

Case study on adoption of new technology for innovation

Perspective of institutional and corporate entrepreneurship

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Abstract

Purpose – This paper aims at investigating the role of institutional entrepreneurship and corporate entrepreneurship to cope with firm's impasses by adoption of the new technology ahead of other firms. Also, this paper elucidates the importance of own specific institutional and corporate entrepreneurship created from firm's norm.

Design/methodology/approach – The utilized research frame is as follows: first, perspective of studies on institutional and corporate entrepreneurship are performed using prior literature and preliminary references; second, analytical research frame was proposed; finally, phase-based cases are conducted so as to identify research objective.

Findings – Kumho Tire was the first tire manufacturer in the world to exploit the utilization of radio-frequency identification for passenger car's tire. Kumho Tire takes great satisfaction in lots of failures to develop the cutting edge technology using advanced information and communication technology cultivated by heterogeneous institution and corporate entrepreneurship.

Originality/value – The firm concentrated its resources into building the organization's communication process and enhancing the quality of its human resources from the early stages of their birth so as to create distinguishable corporate entrepreneurship.

Keywords RFID, Corporate entrepreneurship, Institutional entrepreneurship

Paper type Research paper

1. Introduction

Without the entrepreneur, invention and new knowledge possibly have lain dormant in the memory of persons or in the pages of literature. There is a Korean saying, "Even if the beads are too much, they become treasure after sewn". This implies importance of



entrepreneurship. In general, innovativeness and risk-taking are associated with entrepreneurial activity and, more importantly, are considered to be important attributes that impact the implementation of new knowledge pursuing.

Implementation of cutting edge technology ahead of other firms is an important mechanism for firms to achieve competitive advantage (Capon *et al.*, 1990; D'Aveni, 1994). Certainly, new product innovation continues to play a vital role in competitive business environment and is considered to be a key driver of firm performance, especially as a significant form of corporate entrepreneurship (Srivastava and Lee, 2005). Corporate entrepreneurship is critical success factor for a firm's survival, profitability and growth (Phan *et al.*, 2009).

The first-mover has identified innovativeness and risk-taking as important attributes of first movers. Lumpkin and Dess (1996) argued that proactiveness is a key entrepreneurial characteristic related to new technology adoption and product. This study aims to investigate the importance of corporate and institutional entrepreneurship through analyzing the K Tire's first adaptation of Radio-frequency identification (RFID) among the world tire manufacturers. Also, this paper can contribute to start ups' readiness for cultivating of corporate and institutional entrepreneurship from initial stage to grow and survive.

K Tire is the Korean company that, for the first time in the world, applied RFID to manufacturing passenger vehicle tires in 2013. Through such efforts, the company has built an innovation model that utilizes ICTs. The adoption of the technology distinguishes K Tire from other competitors, which usually rely on bar codes. None of the global tire manufacturers have applied the RFID technology to passenger vehicle tires. K Tire's decision to apply RFID to passenger vehicle tires for the first time in the global tire industry, despite the uncertainties associated with the adoption of innovative technologies, is being lauded as a successful case of innovation. In the global tire market, K Tire belongs to the second tier, rather than the leader group consisting of manufacturers with large market shares. Then, what led K Tire to apply RFID technology to the innovation of its manufacturing process? A company that adopts innovative technologies ahead of others, even if the company is a latecomer, demonstrates its distinguishing characteristics in terms of innovation. As such, this study was motivated by the following questions. With regard to the factors that facilitate innovation, first, what kind of the corporate and institutional situations that make a company more pursue innovation? Second, what are the technological situations? Third, how do the environmental situations affect innovation? A case study offers the benefit of a closer insight into the entrepreneurship frame of a specific company. This study has its frame work rooted in corporate entrepreneurship (Guth and Ginsberg, 1990; Shane and Venkataraman, 2000) and institutional entrepreneurship (Battilana, 2006; Fligstein, 1997; Rojas, 2010). As mentioned, we utilized qualitative research method (Yin, 2008). This paper is structured as follows. Section two presents the literature review, and section three present the methodology and a research case. Four and five presents discussion and conclusions and implications, respectively.

