relationship quality and innovation process at their organization. The data collected for his study were analysed quantitatively. IBM SPSS® Statistics v.22 and Analysis of Moment Structures (AMOS) v.22 were used to run the relevant statistical tests. Finally, the bootstrapping procedure in AMOS has been utilized to test mediating effect (Hayes, 2009). The next section provides the results attained from analysing the data via hypotheses testing.

Results and Discussion

Demographic Profile of Respondents

Out of 393 respondents majority of the respondents were female (255 or 64.9%), in the age group of 31-40 years old (201 or 51.1%), holding a Bachelor degree (268 or 68.20%), were Senior Managers (182 or 46.30%), and were working in the electronics & electrical industry (132 or 33.6%).

Confirmatory Factor Analysis (CFA)

The initial model fit index for broadcast search, ideation community contest, innovation, and relationship quality showed that the model does not fit (CMIN/DF = 4.66; CFI = .812, which is lesser than .900; GFI = .757, which is lesser than .900; RMSEA = .090, which is more than .080). However, after removed weak items found in initial CFA analysis, a re-specified measurement model, as shown in Table 1 shows the model fit index for user broadcast search, ideation community contest, innovation, and relationship quality. All 25 items indicated acceptable fit as the CMIN/DF value changed to 1.787 and significant (which is lesser than

5.0; $p < .010$). The CFI and GFI values improved respectively (CFI = .942 and GFI = .909), while RMSEA reduced to .045.

Table 1: Confirmatory Factor Analysis

			Estimate	C.R.	R	P	Model Fit
Broadcast Search	<->	Ideation Contest	.095	6.173	.424	***	CMIN/DG = 1.787 P = .000 CFI = .942 GFI = .909 RMSEA = .045
Broadcast Search	<->	Relationship	.058	5.098	.376	***	
Broadcast Search	<->	Innovation	.053	4.626	.315	***	
Ideation Contest	<->	Relationship	.097	6.760	.576	***	
Ideation Contest	<->	Innovation	.095	6.610	.513	***	
Relationship	<->	Innovation	.065	5.905	.517	***	

Reliability and Validity

A reliability test was conducted to assess the items' internal degree of consistency and reliability in which case, Cronbach's alpha test was calculated for each of the items of broadcast search, ideation community contest, innovation, and relationship quality (Goforth, 2015). The reliability in Table 2 shows that the Cronbach's Alpha value of each variable is more than .700, demonstrating the reliability of the considerable number of scales as proposed by Hair et al. (2010).

We conducted convergent and discriminant validity tests of the constructs. As a result, shown in Table 2, Composite Reliability (CR) for all variables is greater than .700, and Average Variance Extraction (AVE) is higher than .500 which indicate the convergent validity of the variables (Hair et al., 2010).

Table 2: Reliability and Validity Analysis

Measurements	Number of Items	Cronbach's Alpha	CR	AVE
Broadcast Search	8	.857	0.858	0.531
Ideation Community Contest	8	.904	0.882	0.584
Relationship Quality	5	.847	0.794	0.562
Innovation	4	.833	0.834	0.503

Hypotheses Testing Using Structural Equation Modelling (SEM)

SEM is a multivariate statistical technique which was used to analyse structural relationships between the measured variables and latent constructs (Statistics-Solutions, 2017). The research model in Figure 2, is a composite model that was developed based on the hypothesis of this study. In this model broadcast search, and ideation community contest are the predictor variables and innovation the dependent variable while relationship quality is the mediating variable. The result of the model fit summary in Figure 2 shows the significant value of CMIN/DF of 1.787 ($p = .000 < .05$); while the remaining values supported a model that fitted well (CFI = .942; GFI = .909; RMSEA = .045). Hence, we can conclude that the model fits. Furthermore, Table 3 shows that broadcast search is nonsignificant impact on innovation ($r = .068, p = 0.262 > 0.050$), but significantly and positively related to relationship quality ($r = .160, p = 0.011 < 0.050$). On the other interactions, ideation community contest significantly and positively related to innovation and relationship quality ($r = .301, p = 0.000 < 0.050$) and ($r = .508, p = 0.000 < 0.050$), respectively. Table 3 also indicated that relationship quality is significantly and positively related to innovation ($r = .318, p = 0.000 < 0.050$). The results show

that four hypotheses (H1, H3, H4, & H5) are supported and one hypothesis (H2) is not supported.

