Call for Paper

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Knowledge Management Research and Practice (KMRP) provides an outlet for high-quality, peer-reviewed articles on all aspects of managing knowledge, from the organisational level to that of the individual, nation or profession. The journal places a particular emphasis on cross-disciplinary approaches, and on the mixing of "hard" (e.g. technological) and "soft" (e.g. cultural or motivational) issues. Rigorous contributions from both academics and practitioners are welcomed.

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Articles may be empirical research papers, theoretical papers, conceptual papers, case studies or surveys.

Special Issue on: *'Knowledge Management in The 4th industrial Revolution"*

Guest Editors

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As the appearance of the 4th industrial revolution, open innovation, and Knowledge Corporation which are based on ICT technologies become new trends in the new economy. So, this special issue focuses on open innovation, Knowledge Corporation, and open business models in the 4th industrial revolution.

Subject Coverage

Suitable topics include but are not limited to:

- Open innovation and Knowledge Corporation
- Knowledge Management, digital attitude, and the 4th industrial revolution
- Open Business Model

Important Dates and Importance notice

In advance selection of 13 papers; January 18th, 2018
SOItmC 2018 special issue of KMRP Set-up; May 30th, 2018
SOItmC 2018 special issue of KMRP Deadline for submission: 31th August 2018
Completion of first review round: 31th September 2018; 5 papers will be rejected
Deadline for revised manuscripts: 31th October 2018; accepted 8 papers should be revised
Completion of second review round: 30th November 2018
Publishing 10 December 2018

Editors and Notes

Manuscripts and all editorial correspondence should be addressed to: Pro.Giovanni Schiuma(g.schiuma@arts.ac.uk),
Editor-in-Chief, Knowledge Management Research and Practice, University of Basilicata and Vice Mayor of Matera City, Italy(E-mail: journals@theorsociety.com).

Invited Submissions to the Special Issue

The following selected research papers are invited to the special issue by guest editors. Among these 8 papers will be selected finally.

Special Issue Paper List (13 papers)

No.	Paper Title	Authors (** corre. author)	First or Corresponding Author's Affiliation & Email
1	Digital attitude of startups: Evidence from Italy	Piera Centobelli**, Roberto Cerchione, Emilio Esposito, Renato Passaro, Ivana Quinto	Piera Centobelli**
2	Influence of Innovative and Knowledge Intensive Environment to Development of Managerial Competences	Nikitina,T., Lapina,I.	Nikitina, T.
3	Human Capital Development for Innovation driven Economy and Regional Development: A Cross-region Study	Linya Hong, and Fabian J. Froese	Linya Hong,
4	The global M&A and the development of IC industry ecosystem in China: What can we learn from the case of Tsinghua Unigroup?	Jinxi Wu, Yunhao Feng, Peng He	Jinxi Wu
5	Does open innovation motivate serial entrepreneurs?	JinHyo Joseph Yun**, MinHwa Lee*, KyungBae Park & Xiaofei Zhao	JinHyo Joseph Yun**, MinHwa Lee*
6	Model of technology selection for international science and technology cooperation	Woon-Dong Yeo, GyeongRan Noh, ChangHwan Lee & DongKyu Won	DongKyu Won
7	Open Innovation in the Early Development of Chaebol Conglomerates in Korea: Implications at the Intersection of Business & Culture	Ogan Gurel	Ogan Gurel
8	Towards increasing affective	LAra Agostini**,	LAra Agostini**

	commitment of partners in SME strategic networks	Anna Nosella Karen Venturini	
9	A Methodology for analyzing the Resource-Stakeholder Relationships based on Start-ups Business Process Log Data	Sanghyun Sung, Changlim Joo, Junghyun Yoon**	Junghyun Yoon**
10	Survival factors in the valley of death: Inside views of innovation and behavioral perspectives	Joo Y. Park & Chang Soo Sung**	Chang Soo Sung**
11	Comparing Disjointed and Concentrated Policy Knowledge Ecosystem as a Natural Experiment: Separating Two Different Central Government Complexes from Two Different Cities of South Korea	Kwangho Jung & Eunhyeong Park	Kwangho Jung
12	Serial analysis of the effect of collaboration on new drug development in Korea	Jihyun Park & Heyoung Yang**	Heyoung Yang**
13	Does being part of geographical clusters matter in fostering the crowdfunding of innovative start-ups? An explorative study	Nunzia Carbonara**, Niccolo Riccardi	Nunzia Carbonara**

1.

Digital attitude of startups: Evidence from Italy

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Abstract

Purpose/ Research Question:
The paper has a dual aim. Firstly, to identify an exhaustive taxonomy of digital technologies used by startups, evaluating how intensively they are used, and secondly, to propose a taxonomy of startup strategies addressing the processes of digital transformation. On the base of the analysis of the literature two research questions (RQs) were identified and addressed through an empirical investigation carried out in a sample of 6178 Italian firms listed in the *Register of Innovative Startups*. The first RQ concerns the degree of adoption of digital technologies by startups. The second RQ regards the relationship between the different categories of digital technologies adopted.

Key Literature Reviews (About 3~5 papers): Nowadays, the global environment and digitalization provide a growing number of opportunities for companies in terms of information and communication technologies (ICTs) (Querbes, 2017). Some of these solutions are cheap, very common, and may be also very easy to be implemented. Therefore, in new and dynamic markets, startups should often be the first who identify and explore these opportunities (Hitt et al., 2001). Moreover, the rapid development of new technological solutions to support business processes requires the appropriate skills and specialized resources to select the most suitable technologies (Yun et al., 2016).The way how businesses leverage digital technology to create value is of prime interest in the scientific community (Wheeler, 2002; Yoo et al., 2010; Kilkki et al., 2016). Specifically, it is important to analyze if and how these technologies allow startups to implement differentiation strategies and promote their business exploiting market opportunities. The social media belong to this category of technologies. Social media are an inseparable part of modern life, and the influence and popularity they have in modern society is beyond dispute. Even if they did not exist twenty years ago, they have become one of the most important means of communication of the modern era. They do not serve only for the communication between two individuals. With possibilities such posts on the dashboard, status updates, live streams or shared pictures and links, people managed to address a wide spectrum of users and engage in public communication (Vondra, 2015). Nowadays they represent an important business channel for large firms, SMEs and startups (Schiuma, 2017)for different scopes, such as new product development (Bashir et al., 2017), innovation of existing products or processes, analysis of market and customer needs and satisfaction (Dotsika and Watkins, 2017; Ogink and Dong, 2017).
On the other hand, the variety of technologies, instruments, applications, and information technologies solutions available in the digital economy era offers a wide range of opportunities for companies and startups (Della Corte et al., 2015). Therefore, some of these digital solutions may be challenging to be implemented on the technical level (Hamburg and Rehfeld, 2002).
Digital tools, such as business analytics and customer management systems (CMS), as well as the choice of an appropriate web-server require advanced technical skills to be implemented compared with social media. Nevertheless, even if their contribution is not immediately evident, they represent the solid technological ground for a long-term business. With these premises, we identified two set of ICTs: "*Social Media"* and "*Digital Tools*". Social Media are defined as a set of Internet-based applications that let individuals to create, share and exchange the so-

called User Generated Content (Kaplan and Haenlein, 2010). Digital tools represent the technical infrastructures which enable the functioning and the integration of the startups' Internet-based applications and media.