2. Theoretical review and analysis model

RFID technology is to be considered as not high technology; however, it is an entirely cutting edged skills when combined with automotive tire manufacturing. To examine why and how the firm behaves like the first movers, taking incomparable high risks to achieve aims unlike others, we review three kinds of prior literature. As firms move from stage to stage, they have to revamp innovative capabilities to survive and ceaseless stimulate growth.

2.1 Nature of corporate entrepreneurship

Before reviewing the corporate entrepreneurship, it is needed to understand what entrepreneurship is. To more understand the role that entrepreneurship plays in modern economy, one need refer to insights given by Schumpeter (1942) or Kirzner (1997). Schumpeter suggests that entrepreneurship is an engine of economic growth by utilization of new technologies. He also insists potential for serving to discipline firms in their struggle to survive gale of creative destruction. While Schumpeter argued principle of entrepreneurship, Kirzner explains the importance of opportunities. The disruptions generated by creative destruction are exploited by individuals who are alert enough to exploit the opportunities that arise (Kirzner, 1997; Shane and Venkataraman, 2000).

Commonly all these perspectives on entrepreneurship is an appreciation that the emergence of novelty is not an easy or predictable process. Based on literature review, we note that entrepreneurship is heterogeneous interests and seek “something new” associated with novel outcomes. Considering the literature review, we can observe that entrepreneurship is the belief in individual autonomy and discretion, and a mindset that locates agency in individuals for creating new activities (Meyer *et al.*, 1994; Jepperson and Meyer, 2001).

As a multi-dimensional phenomenon that depends more on the successful interaction among a number of activities than single factor, corporate entrepreneurship (CE) is important for a company’s survival, profitability and growth. CE refers to the process of firm’s renewal relates to phenomena (Guth and Ginsberg, 1990). Jennings and Lumpkin (1989) defined corporate entrepreneurship as the act of new products or new knowledge. Similarly numerous other scholars emphasized new product innovation as an important activity in corporate entrepreneurship (Covin and Miles, 1999; Shane and Venkataraman, 2000; Kuratko, 2007; Phan *et al.*, 2009). According to the Zahra’s (1991) definition, corporate entrepreneurship is a formal or informal activity aimed at creating values, in established firms through product and process innovations by using new technology. In the 1996, Zahra (1996) identified three factors of corporate entrepreneurship:

- (1) the firm’s commitment to innovation (including creation and introduction of products, emphasis on R&D investments and commitment to patenting);
- (2) the firm’s venturing activities, such as entry into new business fields by sponsoring new ventures and creating new businesses; and
- (3) strategic renewal efforts aimed at revitalizing the firm’s ability to compete.

These activities may take place at the firm, division, functional or project levels, with the unifying objective of improving the firm’s competitive position and financial performance. Firms can strive to create and nurture new values that have never existed before by utilization of corporate entrepreneurship – corporate entrepreneurship. Considering the prior literature, we summarized the corporate entrepreneurship as an important success factor:

- developing innovation an organizational tool;
- allowing the employees to propose ideas; and
- encouraging and nurturing the new knowledge (Hisrich, 1986; Kuratko, 2007).

Consistent with the above stream of research, our paper focuses on a firm’s new adaptation of RFID as a significant form of corporate entrepreneurial activity. Thus, CE refers to the activities a firm undertakes to stimulate innovation and encourage calculated risk taking throughout its operations. Considering prior literature reviews, we propose that corporate

entrepreneurship is the process by which individuals inside the organization pursuing opportunities without regards to the resources they control.

If a firm has corporate entrepreneurship, innovation (i.e. transformation of the existing firm, the birth of new business organization and innovation) happens. In sum, corporate entrepreneurship plays a role to pursue to be a first mover from a latecomer by encompassing the three phenomena.

2.2 Institution and institutional entrepreneurship

Most literature regarding entrepreneurship deals with the attribute of individual behavior. More recently, scholars have attended to the wider ecosystem that serves to reinforce risk-taking behavior. Institution and institutional entrepreneurship is one way to look at ecosystem that how individuals and groups attempt to try to become entrepreneurial activities and innovation.