Table 3: Hypothesis Testing

			Estimate	S.E.	C.R.	R	P
Relationship Quality	<---	Ideation Contest	.401	.061	6.570	.508	.000
Relationship Quality	<---	Broadcast Search	.120	.047	2.554	.160	.011
Innovation	<---	Relationship Quality	.350	.089	3.919	.318	.000
Innovation	<---	Ideation Contest	.261	.066	3.955	.301	.000
Innovation	<---	Broadcast Search	.056	.050	1.122	.068	.262

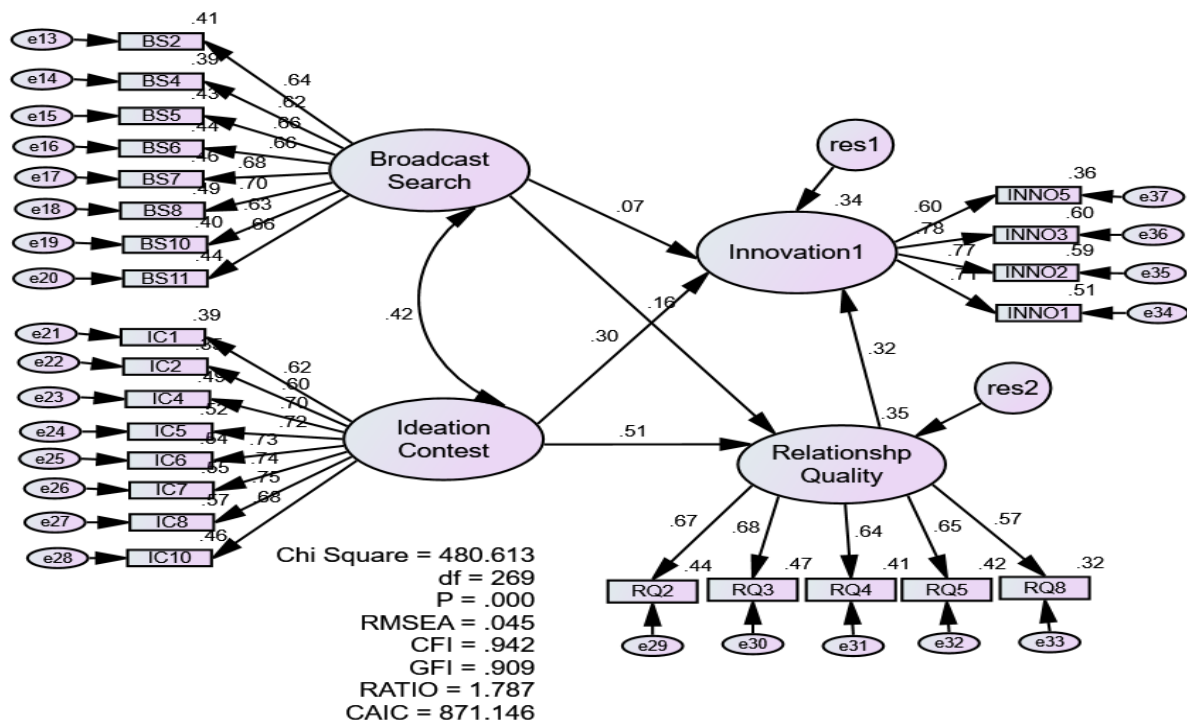


Figure 2: Structural Equation Modelling (SEM)

Mediating Effect

Table 4 displays the output of indirect effect of broadcast search and ideation community contest on innovation. As can be seen, the standardised coefficient for total effect (c) before entering the mediator (relationship quality) was not significant ($r = .068; p = .262 > 0.05$) for broadcast search, but it was significant for ideation community contest with ($r = .301; p = .000 < 0.05$). This means that the broadcast search does not influence innovation, but ideation community contest fully influence innovation. Furthermore, the result in Table 4 shows that when relationship quality acts as a mediator, the influence of broadcast search on innovation remains non-significant but increase to reach ($r = .244; p = .385 > 0.05$). On the other side, when relationship quality acts as a mediator, the influence of ideation community contest on innovation remains significant, but beta/r value reduces to ($r = .258; p = .000 < 0.05$).

Finally, on the indirect effects of broadcast search and ideation community contest, the bootstrapping procedure in AMOS was used and performed with, 5,000 resamples. Statistical significance for the indirect effect was determined from 99 percent bias and accelerated confidence intervals (Hayes, 2009). In this path it indicates that relationship quality does not

transmit ($r = .018$; $p = .108 > 0.05$) of the influence of broadcast search on innovation with 99 percent confidence. We can conclude that the indirect effect of relationship quality is not significantly different from zero at ($p = .108 > .05$). However, in this path it indicates that relationship quality does transmit ($r = .094$; $p = .000 < 0.05$) of the influence of ideation community contest on innovation with 99 percent confidence. We can conclude that the mediating effect of relationship quality is significantly different from zero at ($p = .000 < .05$). As predicted, the results lend no support to a mediation model since the total effect of broadcast search on innovation is not significant when controlling relationship quality, but the results lend support to a partial mediation model since the total effect of ideation community contest on innovation is attenuated slightly but remained significant when controlling the relationship quality. Therefore, hypothesis 6 is not supported and hypothesis 7 is supported.