Design/ Methodology/ Approach: A web-based document analysis methodology has been used to investigate the degree of adoption of digital technologies in a sample of Italian startups.As the web is becoming a critical tool for the dissemination of startup strategies there is a growing amount of research on the world wide web. The research conducted among the startups is based on a systematic approach. A comprehensive review and content analysis was carried out using the information available on the websites of the firms analysed. To have a more comprehensive picture of each individual startup investigated, information from additional sources (e.g. company reporting, industry reports, industry magazines) were collected and analysed. The websites and the complementary sources were analysed for the presence of information related to the adoption of specific digital technologies supporting the startup in the process of digital transformation.
The web-based document analysis has been conducted through the following six steps:

1) *Document search* (Labuschagne, 2003; Zhang and Wildemuth, 2005), in which startup websites and other relevant sources (e.g. company reporting, industry reports, industry magazines) are identified using key words in various search engines, websites and databases
2) *Document selection* (Labuschagne, 2003; Zhang and Wildemuth, 2005), in which the materials of interest are selected in parallel by two researchers and collected in a document management system including a folder for each startup
3) *Manual analysis* (Hsieh and Shannon, 2005; Bowen, 2009), in which the two researchers have conducted the conventional analysis described by Hsieh and Shannon (2005) to analyze in-depth the materials of interest selected. In this phase a database has been created to identify for each firm a preliminary list of individual aims, practices and technological systems adopted
4) *Computer-assisted analysis* (Laender et al., 2002; Zhang and Wildemuth, 2005), in which each material of interest is further analyzed to code frequency of keywords represented by the individual digital technologies identified by cross-examining information using query functions for web mining and knowledge discovery
5) *Confirmation analysis* (Angers and Machtmes, 2005; Bowen, 2009), in which the triangulated findings are confirmed and/or supplemented by an interview carried out by telephone or videoconference to ensure the reliability of results
6) *Triangulation of findings* (Patton, 1990; Eisner, 1991; Angers and Machtmes, 2005; Bowen, 2009), in which the results provided by manual analysis (step 3), computer-assisted analysis (step 4), and confirmation analysis (step 5) are validated through cross verification

(Expected) Findings/Results: By considering the level of the adoption of social media and digital infrastructure we expect to set up an interpretative framework aimed to analyse the digital attitude of Italian startup. We map the degree of coherence between the adoption of the two above elements to categorize four digital attitude profiles of startups: guidepost, exploiter, explorer, and latecomer.
The Guidepost is a startup with a perception of the strategic value of digital transformation and that explores the potential of social media and digital infrastructure, intensively exploiting them. Guidepost startups invest coherently both in social media and in digital tools.
The Exploiter is a startup that intensively exploits the social media and tools at its disposal, although it has yet to become aware of the importance of investing resources in the digital tools.
The Explorer is a startup that, despite investing in digital tools, it is not still able to fully exploit these tools through the social media.
The Latecomer is a startup that is still unaware of the strategic value of digital technologies and still does not have the resources necessary to be competitive in the field of digital transformation.
Thus, we intend that a digital coherent attitude is that of guidepost and latecomer startup profile. While the others show an asymmetric behavior respect to the adoption of digital tools and social media.
We expect that these profile categories, can be affected by the different industry-specific factors (e.g., technology, products, competitive pressures) and firm specific factors (e.g., age, team composition, potential innovation capability). Moreover, we suppose that startups operating in high tech or digital oriented industries show a more coherent and advanced digital attitude; while startups in mid-tech industries or less oriented toward digital tech show a lagging behavior or an incoherent attitude.
Moreover, this analysis allows us to identify possible virtuous startups able to adopt a coherent mix of digital tools and social media even though they operate in traditional or mid-tech industries.

Research limitations/ Implications: The paper presents first results of an explorative research. The first limit is that

the paper does not provide evidence about the impact of the digital attitude on the startups performances. This depends on the lack of appropriate (not solely economic) data able to evaluate the proper startup performance.
Moreover, the peculiarities of Italian context and the considerable differences among startups impact negatively on the generalizability of our results. Notwithstanding, some of our conclusions are coherent with the other few seminal researches on startups. To address these limitations, additional longitudinal analyses are necessary.
As for possible implications the results can be useful from both a theoretical and practical perspectives. From one side we provide an interpretative framework to analyze the digital attitude of startup and their evolutionary path. From the other side, this analysis aspires to provide some guidelines for startups that want to reinforce their digital attitude making more coherent the digital tool-social media mix. As far as the degree of adoption of digital technologies, the paper highlights that startups are not a homogeneous world but there are a variety of approaches and behaviors. The paper identifies three groups of startups that seem to point out the stages of the process of adoption of digital technologies: *Introduction*, startups that deal with the process of digital transformation exploiting practices and tools that already know; *Growth*, startups that adopt specialist technologies acquiring new organizational and managerial competence in the field of digital transformation; *Maturity*, startups that invest in new technology and that acquire new technological competence in the field of digital transformation.

Keywords: digital attitude, digitalization, digital transformation, start-up, social media, technology management

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2.

Influence of Innovative and Knowledge Intensive Environment to Development of Managerial Competences

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Abstract

Purpose/ Research Question:

Managerial professional competences directly related to external environment (Lapiņa and Aramina, 2011; Guðmundsson, 2012; Uroševic and Grahova, 2014; Lapiņa et al. 2015; Derwik et al. 2016; Nikitina and Lapiņa, 2017) and traditionally considered as a set of knowledge and abilities of an individual applied in practice (Spencer and Spencer, 1993). Oxford dictionary describes a manger's role as a "person responsible for controlling or administering an organization or group of staff". At the same time, the concept of individual competencies is linked to the idea about organizational competences. More than 2 decades ago Prahalad and Hamel proposed their concept of core competences of organization, where suggested to understand essence of the phenomenon as "collective learning of the organization" (Prahalad and Hamel, 1993).

As competences are subject for continuous adjustments due to changes in external environment, necessity to lead teams that are diversified in terms of locations and disciplines (Wiek et al. 2011; Guðmundsson, 2012; Urošević and Grahova, 2014; Silvius, 2016; Derwik et al. 2016). Organizations during the Digital Age became more technologically sophisticated, however a corner stone of the organizations success are its human resource abilities and skills (Schiuma, 2017). Then it is logically to propose that organization acts proactively to harmonize HR skills and technologies seeking protection of its interests. Over the globe organizations undertake number of initiatives to assess, share and create new knowledge of their members, i.e. undertakes knowledge management (KM) practices (Denford et al. 2011; Bettiol et al. 2016; Rosha and Lace, 2016; Zieba et al. 2017). The issue became more and more important due to increase in number of Knowledge Intensive Business Service (KIBS) organization, its role in employment (Schricke et al. 2007; Corrocher et al. 2013; OECD, 2017) and stakeholders' orientation towards creation of knowledge society (EU Commission, 2008; International Labour Office (ILO), 2010; Carrillo, 2015; Nikitina and Lapiņa, 2017). Hereafter aim of the research is to recognize what competences are required for a manager nowadays to lead teams in knowledge intensive companies and what instruments might be applied to support these knowledge assets.

Key Literature Reviews:

Literature review reveals that many researchers emphasized ability for communication, negotiation and establishment of relationship with different stakeholders as a soft skills corner stone for managers in last decades (Ingason and Jónasson, 2009; Wiek et al. 2011; Silvius, 2016; Derwik et al. 2016). In the previous studies were discovered that labour market demands more sophisticated transferrable social skills (Kuokkanen et al. 2013), that are evidences that personality-traits based skills and competences are required even more.

Data-driven decisions and innovations management are the organizational context where manager should operate nowadays, hence it is expected that his knowledge based technical competence in the field must be substantial enough (Barbato, 2015; Oosthuisen, 2017; Akhtar, 2017) to control organization, inspire technologically advanced team and act as innovations catalyst (Oosthuisen, 2017).

Researchers also declared that sizeable amount of experience and business domain knowledge (Mathews,

2007; Chen and Wu, 2011) helps to lead KIBS organizations and being oriented to customers and other stakeholders, deliver value driven products (Mathews, 2007; Cikmačs, 2012).

As competences development are impossible without all these technological advances and tremendously fast diffusion of innovations that is ten times less than it was 150 years ago (Grath, 2013) as industry 4.0 organization is not feasible without requirement for information transparency (Marr, 2016). As an evidence is the emerging phenomenon knowledge creation and exchange through electronic network of practice or social media (Sedighi et al. 2017; Sarka and Ipsen, 2017). Apart from obvious senior management support, digitalization and IT development helps (Spies et al. 2005; Huang et al. 2011) enterprises to implement just-in-time approach for knowledge management, i.e. "get the right knowledge to the right people at the right time" (Vitari, 2011).

However, addressing perspective of inter-disciplinary and multicultural team, there is still no consensus about different cultures impact in knowledge management in multinational contexts (Pauluzzo and Cagnina, 2017).

Design/ Methodology/ Approach:

Literature review and content analysis have been selected to investigate the research question. To proceed with text interpretations 12 sources have been selected, the main criteria for selection was relevance to management challenges in knowledge intensive industries (e.g. IT, financial technologies, architecture, medicine, consulting etc.) and multicultural environments, where multiculturalism was assessed as intersection or example of interdisciplinary teams, cross-national teams, virtual teams or different social groups.