Each organization has original norm and intangible rules. According to the suggestion by Scott (1995), institutions constrain behavior as a result of processes associated with institutional pillars. The question how actors within the organizations become motivated and enabled to transform the taken-for-granted structures has attracted substantial attention for institutionalist. To understand why some firms are more likely to seek innovation activities despite numerous difficulties and obstacles, we should take look at the institutional entrepreneurship.

The definition of institutions is variety. Concerning the definition of that, Hoffman's definition is commonly quoted. Hoffman (1999) argues that institution is defined as "rules, norms, and beliefs that describe reality for the organization, explaining what is and is not, what can be acted upon and what cannot". Each organization exists in a specific-environment of institutions that exert some degree of pressure on them. In other words, institutional environments contained by the elaboration of their rules to which workers must conform if they are to receive support and legitimacy (Scott, 1995). Scott (1995) argues that institutions influence behavior as a result of process associated with three institutional pillars:

- (1) the regulative, which induces worker's action through coercion and formal sanction;
- (2) the normative, which induces worker's action through norms of acceptability and ethics; and
- (3) the cognitive, which induces worker's action through categories and frames by which actors know and interpret their world.

North (1990) defines institutions as the humanly devised constraints that structure human action. Actors within some organization with sufficient resources have intend to look at them an opportunity to realize interests that they value highly (DiMaggio, 1988).

It opened institutional arguments to ideas from the co-evolving entrepreneurship literature (Aldrich and Fiol, 1994; Aldrich and Martinez, 2001). The core argument of the institutional entrepreneurship is mechanisms enabling force to motivate for actors to act difficult task based on norm, culture and shared value. The innovation, adopting RFID, a technology not verified in terms of its effectiveness for tires, can be influenced by the institution of the society.

A firm is the organizations. An organization is situated within an institution that has social and economic norms. Opportunity is important for entrepreneurship. The concept of institutional entrepreneurship refer to the activities of worker or actor who have new

opportunity to realize interest that they values highly (DiMaggio, 1988). DiMaggio (1988) argues that opportunity for institutional entrepreneurship will be “seen” and “exploited” by within workers and not others depending on their resources and interests respectively.

Despite that ambiguity for success was given, opportunity and motivation for entrepreneurs to act strategically, shape emerging institutional arrangements or standards to their interests (Fligstein and Mara-Drita, 1996; Garud *et al.*, 2002; Hargadon and Douglas, 2001; Maguire *et al.*, 2004).

Resource related to opportunity within institutional entrepreneurship include formal or informal authority and power (Battilana, 2006; Rojas, 2010). Maguire *et al.* (2004) suggest legitimacy as an important ingredient related to opportunity for institutional entrepreneurship. Some scholars suggest opportunity resources for institutional entrepreneurship as various aspects. For instance, Marquire and Hardy (2009) show that knowledge and expertise is more crucial resources. Social capital, including market leadership and social network, is importance resource related to opportunity (Garud *et al.*, 2002; Lawrence *et al.*, 2005; Townley, 2002). From a sociological perspective, change associated with entrepreneurship implies deviations from some norm (Garud and Karnøe, 2003).

Institutional entrepreneurship is therefore a concept that reintroduces agency, interests and power into institutional analyses of organizations. Based on the previous discussion, this study defines institution as three processes of network activity; coercion and formal sanction, normative and cognitive, to acquire the external knowledge from adopting common goals and rules inside an organization. It would be an interesting approach to look into a specific company to see whether it is proactive towards adopting ICTs (e.g. RFID) and innovation on the basis of such theoretical background.

2.3. Theoretical analysis frame

Companies innovate themselves in response to the challenges of the ever-changing markets and technologies, so as to ensure their survival and growth (Tushman and Anderson, 1986; Tidd and Bessant, 2009; Teece, 2014). As illustrated above, to achieve the purpose of this study, the researcher provides the following frames of analyses based on the theoretical background discussed above (Figure 1).