Table 4: Testing Indirect Effects (Mediation Variables)

	Paths	Direct without Mediator (P)	Direct with Mediator (P)	Indirect (BC) P	Findings
Broadcast	→ Innovation	.068(.262)	.244(.385)	.018(.108)	No M
Ideation	→ Innovation	.301(.000)	.258(.000)	.094(.000)	Partial M

P: Probability, M: Mediation, BC: Bootstrap Confidence (Two Tailed Significance)

Discussion and Conclusion

This study aimed to understand and analyse the effect of broadcast search and ideation community contest on innovation and relationship quality. This research then analysed the effect of relationship quality on innovation. The main purpose of this study was to investigate the mediating role of relationship quality on the relationship among the independent variables and dependent variable. The findings of this study provided evidence showing the non-significant impact of broadcast search on innovation. As a result, it can be inferred that when the manufacturing organizations used the broadcast search for innovation, it did not lead to greater facilitation of innovation. This finding was different from previous findings where the role of broadcast search had played an important role in the innovation process (Jeppesen & Lakhani, 2010). However, broadcast search in the marginal social context, some insignificant effects had also been reported such as limited access to relevant problem-information, lack of idea or resources, and isolation (Jeppesen & Lakhani, 2010; Lakhani, 2006). The findings of this study had disclosed that Broadcast Search is not significantly associated with Innovation. This theoretical and empirical evidence derived from the current study implies that when Malaysian manufacturing firms use Broadcast Search activity for innovation process by collaborating with the customers, they seldom get an innovative idea. But broadcast search has found significant positive impact on relationship quality. As a result, it can be inferred that when organizations used broadcast search activity for customer interaction, it does lead to the greater facilitation of relationship quality (Frey et al., 2011).

However, the significant positive relationship of ideation community contest to innovation and relationship quality, respectively is supported by previous researches (Kärkkäinen et al., 2010; Piller et al., 2011; Groeger et al., 2016). The result indicated that when needed, organizations can use ideation community contest methods to engage customers in the innovation process (Aryobsei et al., 2012). Ideation community contest enable manufacturers to increase their innovation capability as well as reduce the uncertainty of customers' response to next-generation products (Piller et al., 2010). The findings from this study suggests that ideation community contest can be considered a valuable source of external opportunities for innovation (Zejniliovic et al., 2012). In the various manufacturing organizations, it is becoming increasingly popular to access customers' ideas for new product development (Bayus, 2013;

Ihl et al., 2012). Similarly, Piller and Walcher (2006) stated that ideation community contest is a potential platform for idea generation and new product development. Autio et al. (2013), found that users attract attention from their peers in the community by coming up with novel and innovative ideas and engaging in technical problem-solving. As a result, it can be inferred that when organizations use an ideation community contest activity for relationship building, it increases relationship quality. The findings of this investigation support the argument of Bullinger et al. (2010). In their research, they found that ideation community contest is a technical solution activity where an individual wants to generate novel concepts and ideas for the organization without expecting money for their contribution (Ebner et al., 2009). Similarly, Bjork et al. (2011) stated that ideation community contest is a type of competitive mechanism of a relationship strategy for fostering the customer innovation process. The findings indicated that by using an ideation community contest activity, an organization could build a stronger relationship with the customer (Antikainen et al., 2010). Therefore, the findings of this investigation demonstrate that there is a significant and positive association among ideation community contest and relationship quality.

In our study we hypothesized that relationship quality is positively related with product innovation. The findings of this investigation support the argument of Wagner and Sutter (2012) who demonstrated that high-quality customer connections develop supplier-customer joint innovation execution. A previous study's result described that maximizing the trust of corporate relationships tends to increase green service innovation (Landry et al., 2002). This result was also supported by previous researches that highlighted the importance of relationship quality for product innovation, particularly with key customers (Lin & Chen, 2018). Thus, relationship quality is the strength of customer relationship which significantly affects product innovation. Through high relationship quality, customers tend to take additional responsibilities to participate in the product innovation process. In a nutshell, the results of this research provide evidence on the significant effect of relationship quality on innovation. Our findings suggest a partial mediating effect of relationship quality on the relationship of ideation community contest and innovation (Giovanis et al., 2015; Chu et al., 2016; Lin & Chen, 2018). This finding is also supported by previous investigation by Lin and Chen (2018). The reason for this could be that there are other factors that have a bigger impact on product innovation (Hamidi & Gharneh, 2017; Chen et al., 2017).