(Expected) Findings/Results:

In accordance to methodology proposed by Mayring (2000) for qualitative content analysis, 16 elements of managerial skills, abilities, and competences have been identified. Description of these components are listed below:

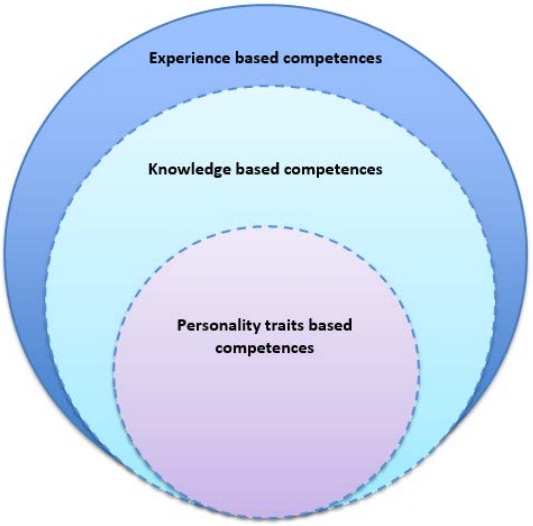
- Communication - ability to express ideas orally and in written form, as well as act as facilitator in exchange ideas and thoughts; act as active listener and proactively provide with feedback or response to other parties;
- Culture awareness - ability to recognize difference between various cultures incl. interdisciplinary teams, cross-national teams, virtual teams, and different social groups;
- Teamwork - ability to interact with other people to work together with them on purpose for a common of different goals;
- Technical competence - ability to apply knowledge that are specific for the industry;
- Leadership - ability to lead, motivate, and develop other people;
- Ethics - ability to act in accordance to supranational and ethnic cultural norms with high level of moral code, integrity and transparency over time;
- Business acumen – ability to consider customer needs and business stakeholders perspectives, as well as current market trends and economic efficiency of decisions;
- Negotiation - ability to convince others;
- Strategic thinking - ability to develop strategies to reach long-term goals and adjust them in accordance to changing environment with a purpose to maintain sustainability of the system;
- Emotional intelligence - ability to assess and control own emotions;
- Advisory skills - ability to provide other parties with advice to increase overall quality of administrative actions;
- Achievement orientation - ability to meet desired outcome(s);

- Conflict management - ability to assess diversity of stakeholders, and negotiate the best possible solution in arguable situation;
- Adaptability - ability for flexible response to changing environment challenges;
- Analytical thinking - ability to assess problem and critically analyse it from different angles, and develop a solution based on facts, not emotions;
- Coordinating - ability to plan activities among other people efficiently, setting roles and deadlines.

These elements might be grouped in three groups as followed:

1. Elements that based and developed on personality traits (e.g. leadership, ethics, emotional intelligence, achievement orientation, and adaptability),
2. Elements that are related to a person's education (e.g. technical competence, culture awareness, business orientation, strategic and analytic thinking), and
3. Elements which are acquired in a result of experience (teamwork, communication, negotiation, conflict management, advisory and coordinating skills).

Visual representation of the preliminary results is presented on the picture 1 below:



Early research results demonstrate that individuality based, education based and learned from experience groups of elements are distributed unevenly, where portion of experience based competences is the largest and personality traits based set is the smallest; this is a field for verification and further investigation to validate authors' hypothesis, which was already partially discussed in their previous studies (Nikitina and Lapiņa, 2016; Nikitina and Lapiņa, 2017), that modern business education is subject for changes due to range of transformations in external environment and consequent revision of the subject's requirements. Hereafter as the research is not finalized, authors plan to continue analysis of these elements to identify groups of managerial competences demanded.

Additionally it was observed that KIBS organizations use technology-based (for example, electronic networks of practice or social media) and service-based (for instance, Expert Service, Knowledge Management Service, Centres of Competences) instruments to preserve knowledge assets, competences are a particular case of the assets; as well as recognized importance of cultural differences, capabilities development, and alignment to organization strategy development for adoption of the instruments.

Research limitations / Implications:

The research continues previous studies of the authors which were aimed to discover

- latest trends influencing business education development and management, as well as to summarize the findings and define set of factors affecting higher education institutions (HEI) development (Nikitina and Lapiņa, 2016).
- development of managerial professional competences that are necessary for actors who performs as entrepreneur, manager, and leader simultaneously to lead and enterprise during 4IR era (Nikitina and Lapiņa, 2017).
- professional competences that are necessary to lead the cross-cultural and multi-disciplinary teams as well as identify factors affecting adjustments in managerial competences in knowledge intensive business service organizations (Nikitina and Lapiņa, 2017).
- skills and competences that are required by modern labour market for current and future jobs, the problems encountered and the needs experienced in practice, and, finally, student perception about the modern teaching, learning and assessment methods (Lapiņa et al. 2017).

Keywords:

managerial competences, knowledge intensive business service - KIBS, fourth industrial revolution - 4IR, knowledge management - KM

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3.

Human Capital Development for Innovation driven Economy and Regional Development: A Cross-region Study

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Abstract

There has been significant increase in the knowledge creation and intellectual capital transfer in today's global economic environment, industrial macro-economists have consistently backed opinions that the economic growth of developing nations should increasingly depend on the ability to innovate and the focus of any industrial policy in a developing economy should strive for a conducive climate that enables innovations to flourish (Giget, 1997; Branscomb, 1992). According to Porter's (1998) classification of economies by a four-phase model of national competitive development, if a country aspired to become a developed nation, it must transit to innovation-driven category. Technocrats also point out that a relentless pursuit of innovation is central to economic competitiveness and constitutes a principal determinant of industry growth for both the manufacturing and services sectors, which form the two largest engines of economic growth in most developing economies (Goh, 2003; 2004; Tidd, 1997).

The fundamental driver behind any innovation process is the human factor associated with it, theory suggests that innovation is a process of learning both by individual personnel and by the organization as a whole (Lloréns Montes et al., 2005 and Schneider et al., 2010). This learning comes, through face-to-face communication (Asheim et al., 2007); teamwork (Lloréns Montes et al., 2005); absorptive capacity (Cohen and Levinthal, 1990) and education, occupation and work experience (Schneider et al., 2010). For the country to continuously improve their competitiveness in a rapid changing global market, the quality and integration of human capital becomes a critical element. Human capital is a central element of economic growth theory (Storper and Scott, 2009). An economy with a larger total stock of human capital will experience faster growth (Romer, 1990). A firm's growth is positively related to the quality of human capital and the firm's investment in it (Gossling and Rutten, 2007 and Santos-Rodrigues et al., 2010). Human capital pertains to individual's knowledge and abilities that allow for changes in action and economic growth (Coleman, 1988). Prior research has shown that one's overall level of human capital has an impact on economic success, both at the business level and marco-level. (Kilkenny and al., 1999; Prais, 1995). Zaccaro and Banks (2004) explained how important innovation and human resources are for firms continue to thrive and maintain their core competences. It is widely accepted that human Capital is the embodiment of knowledge, in better educated and productive people (Santos-Rodrigues et al., 2010 and Storper and Scott, 2009). It is also an enabling factor in innovation (Leiponen, 2005) and as most firm-level innovations are incremental, it points to their role in the generation, adaption and diffusion of technical and organisational change (Toner, 2011). Research has identified middle management's creation of an innovative climate and openness to technological innovation as influences on innovation (Hosseini et al., 2003). Yet in the literature, blue-collar workers are an understudied population especially in an Asian emerging economy context. Skill development of this cohort and effective employment of them is crucial because "blue collar workforce is a major contributor of organizational success and a main driver to the growth of China's economy" (Chang et al., 2011:701).

Several studies indicate innovation can not only be created, but also trained.The study of Martínez-Ros and Orfila-Sintes (2012) implicated that training has positive effect on the frequency of innovation and the scope of innovation, especially when the training is constant and internal rather than occasional and external. Becker (2002) found out that

economic productivity is intimately connected to the skills level and ability of the workforce, which can be upgraded by education and training. Leiponen (2005) found that technical skills are the key to profitable innovations. According to Lundvall and Johnson (1994), higher education impacts on innovation in two ways; firstly, graduates can invent and develop new technologies and, secondly, these higher educated graduates can exploit technological progress. There has been a series of expansions and reforms of vocational education in post reform China, and the value of education is heightened in the country's development of a market economy (de Brauw and Rozelle 2008; Maurer-Fazio 2006). In 2012, vocational high school enrolment reached 21.13 millions, compare with 2.26 million in 1980 (Central Government of People's Republic of China（PRC）2013). The vocational high school graduates in China become the largest cohorts of the labor force to meet an unprecedented demand in the industrial sector ever since China has integrated into the international economic regime by joining World Bank, IMF, GATT and WTO. It is reported that a World Top 500 Enterprise in Guangzhou employed more than 1200 students in their factory, outnumbering their 1100 permanent workers (Xinhua Net 2011).