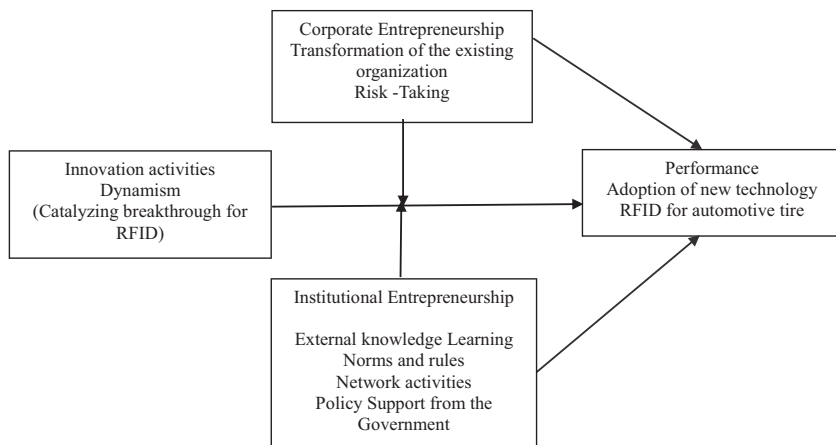


Figure 1.
Integrated frame of
analysis

3. Case study

3.1 Methodology

It is a highly complicated and tough task to analyze the long process of innovation at a company. In this paper, we used analytical approach rather than the problem-oriented method because the case is examined to find and understand what has happened and why. It is not necessary to identify problems or suggest solutions. Namely, this paper analyzes that “why K Tire becomes a first mover from a late comer through first adoption of RFID technology for automotive tire manufacture with regards to process and production innovations”.

To study the organizational characteristics such as corporate entrepreneurship, institutional entrepreneurship, innovation process of companies, the qualitative case study is the suitable method. This is because a case study is a useful method when verifying or expanding well-known theories or challenging a specific theory (Yin, 2008). This study seeks to state the frame of analysis established, based on previously established theories through a single case. K Tire was selected as the sample because it is the first global tire manufacturer, first mover to achieve innovation by developing and applying RFID.

The data for the case study were collected as follows. First, this study was conducted from April 2015 to the end of December 2015. Additional expanded data also were collected from September 12 to November 22, 2016, to pursue the goal of this paper. Coauthor worked for K Tire for more than 30 year, and currently serves as the CEO of an affiliate company. As such, we had the most hands-on knowledge and directed data in the process of adoption RFID. This makes this case study a form of participant observation (Yin, 2008). To secure data on institutional entrepreneurship, in-depth interviews were conducted with the vice president of K Tire. The required data were secured using e-mail, and the researchers accepted the interviewees' demand to keep certain sensitive matters confidential. The interviewees agreed to record the interview sessions. In this way, a 20-min interview data were secured for each interviewee. In addition, apart from the internal data of the subject company, other objective data were obtained by investigating various literatures published through the press.

3.2 Company overview

In September 1960, K Tire was established in South Korea as the name of Samyang Tire. In that time, the domestic automobile industry in Korea was at a primitive stage, as were auto motive parts industries like the tire industry. K Tire products 20 tires a day, depending on manual labor because of our backward technology and shortage of facilities.

The growth of K Tire was astonishment. Despite the 1974 oil shock and difficulties in procuring raw materials, K Tire managed to achieve remarkable growth. In 1976, K Tire became the leader in the tire sector and was listed on the Korea Stock Exchange. Songjung plant II was added in 1977. Receiving the grand prize of the Korea Quality Control Award in 1979, K Tire sharpened its corporate image with the public. The turmoil of political instability and feverish democratization in the 1980s worsened the business environment. K Tire also underwent labor-management struggles but succeeded in straightening out one issue after another. In the meantime, the company chalked up a total output of 50 million tires, broke ground for its Koksung plant and completed its proving ground in preparation for a new takeoff.

In the 1990s, K Tire expanded its research capability and founded technical research centers in the USA and the United Kingdom to establish a global R&D network. It also concentrated its capabilities in securing the foundation as a global brand, by building world-class R&D capabilities and production systems. Even in the 2000s, the company maintained

its growth as a global company through continued R&D efforts by securing its production and quality capabilities, supplying tires for new models to Mercedes, Benz, Volkswagen and other global auto manufacturers.