Implication for Theory and Practice

There are practical and theoretical contributions from this study. First, this study reinforces the customer contribution in the firm's innovation process through the empirical investigation of broadcast search and ideation community contest. Both broadcast search and ideation community contest dimensions have significant effects on relationship quality and ideation community contest has significant impact on innovation as well. Second, the results confirm important implications for practitioners wanting to reap benefits from innovative products through ideation community contest. Third, this study brings to the fore the types of values garnered from broadcast search and ideation community contest. Moreover, this study empirically confirms the high-value ideation community contest can garner within the Malaysian context. Furthermore, this study's findings add to the literature of broadcast search and ideation community contest, innovation, and relationship quality within an emerging market setting. The fact that innovation is no longer a closed activity permeates the findings of this study. Embracing openness is one of the implicit implications of this study's findings, which is in line with the empirical outcome of another Malaysian study (Singh et al., 2016). This study highlights how a manufacturing firm can achieve appropriate value from their key customers and show the way for competitive advantage. However, this study creates awareness

about the importance of actively managing social capital to stimulate knowledge and build competitive advantage. These findings assist the operation manager by giving knowledge about their product innovation, firms growth and the potential in external knowledge.

Limitation and Future Research

Although this research provides numerous contributions, it still has some limitations. First, this investigation was limited to a particular area, and just the manufacturing organization in Malaysia was examined. Accordingly, the discoveries of this investigation may not be totally applicable and generalizable to other industries in the service sector. The manufacturing sector of high technology industries might be different from other low-technology manufacturing industries or service industries. Therefore, further study is necessary to verify and generalize these findings. Second, the data was collected from the firms only located in the Klang Valley area. Therefore, future studies could be conducted in other industries and other area settings.

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Appendix I

Broadcast Search:

- 1 *Broadcast search helps firms to collect new development ideas.
- 2 Firms can have a better understanding of the clients' needs and expectations.
- 3 *Sharing idea and knowledge improves firms' innovation efficiency.
- 4 Broadcast search is a highly efficient way to perform technical problem-solving.
- 5 Firms can use external sources of knowledge and technology when developing new products through broadcast searching.
- 6 Customers' feedback in the broadcast search leads to a chain of actions to produce the right products and/or services.
- 7 The broadcast is an economic exchange relation, both from firm to customer as well as from customer to customer relationship.
- 8 Customers can obtain favorable information about the firm's products from various sources via broadcast search.
- 9 *Broadcast search allows firms to gather information about customers' post-purchase behavior.
- 10 Customers' feedback via broadcast is a rich source of innovative idea.
- 11 Firms can create highly interactive platforms via broadcast search by updating product and/or services information daily.
- 12 *Firms can invite customers to exchange ideas regarding new product and/or service development from time to time.
- 13 *Increase in customer satisfaction in general, or as a direct result of a new product and/or service.
- 14 *Through broadcast search, firms are able to achieve Real-time customization of products and/or services.

Ideation Community Contest

- 1 If the firm wants to make changes to its equipment, the firm needs to know enough people who could help the firm do so.
- 2 When the firm encounters technical problems, the firm knows exactly who to ask for advice.
- 3 *The firm knows many users who have a thorough knowledge of the product and equipment.
- 4 The firm can find people who possess all of the abilities that the firm would require to make improvements to their product and equipment.
- 5 If the firm wants to make changes to its product and equipment, the firm could count on getting positive feedback about the changes from the fellow users.
- 6 The firm knows many users who are capable of repairing the equipment.
- 7 The firm has no difficulty in using the online community system.
- 8 The community contest helps to bring like-minded people together for product innovation.
- 9 *The community contest is useful for gathering various information about the products and/or services.
- 10 The community contest allows for direct user input or posting to the innovation process.
- 11 *Customers exchange information about the firm and the firm's products and/or services with the community.

Relationship Quality:

- 1 *Maintaining the relationship with this major user is our business' maximum effort.
- 2 The relationship with this major user is something our business really cares about.
- 3 The relationship with this major user is something our business intends to maintain indefinitely.
- 4 The relationship with this major user is very important to our business.
- 5 The relationship with this major user is something to which we are very committed.
- 6 *The major user is trustworthy.
- 7 *Our firm trusts that this major user keeps our best interests in mind.
- 8 This major user considers our welfare as well as its own when making important decisions.

Innovation:

- 1 New ideas are readily accepted in our firm's product and/or service development.
- 2 Our firm's top management gives special emphasis to product and/or service innovation.
- 3 Our firm constantly seeks new ways to better our product and/or service to our customers.
- 4 *Our firm is able to change/modify our current service approaches to meet customers' special requirements.
- 5 Compared to our competitors, our firm is able to come up with new product and service offerings.
**Week items has been removed from the final model test.*