Thus, our research examined how individual innovative capabilities of vocational school graduates influence the skill development such as knowledge transfer, teamwork, and self presentation and how it differs across regions by conducting a large scale surveys in inland city and coastal city in China. We apply the employability framework as the measurements of skill development. The employability framework essentially concerns what kinds of skills are necessary for job-seekers to gain employment and to enhance their 'employability' throughout their life time (Fugate, Kinicki, & Ashforth, 2004; Harvey, 2001). Researchers have produced extensive lists, containing various competencies, technical skills (Lowden, 2011). Employability skills include workplace competencies, such as problem solving, communication skills, personal qualities, work ethic, interpersonal skills and teamwork skills (Leigh et al., 1999). They are found significant across occupations, positions, pay levels (Damitz et al., 2003), and cultures (Nonaka and Johansson, 1985). However, the employability framework has been predominantly developed and tested in the Western higher education system (McQuaid & Lindsay, 2005), and this limitation calls for further transfer of the concept to non-Western contexts, and low skilled workforce. What is the level of individual innovative capability of technical vocational school graduates in China, what kind of employability skills they appeal to their prospective employers, and how individual innovative capability affect their employability, are largely unknown. Furthermore, we examine whether individual innovative capability and employability skills development leads to the ability of career placement, and generate practical implications on skill development that could be implemented in the corporate setting and education curriculum.

Keywords: innovation capability, human capital, human resource development, employability.

4.

The global M&A and the development of IC industry ecosystem in China: What can we learn from the case of Tsinghua Unigroup?

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Abstract: Found in the year of 1988, Tsinghua Unigroup was originally a spin-off company from Tsinghua University in China, and now it has become a big giant in IT industry in China, whose business range is from computer parts to internet services. In the past five years, Tsinghua Unigroup had made a huge investment in the global IC industry by M&A, it has merged many leading companies in the sub-industries of IT all over the world, for example, Spreadtrum Communications, Inc., a Nasdaq listed company, had been merged by Tsinghua Unigroup in 2003. By the large amount of M&A and the self-development, Tsinghua Unigroup grows rapidly and becomes an influencial company in IC industry, and makes China's IC ecosystem stronger. This paper uses the case study method, not only by a long time investigating, but also by using the second hand data. By case study, we find that IC industry ecosystem is quite different from other mature industry ecosystems. The M&A of Tsinghua Unigroup improved the capabilities of the IC industry in China. The contribution of this paper is that the analyse of the characteristics of IC industry ecosystem in China, the findings of difficulties and experiences in the process of M&A activities in the developing country companies, rather than in developed country companies, and the relationship between the M&A activities globally and the development of IC ecosystem in China.

Key words: Industry ecosystem; M&A; IC industry; Strategy management

5.

Does open innovation motivate serial entrepreneurs?

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ABSTRACT

With the Fourth Industrial Revolution, above all things, the role of entrepreneurs that lead start-ups through a new combination of technologies and markets becomes important. Thus, this study suggests serial entrepreneur models suitable for the Fourth Industrial Revolution by answering the following questions:

Does open innovation motivate serial entrepreneurs?

If yes, how does open innovation motivate serial entrepreneurs?

This research has undergone in-depth analyses of Medison, a Korean representative medical device company, from 1985 to 2016, to find the answer to the questions above. First, we analyze the diverse open innovation strategies conducted by Medison before the merger with Samsung. At the time, Medison actively implemented open innovation strategies. Today, most serial entrepreneurs of Medison come from before the merger or through open innovation channels. Second, we analyze how the start-ups of spin-out, venture investment, and joint venture companies, which are open innovation channels, emerged through the open innovation of Medison. Third, we analyze the companies founded by the people who worked at Medison. Fourth, we analyze how the companies established by the people from the open innovation channel start-ups of Medison. Finally, we suggest suitable models for open innovation to promote serial entrepreneurs.

Keywords: Open innovation, Serial entrepreneur, Intra-venture, Spin-out, Venture investment, Joint venture

1. Introduction

With the emergence of the second information technology (IT) innovation, the so-called Fourth Industrial Revolution, the foundation of a new business model based on a creative re-combination between technology and market becomes a new driving force to overcome the stagnation of the growth of capitalism (Yun, 2015; Yun et al., 2016). Digitization will revolutionize everything, making the overused and often ill-used adage 'this time is different' apt (Schwab, 2017: 9). The role of entrepreneurs that lead start-ups through a new combination of technologies and markets becomes important in this era mostly. An entrepreneur is not the 'inventor' of the good or process he/she introduces, but the "innovator" who combines new factors, such as technology, and new combinations in the market (Schumpeter, 1939: 84, 102). But because of limited knowledge, as well as the Schumpeterian irony, "planning" is incompatible with innovation; progress by new combination depends on the ability of individuals to command resources and direct them in unconventional and surprising directions. However, the obsolescence of the entrepreneurial function will arrive because capitalism, being essentially an evolutionary process, would become atrophic (Sehumpeter, 1942: 131).

In this situation, the activation of serial entrepreneurs, in which the existing entrepreneurs continue to establish new companies under certain conditions, is a very effective method to handle the obsolescence of the entrepreneurial function. PayPal was sold for USD 1.5 billion in 2002. A team that was put together, known in Silicon Valley as the "PayPal Mafia," included some entrepreneurs who have gone on to launch successful start- ups (Denning, 2014). In Korea, Medison (currently, Samsung Medison), a leading global IT healthcare firm, has led the emergence of many serial entrepreneurs, called the Medison Mafia. They differed in that when PayPal was sold to eBay after its listing, the number of serial entrepreneurs explosively increased, whereas Medison led many serial entrepreneurs with diverse open innovation strategies conducted before and after its listing and the emergence continued until the 2010s. Medison continues to lead the emergence of many serial entrepreneurs even after the merge with Samsung because the company could not overcome the financial crisis as a result of the dot- com bubble in the early 2000s.

1.1. Research questions

This study is conducted to answer the following questions:

Does open innovation motivate serial entrepreneurs?

If yes, how does open innovation innovate serial entrepreneurs?

To handle the Fourth Industrial Revolution in Korea, the development of business models that creatively recombine technology and market and foundation became an important issue. However, in spite of various attempts made for the emergence and success of entrepreneurs based on creative business models, the strategies to effectively foster entrepreneurs are not evident. However, Medison leads the continuous foundation with 100 serial entrepreneurs, called Medison Mafia (Lee, 2016a: 357-398). Since 1990, Medison has operated diverse outbound channels through strong open innovation. Thus, this study focuses on the serial entrepreneurs of Medison, and finds an answer to the question "Does open innovation motivate serial entrepreneurs?". In addition, we are to find the mechanism where open innovation triggers serial entrepreneurs. When we can determine if this research question needs to be addressed, we use a literature search as follows (Lewis, 2015: 451).

1.2. Research scope and method

This study has undergone an in-depth analysis of Medison, a Korean representative medical device firm. Medison, which is one of the leading ultrasonic diagnostic device manufacturers in the global market and one of the pioneering Korean venture companies, was established in 1985 and has merged with Samsung in 2011 (Ko and Park, 2016).

The analysis period was from 1985 to 2016. First, we analyze the diverse open innovation strategies conducted by

Medison before the merger with Samsung. At the time, Medison actively implemented open innovation strategies. Today, most serial entrepreneurs of Medison were from before the merge or through open innovation channels. Second, we analyze how the companies, which are open innovation channels, emerge through the open innovation of Medison. Third, we analyze the companies founded by the people who worked at Medison. Fourth, we analyze how the companies established by the people of a company emerge through an open innovation strategy of Medison.

This study uses the interviewing method for qualitative research. Interview research requires time and money (Seidman, 2013: 11). This research uses in-depth interviews. We interview representative entrepreneurs in the research field, such as those from an open innovation channel, including the founder of Medison; those who worked at Medison; and those coming from an open innovation channel of Medison. As shown in Table 1, we conducted an in-depth interview with people for about a year, from November 2016 to October 2017. In this interview, we tried to keep participants focused on concrete details, and asked them to reconstruct, not to remember (Seidman, 2013: 90, 91).

Table 1

In-depth interviewee lists.