3.3 Implementation of radio-frequency identification technology

RFID is radio-frequency identification technology to recognize stored information by using a magnetic carrier wave. RFID tags can be either passive, active or battery-assisted passive (BAP). An active tag has an on-board battery and periodically transmits its ID signal. A BAP has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. However, to operate a passive tag, it must be illuminated with a power level roughly a thousand times stronger than for signal transmission. That makes a difference in interference and in exposure to radiation.

RFID tags contain at least two parts:

- (1) an integrated circuit for storing and processing information, modulating and demodulating a radio frequency signal, collecting DC power from the incident reader signal, and other specialized functions; and
- (2) an antenna for receiving and transmitting the signal.

The tag information is stored in a non-volatile memory. The RFID tag includes either fixed or programmable logic for processing the transmission and sensor data, respectively. The RFID characteristics is varieties:

- capable of recognizing information without contact;
- capable of recognizing information regardless of the direction;
- capable of reading and saving a large amount of data;
- requires less time to recognize information;
- can be designed or manufactured in accordance with the system or environmental requirements;
- capable of recognizing data unaffected by contamination or the environment;
- not easily damaged and cheaper to maintain, compared with the bar code system; and
- tags are reusable.

3.3.1 Phase 1. Background of exploitation of radio-frequency identification (2005-2010).

Despite rapid growth of K Tire since 1960, K Tire ranked at the 13th place in the global market (around 2 per cent of the global market share) as of 2012. To enlarge global market share is desperate homework. K Tire was indispensable to develop the discriminated technologies. When bar code system commonly used by the competitors, and the industry leaders, K Tire had a decision for adoption of RFID technology instead of bar code system for tires as a first mover strategy instead of a late comer with regard to manufacture tires for personal vehicle. In fact, K Tire met two kinds of hardship. Among the top 20, the second-tier companies with market shares of 1-2 per cent are immersed in fiercer competitions to advance their ranks. The fierceness of the competition is reflected in the fact that of the companies ranked between the 11th and 20th place, only two maintained their rank from 2013.

With the demand for stricter product quality control and manufacture history tracking expanding among the auto manufacturers, tire manufacturers have come to face the need to change their way of production and logistics management. Furthermore, a tire manufacturer cannot survive if it does not properly respond to the ever stricter and exacting demand for safe passenger vehicle tires of higher quality from customers and auto manufacturers. As mentioned above, K Tire became one of the top 10 companies in the global markets, recording fast growth until the early 2000. During this period, K Tire drew the attention of the global markets with a series of new technologies and innovative technologies through active R&D efforts. Of those new products, innovative products – such as ultra-high-performance tires – led the global markets and spurred the company's growth. However, into the 2010s, the propriety of the UHP tire technology was gradually lost, and the effect of the innovation grew weaker as the global leading companies stepped forward to take the reign in the markets. Subsequently, K Tire suffered from difficulties across its businesses, owing to the failure to develop follow-up innovative products or market-leading products, as well as the aggressive activities by the company's hardline labor union. Such difficulties pushed K Tire down to the 13th position in 2014, which sparked the dire need to bring about innovative changes within the company.

3.3.2 Phase 2. Ceaseless endeavor and its failure (2011-2012). K Tire developed a wide range of top-class technologies inside and outside of South Korea. As such, success and development capabilities are institutionalized inside the organization, which are the driving forces in the attempt for new innovations. In the course of deciding to adopt RFID and developing the technology, the institutionalized organizational culture allowed K Tire to overcome the fear of failure and attempt technical innovation. To be adopted of RFID for tires, five phenomena are solved:

- (1) *It needs to be lightweight:* An RFID tag attached inside a vehicle may adversely affect the weight balance of the tires. A heavier tag has greater adverse impact on the tire performance. Therefore, a tag needs to be as light as possible.
- (2) *It needs to be durable:* Passenger vehicle tires are exposed to extensive bending and stretching, as well as high levels of momentum, which may damage a tag, particularly causing damage to or even loss of the antenna section.
- (3) *It needs to maintain adhesiveness:* Tags are attached on the inner surface, which increase the possibility of the tags falling off from the surface while the vehicle is in motion.
- (4) *It needs to be resistant to high temperature and high pressure:* While going through the tire manufacture process, a tag is exposed to a high temperature of around 200°C and high pressure of around 30 bars. Therefore, a tag should maintain its physical integrity and function at such high pressure and temperature.
- (5) *It needs to be less costly:* A passenger vehicle tire is smaller, and therefore cheaper than truck/bus tires. As a result, an RFID tag places a greater burden on the production cost.

Uncountable tag prototypes, were applied to around 200 test tires in South Korea for actual driving tests. Around 150 prototypes were sent to extremely hot regions overseas for actual driving tests. However, the driving tests revealed damage to the antenna sections of the tags embedded in tires, as the tires reached the end of their wear life. Also, there was separation of the embedded tags from the rubber layers. This confirmed the risk of tire separation, resulting in the failure of the tag development attempt.

3.3.3 Phase 3. Success of adoption RFID (2013-2014). Despite the numerous difficulties and failures in the course of development, the company ultimately emerged successful, owing to its institutional entrepreneurship and corporate entrepreneurship the government's support. Owing to the government-led support project, K Tire resumed its RFID development efforts in 2011. This time, the company discarded the idea of the embedded-type tag, which was attempted during the first development. Instead, the company turned to attached-type tag. The initial stages were marked with numerous failures: the size of a tag was large at 20×70 mm, which had adverse impact on the rotation balance of the tires, and the attached area was too large, causing the attached sections to fall off as the tire stretched and bent. That was when all personnel from the technical, manufacturing, and logistics department participated in creating ideas to resolve the tag size and adhesiveness issues. Through cooperation across the different departments and repeated tests, K Tire successfully developed its RFID tag by coming up with new methods to minimize the tag size to its current size (9×45 mm), maintain adhesiveness and lower the tag price. Finally, K Tire was success the adoption RFID.

3.3.4 Phase 4. Establishment of the manufacture, logistics and marketing tracking system. Whenever subtle and problematic innovation difficulties arise, every worker and board member moves forward through networking and knowledge sharing within intra and external.

While a bar code is only capable of storing the information on the nationality, manufacturer and category of a product, an RFID tag is capable of storing a far wider scope of information: nationality, manufacturer, category, manufacturing date, machines used, lot number, size, color, quantity, date and place of delivery and recipient. In addition, while the data stored in a bar code cannot be revised or expanded once the code is generated, an RFID tag allows for revisions, additions and removal of data. As for the recognition capability, a bar code recognizes 95per cent of the data at the maximum temperature of 70°C . An RFID tag, on the other hand, recognizes 99.9 per cent of the data at 120°C .

K Tire, can construct its Manufacture, Logistics and Marketing Tracking System (MLMITS), which consists of infrastructures across various sections such as manufacture, logistics and marketing for the first time thanks to RFID adoption. The MLMITS receives and manages such information, which allows for sharing the information with others within the organization, as well as the customers. The MLMITS comprises four sections – manufacture, logistics and marketing – and the integrative server that integrates the three sections. The system for each section offers the following features:

- The manufacture and transportation information during the semi-finished product process before the shaping process is stored in the RFID tags, which is attached to the delivery equipment to be provided to the MLMITS;
- Logistics Products released from the manufacture process are stored in the warehouses, to be released and transported again to logistics centers inside and outside of South Korea. The RFID tags record the warehousing information, as the products are stored into the warehouses, as well as the release information as the products are released. The information is instantly delivered to the MLMITS;
- As a marketing, the RFID tags record the warehousing information of the products supplied and received by sales branches from the logistics centers, as well as the sales information of the products sold to consumers. The information is instantly delivered to the MLMITS; and
- As a role of integrative Server, MLM Integrative Server manages the overall information transmitted from the infrastructures for each section (production

information, inventory status and release information, product position and inventory information, consumer sales information, etc.).

The MLMTS provides the company with various systemic functions to integrate and manage such information: foolproof against manufacture process errors, manufacture history and quality tracking for each individual product, warehousing/releasing and inventory status control for each process, product position control between processes, real-time warehouse monitoring, release control and history information tracking across products of different sizes, as well as link/control of sales and customer information. To consumers, the system provides convenience services by providing production and quality information of the products, provision of the product history through full tracking in the case of a claim, as well as a tire pressure monitoring system:

“South Korea’s K Tire Co. Inc. has begun applying radio-frequency identification (RFID) system tags on: half-finished” tire since June 16. We are now using an IoT based production and distribution integrated management system to apply RFID system on our “half-finished products” the tire maker said, claiming this is a world-first in the industry. The technology will enable K Tire to manage products more efficiently than its competitors, according to the company. RFID allows access to information about a product’s location, storage and release history, as well as its inventory management (London, 22, 2015 Tire Business).

4. Discussions

Originally, aims of RFID adoption for passenger car “half-finished product” is to chase the front runners, Hankook Tire in Korea including global leading companies like Bridgestone, Michelin and Goodyear. In particular, Hankook Tire, established in 1941 has dominated domestic passenger tire market by using the first mover’s advantage. As a late comer, K Tire needs distinguishable innovation strategy which is RFID adoption for passenger car’s tire, “half-finished product” to overcome shortage of number of distribution channels. Adoption of RFID technology for passenger car’s tire has been known as infeasible methodologies according to explanation by Changmin Park, vice-CTO (chief technology officer) until K Tire’s success.

We lensed success factors as three perspectives; institutional entrepreneurship, corporate entrepreneurship and innovation. First, as a corporate entrepreneurship perspective, adopting innovative technologies having uncertainties accompanies by a certain risk of failure. Corporate entrepreneurship refers to firm’s effort that inculcate and promote innovation and risk taking throughout its operations (Burgelman, 1983; Guth and Ginsberg, 1990). K Tire’s success was made possible by overcome the uncountable difficulties based on shared value and norms (e.g. Fligstein and Mara-Drita, 1996; Garud *et al.*, 2002; Hargadon and Douglas, 2001; Maguire *et al.*, 2004).

An unsuccessful attempt at developing innovative technologies causes direct loss, as well as loss of the opportunity costs. This is why many companies try to avoid risks by adopting or following the leading companies’ technologies or the dominant technologies. Stimulating corporate entrepreneurship requires firms to acquire and use new knowledge to exploit emerging opportunities. This knowledge could be obtained by joining alliances, selectively hiring key personnel, changing the composition or decision-making processes of a company’s board of directors or investing in R&D activities. When the firm uses multiple sources of knowledge (Branzei and Vertinsky, 2006; Thornhill, 2006), some of these sources may complement one another, while others may substitute each other (Zahra and George, 2002). Boards also provide managers with appropriate incentives that better align their

interests with those of the firm. Given the findings, K Tire seeks new knowledge from external organizations through its discriminative corporate entrepreneurship.

When adopting the RFID system for its passenger vehicle tires, K Tire also had to develop new RFID tags suitable for the specific type of tire. The company's capabilities were limited by the surrounding conditions, which prevented the application of existing tire RFID tag technologies, such as certain issues with the tire manufacturing process, the characteristic of its tires and the price of RFID tags per tire. Taking risks and confronting challenges are made from board member's accountability. From the findings, we find that entrepreneurship leadership can be encouraged in case of within the accountability frame work.

Despite its status as a second-tier company, K Tire attempted to adopt the RFID system to its passenger vehicle tires, a feat not achieved even by the leading companies. Thus, the company ultimately built and settled the system through numerous trials and errors. Such success was made possible by the entrepreneurship of K Tire's management, who took the risk of failure inherent in adopting innovative technologies and confronting challenges head on.