Date	Name	Present		Relation with Medison
		Affiliation	Main Products	
15 November 2016	MinHwa Lee	Chairman of Korea Creative Economy Research Network		Former CEO of Medison
6 December 2016	JongCheol Kim	CEO of MEK-ICS	ICU monitoring system, respirator	Worked at Medison, CTO of Biosis, a spin-out of Medison, a start-up
11 July 2017	JinTae Kim	CEO of U2Bio	Medical examination S/W, medical examination kit, etc.	Worked at Medison, CEO of UBcare, a venture investment company of Medison, a start-up
14 August 2017	YoungShin Cho	CEO of Medicore	Medical infrared thermograph system, autonomic nerve analyzer, stress measuring system, etc.	CEO of Median, a venture investment company of Medison, a start-up, Investment by Medison to Medicore
18 August 2017	SeongWook Choi	IRM	Medical information cloud platform	Worked at Medison, a chief of the development team of Mediface, a spin-out of Medison
22 August 2017	ManSeok Go	ITVERS	Medical service start-up consultation, medical service venture investment	Worked at the planning team of Medison, a start-up
22 August 2017	MoonJong Gil	Mediana	Patient monitor, vital sign monitor, AED	Worked at the overseas business team of Medison, a start-up
23 August 2017	ByeongIl Cho	M2COMM	Marketing agency, mobile biz, development of various solutions	Worked at Medison, a spin-out of the marketing team of Medison

27 October 2017	Young Choi	Health Medical Equipment division		Worked at Medison, worked at the Health Medical Equipment division of Samsung Medison

Second, we analyze the open innovation strategies of Medison, provided by Professor MinHwa Lee, founder of Medison, and the internal materials of serial entrepreneurs. These include various lecture materials and internal information, which are not disclosed to the public, as well as books. Third, the latest data and basic materials of Medison are supplemented by using Internet websites and analyzing preceding researches of related studies.

2. Literature review and research framework

2.1. Literature review

2.1.1. Serial entrepreneur

The 'PayPal mafia' is one well-known group of serial entrepreneurs. These multi-millionaires from PayPal chose not to relax on the beach and bask in the California sun, but started new companies (Rao, 2008). Most of PayPal's key employees left eBay, but they stayed in touch, and even have a name for themselves: the PayPal mafia, a group of serial entrepreneurs and investors that represent classic characters of Silicon Valley, where success and easy access to capital breed ambition and further success (Twomey, 2007). Among the new start-ups founded by Paypal Mafia, there are seven billionaires. These start-ups are "Tesla" and "SpaceX" of Elon Musk; "LinkedIn" of Reid Hoffman; "YouTube" of Steve Chen, Chad Hurley, and Jawed Karim; "Yelp" of Jeremy Stoppelman and Russel Simmons; "Yarmmer" of David O. Sacks; and "Palantir" of Peter Thiel (Lee, 2016b: 356). Serial entrepreneurs are different from novice entrepreneurs and portfolio entrepreneurs (Westhead et al., 2005). Although novice entrepreneurs are first owners of a minority of majority equity stake in an independent business that is either new, purchased, or inherited, serial entrepreneurs are not first owners. And although portfolio entrepreneurs currently have minority or majority ownership stakes in two or more independent businesses that are either new, purchased, or inherited, serial entrepreneurs have ownership stakes in one. Unlike novice or portfolio entrepreneurs, serial entrepreneurs are repeat business starters who, in the past, have sold or closed down a business that they at least partly ran and owned, and who currently run another, possibly new business that they at least partly own (Hyytinen and Ilmakunnas, 2007).

Serial entrepreneurship accounts for nearly 30% of the transitions from paid employment to entrepreneurship. An employee with entrepreneurial aspirations is more likely to become an entrepreneur subsequently, than an employee without such aspirations (Hyytinen & Ilmakunnas, 2007). As venture capital (VC) markets mature, increasing numbers of entrepreneurs are likely to exit from their initial enterprises, creating a pool of entrepreneurs with a potential for embarking on subsequent ventures (Wright et al., 1997). According to Wright et al. (1997), when venture capitalists invest, their major investment targets are serial entrepreneurs. According to a survey, the investments account for 48.7% in England. In a study of technology commercializers conducted by a Canadian college, 12% of professors are repeat commercializers that repeatedly execute 80% of technology commercialization. Thus, repeat commercializers are parallel-serial or habitual entrepreneurs in that they have the ability to commercialize (i.e., the ability to generate and identify commercialize inventions and the ability to acquire resources for the commercialization of their inventions) and the aspiration to do so (i.e., commercialization-friendly attitudes) (Hoye and Pries, 2009).

2.1.2. Open innovation: spin-out, venture investment, and joint venture

Open innovation has three core processes: (1) the outside-in process: enriching a company's own knowledge base; (2) the inside-out process: the external exploiting of ideas in different markets; and (3) the coupled process:

linking outside-in and inside-out by working in alliance with complementary companies (Gassmann and Enkel, 2004). Spin-out or spin-off is an inside-out open innovation process that peruses new markets (Docherty, 2006; Mortara and Minshall, 2011). Spin-outs are alternative to the conventional growth strategy and diversification of a business portfolio under the umbrella of a single organization (Lee et al., 2000). According to Lee et al. (2000), in the context of Schumpeterian competition, the spin-out strategy is more appropriate for high-tech start-ups than the conventional diversification strategy. High-tech spin-out companies from universities have critical junctures in developments (Vohora et al., 2004). In other words, the survival and development of spin-out companies depend on how they stand critical junctures. Spin-out companies have incubator models with enough resources and activities, competence-deficient models with lack of activities, resource-deficient models with lack of resources, and low selective models with lack of resources and activities (Clarysse et al., 2005). In an open innovation strategy starting up new organizations that draw on internal knowledge, that is, it implies spinoff and spin-out processes, the parent organization may support finance, human capital, legal advice, administrative services, etc., in addition to knowledge for the spin-out firms (Van de Vrande et al., 2009).

Corporate venture investments are not a threat but an opportunity to grow as a kind of open innovation strategy to avoid the threat of opportunism as a result of lock-in situations (West et al., 2006). Astrong relationship between VC and patenting on an industry level arrives at a high relationship between venture investment and high innovation of firms (Kortum and Lerner, 2001). Open innovation in risk-laden activities, such as corporate venturing, has the following advantages: (1) benefits from early involvement in new technologies or business opportunities; (2) delayed financial commitment; (3) early exits that reduce the downward losses; and (4) delayed exit in case it spins off a venture (Vanhaverbeke, Van de Vrande, & Chesbrough, 2008). That is, as venture investment is a channel that gives an opportunity for a new business technology, it is close to the outside-in open innovation (Gassmann and Enkel, 2004). Better-networked VC firms experience significantly better fund performance, as measured by the proportion of investments that are successfully exited through an IPO or a sale to another company (Hochberg et al., 2007). In other words, the more the venture investment has enough open innovation-friendly networks, the higher the corporate performance is.

Business models could be innovated through co-development partnerships such as joint venture open innovation. In addition, co-development partnership can increase the return from internal R&D by leveraging a partner's capabilities (Chesbrough and Schwartz, 2007). Co-development partnership, such as joint venture, is a kind of coupled open innovation channel that can increase profitability and innovation capability together (Chesbrough and Schwartz, 2007; Gassmann and Enkel, 2004). Joint venture can be an open innovation channel when competition eclipses cooperation if its transaction cost can be controlled (Park and Russo, 1996). When a partner firm has a higher density, the host firm will likely choose a joint venture than a wholly owned subsidiary (Yiu and Makino, 2002). When a firm does not have enough information about a new sector with a different culture, it can choose a joint venture with another firm that knows the sector well and looks in foreign countries especially (Pothukuchi et al., 2002; Reuer and Koza, 2000). Joint venture as networking means that strategy change had been chosen by the mobile phone sector (Dittrich and Duysters, 2007).

2.1.3. Research framework

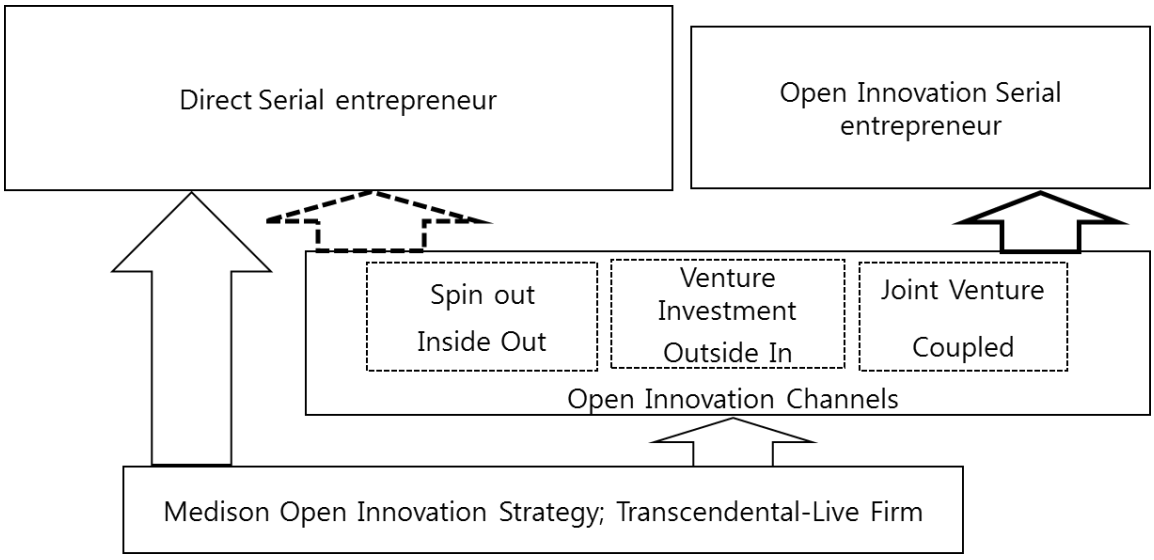

Fig. 1. Open Innovation to Serial Entrepreneur Research Framework.

This study starts with the analysis of the open innovation strategy of Medison and analyzes which performance is created by the strategy in the three channels of open innovation: spin-out, venture investment, and joint venture. In addition, we track and analyze the open innovation serial entrepreneurs coming from the three channels of open innovation. Furthermore, we also track and analyze direct serial entrepreneurs who founded companies, directed by the people from Medison. Above all, we find the role of the open innovation strategy of Medison and the three open innovation channels when two types of serial entrepreneurs emerge.

3. Medison's open innovation

3.1. Open innovation strategy

Medison acquired Kretz, a 3D source technology firm. Global companies like HP or Toshiba were hesitant on this M&A. Kretz applied the 3D source technology to a medical ultrasonography, and successfully developed the world's smallest 3D ultrasonic diagnosis system. The first success of the open innovation strategy in the history of Medison was to significantly decrease the 3D scanning time from 30 minutes to 0.05 seconds. In addition, Medison promotes the Transcendental-Live Firm strategy, that is, the strategy of diversely formed companies through an open innovation channel in the medical technology, medical information, and biotechnology fields using itself as a platform after dominating the domestic market and successfully exploring overseas markets through the niche market strategy. In other words, the general medical ecosystem is formed with the open innovation strategy of spin-out, venture investment, and joint venture. The Transcendental-Live Firm strategy of Medison is an open community that promotes shared value, shared information, and shared benefits as centripetal roles. It is a kind of an open platform (Lee and Lee 2000: 101-12). Whereas Medison enhances its internal market competitiveness through autonomy, competitiveness, and intraventure, it also promotes the Transcendental-Live Firm strategy through open innovation, called joint venture. A Transcendental-Live firm indicates that every single corporate creature gathers together as one life (holistic) and that each one represents the entire organization.

3.2. Open innovation channel a: spin-out

The spin-out strategy of Medison motivates entrepreneurship for sectors not relatively related to the core competencies of its head office, strengthens the core competencies, and improves the core competencies of spin-out companies. Thus, the spin-out of Medison is different from the spin-off that separates a sector that is not strategically important (Allen, 1998). The spin-out of Medison is classified into the spin-out of a project team and that of a functional department.

Among them, UBcare is a representative project team spin-out company. It is the first corporate venture company of Medison. JinTae Kim, the former CEO of UBcare, was taking up a doctoral course in medical engineering while working at Medison. He led the Picture Archiving and Communication System (PACS) team that converts the images of an ultrasonic diagnosis system into digital files and saves and processes them. He suggested a start-up to Medison, and Medison provided all things necessary for the foundation such as its resources, brand, and sales networks, and created a team to start the company, with three doctoral students who joined the project. Medison built a system that sent feedback on the achievement of the spin-out company while taking about 40% of the shares of UBcare. One of the markets of Medison is ultrasound system, but UBcare is an IT company. They had very different characteristics in strategies, marketing, and advertisements. The spin-out of UBcare became an important momentum that led to the development of the division. In addition, even though it was a new spin-out company, it could use the brand of Medison and continuously secured good human resources. The points gave an opportunity for UBcare to constantly grow as a medical IT firm. The company went public and now became a subsidiary of the SK Group. It grows as a symbol of the Korean medical IT sector. Other project spin-out companies are Meridian from the dongseo medical device development team of the meridian system, MGB ENDOSCOPY from the Rigid Borescope team, BeMeMs from the X-ray team, Medison Econet from the Econet division, Medinus, Medisonxray, Prosonic, and Welson EnterTech. With regard to divisions, the MIDAS, dongseo, bio-signal, PACS, X-ray, and MRI were spun out from Medison.

M2COMM is a representative spin-out from the marketing functional department of Medison. A spin-out from a project team or a business department is easily seen in global companies, but from a functional department, it is seldom seen. In the spin-out process of the patent development research team of a collage, a representative case of spin-out, there are a few cases where a functional department is spun out even though the business development capabilities of technology transfer of offices are important (Lockett and Wright, 2005). ByeongIl Cho, CEO of M2COMM, said it was the strategy of increasing internal corporate ventures through the experimental spirit of

Medison that allows founding a start-up, coming from a functional department. M2COMM was spun out with the aim to strengthen online business and medical IT company marketing, including Medison. In other words, the spin-out happened with the clear goal of expanding the IT-based industry based on functions. Some examples of the start-ups of functional departments are IT@Venture from the computer department, FUTURE COMMUNICATION from the public relations department, and SURTECH from the medical device repair department. The start-ups coming from a functional department set a goal of expanding or improving new medical IT services based on the activation of the IT industry in addition to the function performed at Medison. Cho said that he continuously implemented the entrepreneurship, obtained from Medison, such as the promotion of diversification, including the non-medical markets such as the warehouse of the training center and the silver industry, as well as its business sectors like medical marketing and online business.

Table 2
Medison's spin-out list.

Number	Firms	Initial Year	Relation with Medison	Founder and Others	Business Field
1	UBCARE CO., LTD. (renamed from Medidas and Euisarang)	Founded in 1992 Incorporated in 1994	The PACS development team that converts the images of an ultrasonic diagnosis system into digital files and saves and processes them was spun out. First internal corporate venture in Medison 39.8% stake in the business in 2000	JinTae Kim and SangKyeong Lee; listed company; a subsidiary of SK Group	System Software, U Health Care, medical information
2	MERIDIAN CO., LTD.	1994	The dongseo medical device development team of the Meridian system was spun out 53% stake in the business in 1998	InBeom Park and HyeongSung Myeong (Medison)	Pulse wave analyzer
3	MGB ENDOSCOPY CO., LTD. (renamed from Welson EnterTech)	Founded in 1997 Incorporated in 1998	The Rigid Borescope team of the Medison research center was spun out. 60% stake in the business in 1998	DongJu Gang and KwangJin Go	Endoscope
4	Genoray Co., LTD.	2001	The X-ray division of Medison was spun out.	ByeongWook Park and SeungCheol Kim (Medison)	Radioscope, X-ray
5	BeMeMs CORP.	2008	?	KyeongSeok Joo and CheongSan Ji (Medison)	Mammo X-ray
6	Medison Econet	2001	Econet division of Medison	JinSoo Do, SangHoon Kim, and DongSik Cho	Full body BDM

7	Medinus Co., LTD (disappear)				Radiological apparatus manufacturing business
8	Medisonxray (M&A by Medison)				Radiological apparatus manufacturing business
9	Prosonic Co., LTD (M&A by Medison)				Other manufacturing business
10	Welson EnterTech	1997	Division		Endoscope medical device
11	SURTECH CO., LTD.	2000	Functional Department 18.0% (2000)		Medical device A/S
12	**M2COMM (renamed from M2Community)**	**1999**	**The marketing department of Medison was spun out.** **50% stake in the business in 2000**	**ByeongIl Cho**	**Medical marketing agency, mobile biz, various solutions**
13	IT@Venture (disappear)	1999	The computer team of Medison was spun out. 17.2% stake in the business in 2000		MEDISON Computing Department
14	Future	1998	The public relation team of Medison was spun out. 10% stake in the business in 2000		MEDISON PR

Source: In-depth interview result; internal material of Korea Creative Economy Research Network; Lee and Lee (2000); Lee et al. (2000)

3.3. Open innovation channel b: venture investment

Medison aggressively focused on venture investment in the sectors necessary for the future of IT medical devices or related to their future business even though they are not their core competence. The investment was led by the leadership of MinHwa Lee, founder and CEO of Medison, and its planning team supported the investment. The venture investment companies with diversification characteristics are Osang Healthcare, which handled blood analyzer; Viewworks, which handled X-ray images; OSTEOSYS, which handled bone mineral densitometers; AG Bio Diagnosis, which developed an artificial heart; JVM, which handled drug-packing machines; Viromed, which developed gene therapy; DRTech, which handled X-ray detectors; Scimedix, which handled MRI; KORMED, which handled lithotripters; TAEHA MECATRONICS, which produced treadmills; KORMED, which produced C-arm; and Scimedix, which handled MRI.