Second, institutional entrepreneurship not only involves the "capacity to imagine alternative possibilities", it also requires the ability "to contextualize past habits and future projects within the contingencies of the moment" if existing institutions are to be transformed (Emirbayer and Mische, 1998). New technologies, the technical infrastructure, network activities to acquire the new knowledge, learning capabilities, creating a new organization such as Pioneer Lab and new rules to create new technologies are the features. To qualify as institutional entrepreneurs, individuals must break with existing rules and practices associated with the dominant institutional logic(s) and institutionalize the alternative rules, practices or logics they are championing (Garud and Karnøe, 2003; Battilana, 2006). K Tire established new organization, "Special lab" to obtain the know technology and information as CEO's direct sub-committees. Institutional entrepreneurship arise when actors, through their filed position, recognize the opportunity circumstance so called "norms" (Battilana *et al.*, 2009). To make up the deficit of technologies for RFID, knowledge stream among workers is more needed. Destruction of hierarch ranking system is proxy of the institutional entrepreneurship. Also, K Tire has peculiar norms. Namely, if one requires the further study such as degree course or non-degree course education services, grant systems operated via short screen process. Third, as innovation perspectives, before adopting the RFID system, the majority of K Tire's researchers insisted that the company use the bar code technology, which had been widely used by the competitors. Such decision was predicated on the prediction that RFID technology would see wider use in the future, as well as the expected effect coming from taking the leading position, with regard to the technology.

Finally, K Tire's adoption of the RFID technology cannot be understood without government support. The South Korean government has been implementing the "Verification and Dissemination Project for New u-IT Technologies" since 2008. Owing to policy support, K Tire can provide worker with educational service including oversea universities.

5. Conclusions and implications

To cope with various technological impasses, K Tire demonstrated the importance of institutional and corporate entrepreneurship. What a firm pursues more positive act for innovation is a research question.

Unlike firms, K Tire has strongly emphasized IT technology since establishment in 1960. To be promotion, every worker should get certification of IT sectors after recruiting. This has become the firm's norm. This norm was spontaneously embedded for firm's culture. K Tire has sought new ICT technology become a first mover. This norm can galvanize to take risk to catch up the first movers in view of institutional entrepreneurship.

That can be cultivated both by corporate entrepreneurship, referred to the activities a firm undertakes to stimulate innovation and encourage calculated risk taking throughout its operations within accountabilities and institutional entrepreneurship, referred to create its own peculiar norm. Contribution of our paper shows both importance of board members of directors in cultivating corporate entrepreneurship and importance of norm and rules in inducing institutional entrepreneurship.

In conclusion, many of them were skeptical about adopting RFID for its passenger vehicle tires at a time when even the global market and technology leaders were not risking such innovation, citing reasons such as risk of failure and development costs. However, enthusiasm and entrepreneurship across the organization towards technical innovation was achieved through the experience of developing leading technologies, as well as the resolve of the company's management and its institutional entrepreneurship, which resulted in the company's decision to adopt the RFID technology for small tires, a technology with unverified effects that had not been widely used in the markets. Introduction of new organization which "Special lab" is compelling example of institutional entrepreneurship. Also, to pursue RFID technology, board members unanimously agree to make new organization in the middle of failing and unpredictable success. This decision was possible since K Tire's cultivated norm which was to boost ICT technologies. In addition, at that time, board of director's behavior can be explained by corporate entrepreneurship.

From the findings, this paper also suggests importance of firms' visions or culture from startup stage because they can become a peculiar norm and become firm's institutional entrepreneurship. In much contemporary research, professionals and experts are identified as key institutional entrepreneurs, who rely on their legitimated claim to authoritative knowledge or particular issue domains. This case study shows that authoritative knowledge by using their peculiar norm, and culture as well as corporate entrepreneurship.

This paper has some limitations. Despite the fact that paper shows various fruitful findings, this study is not free from that our findings are limited to a single exploratory case study. Overcoming such limitation requires securing more samples, including the group of companies that attempt unprecedented innovations across various industries. In this paper, we can't release all findings through in-depth interview and face-to-face meetings because of promise for preventing the secret tissues.

Nevertheless, the contribution of this study lies in that it shows the importance of corporate entrepreneurship and institutional entrepreneurship for firm's innovative capabilities to grow ceaselessly.

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