Medison's venture investment also covers IT companies in various ways even though there are not many diversification characteristics. Examples are Bit Computer, Hancom, Softcamp, and MUHAN INVESTMENT. The investment of Medison in the sectors with strong or weak diversification characteristics caused conflicts within its venture ecosystem. There were conflicts of interest between companies such as Bionet, Mediana, and MEK-ICS for patient monitoring systems, and companies such as VIEWWORKS, DRTech, and COMED for X- ray systems.

Most interviewees said that the activation of the venture investment of Medison had been a strong incentive to

provide direct and indirect experiences, know-how, and motivation for start-ups to related departments and members of Medison.

Table 3
Medison's venture investment list.

Number	Firms	Initial Year	Relation with Medison	Founder and Others	Business Field
1	InfoPia (now Osang Healthcare)	1996	Invested by Medison; ByeongWoo Bae joined this company	BongUk Lee and ByeongWoo Bae from Medison; a listed company	Liver disease diagnosis sensor, heart disease diagnosis sensor, blood analyzer
2	VIEWWORKS CO., LTD	1999	Invested by Medison (20% stake in the business in 2000) Started as Raysis CO., LTD KRW 4.08 million, KRX CEO: Hoosik Kim	HooSik Kim, a listed company	X-ray image equipment Industrial camera
3	OSTEOSYS	2002 (2000)	Invested by Medison (12.1% stake in the business in 2000)	YeongBok Ahn	Bone mineral densitometer (BMD)
4	BioromadLab (now AG Bio Diagnosis)	1994	Invested in the team of professor ByeongGoo Min of Seoul National University by Medison; 47.8% stake in the business in 2000	JongWon Kin and ByeongGoo Min; a listed company; SunYoung Kim from Medison	Artificial heart, a DNA chip company
5		1995	Invested in the sports club and health equipment company by Medison; 9.8% stake in the business in 2000	SangHee Lim	Treadmill, cycle, etc.
6		1995	Merged an extracorporeal shock wave lithotripsy sector company in Gyeongsangnam-do and invested in the company, 55.9% stake in the business in 2000	JaSeong Lee, (former chief of the policy research team of Medison)	Extracorporeal shock wave lithotripter, digital X-ray
7	Viromed Co., LTD. (renamed from Bio MedicalPacific)	1996	Invested by Medison	SunYoung Kim; listed in KOSDAQ	Gene therapy, sample for research

8	JVM CO., LTD	1977	Invested in HyeopShin Medical Device in 1996; JunHo Kim was appointed as CEO	YongHee Lee and JunHo Kim (Medison); a listed company	Pharmacy compounding /management system
9	Bit Computer			HyeonJeong Cho and JinWook Cheon	
10	InBody			GiCheol Cha	
11	Hancom	1990		HongGoo Lee; a listed company	SW development and distribution
12	DRTech	2002		JeongGi Yoon and JaeOk Cho (Medison)	Flat-panel digital X-ray detector
13	Scimedix Co. Ltd.	1998		YongJu Jang	MRI
14	Softcamp Co., LTD.	1999		HwangKook Bae	DRM, web security, keyboard SW
15	Cygenic	1999	Invested by Medison	HeeSeol Lee	New drug for dementia/disease treatment with natural substances, and health functional foods
16	MEDICHEMS extinguished		Invested by Medison; 43.3% stake in the business in 2000	43.3% (2000)	UBT
17	MUHAN INVESTMENT extinguished		Invested by Medison; 22.9% stake in the business in 2000	22.9% (2000)	Start-up investment
18	KORMED		Invested by Medison; 55.9% stake in the business in 2000		Lithotripter/C-arm

Source: In-depth interview result; internal material of Korea Creative Economy Research Network; Lee (2016a); Lee and Lee (2000)

3.4. Open innovation channel c: joint venture

With the capabilities accumulated through the business diversification, Medison established a strategic alliance or organised a joint venture with biotechnology companies in 2000. For example, Prosonic handled proven ultrasonic transducers, Infinitt of PACS, and Biosys of Biosignal. In addition, Medison created joint ventures with Cyber KAIST, which handled online education; Exmedicom, which handled medical distribution; Medilinx of medical B2B; and Korea Internet Holdings, an Internet venture holding company, to expand its areas through business diversification.

The joint venture investment of Medison played a role in completing the venture ecosystem of Transcendental-Live Firm. The reason for the synergy value creation through the diversification was not limited to Medison. It also adopted the open economy to outside firms.

Table 4

Medison's joint venture list.

Number	Firms	Initial Year	Relation with Medison	Founder and Others	Business Field

1	PROSONIC CO., LTD. (Daewon Electronics) (merged to Medison)	1990	An outside venture company of Medison, founded through joint investment; 38.7% stake in the business in 2000	JinHo Han; a listed company,	Probe ultrasonic transducer
2	Infinitt (renamed from Mediface)	2002	Merged between Mediface and 3DMed; 52% stake in the business in 2000	GiTae Hong, DongWook Kim SunJoo Lee, and SeungWook Choi from Medison; a listed company,	SW development and distribution, PACS
3	Exmedicom Co., LTD.	2000		HyeonO Woo and MoonSoo Kim (Medison)	Medical consumables distribution company
4	Biosys Co., LTD. extinguished		Stake: Sein Electronics (30%) + Medison (30%)	DongJoo Gang, Sein Electronics + Invested by Medison	Biosignal diagnostor
5	Medilinx		Joint venture; 25.0% stake in the business in 2000		Medical B2B
6	Korea Internet		Joint venture;		Internet ventur e
	Holdings		20% stake in the business in (2000)		holding company
7	Cyber KAIST (extinguished)		Invested by Medison; 30% stake in the business in 2000		Online education

Source: In-depth interview result; internal material of Korea Creative Economy Research Network; Lee (2016a); Lee and Lee(2000)

3.5. Small conclusion

The open innovation strategy and the three open innovation channels—that is, spin-out, venture investment, and joint venture—made a significant contribution to strengthen the entrepreneurship of Medison members, directly and indirectly accumulating the experiences from start-ups, and increasing the desire of founding start- ups.

First, the people involved in founding a start-up through one of the three channels of the open innovation strategy directly obtained the experiences of start-ups from beginning to end. Their experiences were different from the entrepreneurship that could be gained through start-up education courses. The start-ups could secure good talents, which was something difficult for general start-ups, with the brand power and background of Medison in Korea. In addition, the people who experienced open innovation channel could sell their products in global markets as well as the Korean market through the Medison sales network. Furthermore, they had opportunities to do diverse businesses, as required for start-ups, by fully raising funds through Medison.

Second, the members of Medison could have indirect start-up experiences through internal corporate ventures and constant and direct exchanges with the start-ups built through open innovation channel to have diverse experiences.

4. Open innovation serial entrepreneurs

This refers to the entrepreneurs who had the experience of MEDISON open innovation strategy (spin-out, venture investment, and joint venture), and established new medial corporations.

Table 5

Medison’s open innovation serial entrepreneur list.

number	Firms	Initial Year	Relation with Medison	Founder and Others	Business Field
1	MEK-ICS	1998	Joint venture investment (c); CTO of Biosis	JongCheol Kim; a listed company	ICU monitoring system, respirator
2	Medicore	1999	Venture investment company; CEO of Median (b)	YoungShin Cho Medison's stake	Medical infrared thermograph system, cardiac output system, blood pressure gauge
3			Spinoff company (a); chief of the development team of Mediface	SeongWook Choi	Medical information cloud platform
4		1999	Division spin-out company (a); 40.0% stake in the business in 2000	DongJoo Gang	Patient monitoring system, electrocardiograph, respirometer, disposable drug infuser, electrode
5	Medical Standard	2000	Medison investment	SeongMook	Picture Archiving
			company (a)	Lee and HanYoung Hwang	and Communication System
6	M2Community	2011	Spinoff from the online sector of M2Comm(a)	DongSeok Han	SW development
			Spinoff from the marketing division of M2Comm (a)	ByeongIl Cho	Medical marketing agency, advertisement
			Spin-out from UBCARE CO., LTD (a)	ByeongChan Kim	Medical S/W management and maintenance
			Start-up from a spin-off company (a)	ManHee Gang,	EEG
			CEO of UBcare of spin-out company (a)	JinTae Kim	Health Wallet, IT-U2 Check

Source: In-depth interview result; internal material of Korea Creative Economy Research Network; Lee (2016a, 2016b); Lee and Lee (2000).

JinTae Kim, CEO of U2Bio, founded UBcare with the financial support, sales network, and brand of Medison, became an executive of SK Group, and started a new business after retirement. He said he learned many things

in Medison so he decided to found U2Bio as a new challenge after resigning from his post. In particular, the experience in founding a company through open innovation actively provides a motivation for a new business to him, and he explored a new area of business based on medical data beyond the existing company.

JongCheol Kim, CEO of MEK-ICS, worked at Medison and moved to the chief of the development team in Biosys, a joint venture investment company of Medison. He has experience in all the processes, from company establishment to product development and sales. With the experience he had in designing patient monitoring systems in Biosys, he received investment from Sein Electronics, a joint venture investor of Biosys, and developed a competitive product against Biosys. Kim also said his experiences in the Medison culture of encouraging the foundation of internal corporate ventures for three years, the participation in the establishment of a start-up through an open innovation channel-up, and the development products became a decisive motivation factor for him to attempt to start a new business. Currently, MEK-ICS is challenging to explore the respirator field, which is not developed yet in the domestic medical device sector, as well as the ICU monitoring systems. Kim said that MEK-ICS' challenging spirit was based on the experiences in the entrance into new technology fields from the open innovation strategy of Medison.

ByeongIl Cho, CEO of M2Com, a spin-out company of the marketing functional department of Medison, has extended the experiences in the strong internal corporate venture culture of Medison and his own experience in founding a start-up through an open innovation channel. The internal corporate venture fostering program of Medison inspired his spin-out strategy that prevents middle-standing entrepreneurs with competence from leaving their companies, but maximizes their competence and increases their corporate profits. He enables DongSeok Han, who led the same sector by separating M2Community as a spin-out company from the software development department of M2Comm, to upgrade the company to the next level. Cho said that he aggressively expanded the medical marketing sector and founded Innoen and became its CEO by separating from the company, but would appoint a person who leads the same field as its executive in the near future and advance the company further. Cho's strategy of serially founding a spin-out company of M2Com implemented the goals of the spin-outs of functional departments and the strategies of expanding and deepening the business of Medison.

SeongWook Choi of IRM worked at Medison and founded a joint venture company, called Mediface, at age 29. He said that the internal corporate venture training and open innovation culture of Medison, and the experience in founding companies through an open innovation channel in his 20s naturally led to his foundation of the company. He continuously mentioned that Medison's weekly meeting, quarterly workshop, and management strategy meeting allowed members to naturally have ownership, and internal corporate venture and start-up culture. IRM makes medical data cloud platform. Choi learned the innovation culture of openness and sharing among members from Medison, and develops it in his company.

As shown in Table 4, eight open innovation serial entrepreneurs come from the spin-outs of Medison and the two other entrepreneurs also worked at Medison and learned indirect experiences through the internal corporate venture program and direct experiences through an open innovation channel to start a company.

5. Direct serial entrepreneurs

Professor MinHwa Lee, founder of Medison, Korea Creative Economy Research Network, and Korea Venture Business Association, said that the internal corporate venture activation culture of Medison was an unavoidable choice to compete with global companies such as GE, Siemens, and Toshiba. He thought that the only way that Medison could survive in the global market, considering its size and capability, was to make each member of Medison as an entrepreneur. When core business begins to flag, corporate entrepreneurship offers one increasingly potent solution (Wolcott and Lippitz, 2007). Lee said that Medison selected a model similar to that of Google among four corporate entrepreneurship models such as the enabler, the producer, the opportunist, and the advocate. Suffice to say, Medison provided funding and senior executive attention to prospective projects. Medison formed its organization with internal business development teams, that is, internal corporate ventures, as much as it could in functional departments such as sales, production, promotion, financial management, and planning control, as well as product departments such as X-ray and MRI divisions. The basic spirit of the internal corporate venture system of Medison is to separate a company in a company and encourage the reliable management to have entrepreneurship and develop the self-interest that may be generated through corporate competitiveness for the company (Lee and Lee 2000: 116).

One of the characteristics of the internal corporate venture system of Medison is that the company fully embraces failures. Lee strongly expressed his willingness to accept and embrace new attempts and failures through internal corporate ventures. An executive engagement is essential for employees to trust that the process of corporate entrepreneurship is being taken seriously and that good ideas will indeed be developed and commercialized

(Wolcott and Lippitz, 2007).

The professor founded the Korea Venture Business Association while socially extending the internal corporate venture system and the federal system of ventures of Medison, and led the activation of the Korean venture ecosystem. Furthermore, he established Korea Creative Economy Research Network and focused on consulting and started projects to spread the openness and sharing culture of open innovation.

Table 6
Medison's direct serial entrepreneur list

number	Firms	Initial Year	Relation with Medison	Founder and Others	Business Field
1	Medical Supply	1989	Initial member of Medison	GwangMin Kim	Medical device
	Mediana MEDINUS CO., LTD		Worked at the overseas sales team of Medison	MoonJong Gil	Patient monitor, vital sign monitor, AED
	Unitek Co., LTD.		?	YoungJong You	Disc decompression system
	Mega Medical		?	ByeongChang Kim	ENT unit, obesity treatment
	Isol Technology INC.		?	HongGyu Lee	Radiation equipment manufacturing
	Inbus (renamed from Korea ERP System			ByeongYoon Ahn	System SW development and distribution
	CU medical Systems, INC		?	HakRok Na; a listed company	Automated external defibrillator, external defibrillator
	Bistos			HuJeong Lee	Fetal monitor, incubator, fetal Doppler, phototherapy
	Gru I&I		Worked at the planning team of Medison	ManSeok Go	Venture investment company
	Meditech			BoongHan Kim	Medical device module, medical device keyboard
	Hubidic Co., LTD.			JaeHo Shin	thermometer, blood pressure measuring devices, low-frequency stimulator

	Bionics Co., LTD.			DaeSeong Kim	Patient monitoring system, fetal heart rate monitoring system, electrocardiograph
	UTB Co., LTD. (renamed to Sono Solution)		Worked at Medison	YoungJae Cho	Ultrasound diagnostic units for medical use
	Korea Venture Business Association			MinHwa Lee and Joon Jeong	Support of ventures
	Biosoundlab			CheonJeong Park and SeongWoo Lee (Medison)	Hearing aid
	Votem			MoonSeok Gang, SoonSik Park (Medison)	Patient monitor, pulse oximeter
	Mediconet			YongDae Han	Hyperbaric oxygen therapy, camera for medical use
	Eurasian Network	2008	Former CEO of Medison	MinHwa Lee	Publication and academic project
19	Smartcareworks Co. LTD.	2010		JeongBeom Cheon	SW package for medical use
20	Waygence Co., LTD.	2011		CheonJeong Park and DoAhn You (Medison)	Exploring new markers through technical convergence of medical devices
21	Korea Creative Economy Research Network	2013	Former CEO of Medison	MinHwa Lee	Academic projects for medical management research project collaboration with governmental agencies
22	Han Sono	2015		SangBeom Gye and YoungBae Lee (Medison)	Digital stimulator for medical use
23	Hearlthpia extinguished				Medical device

Source: In-depth interview result; internal material of Korea Creative Economy Research Network; Lee (2016a, 2016b); Lee and Lee (2000).

MoonJeong Gil, CEO of Mediana, founded the company based on the experiences in the overseas sales team of Medison, and the firm is growing as a global company in the patient monitoring field. He entered Medison upon returning to Korea after just starting his doctoral course in the United States. He could identify the current conditions of the global IT medical device sector while being engaged in overseas sales and founded a company based on his know-how of the market. In addition, the sales network of Medison was helpful for his business in its early stage of growth. The experiences of the internal corporate venture culture of Medison and the spin-out of the overseas sales team to Meditech in Medison encouraged him to start a company. Gil's experiences in Medison

became the driving force for the open innovation-based technology accumulation and product development such as the technology accumulation through the import, sales, and repair of overseas medical devices and ODA, its R&A and product development, and related business diversification.

ManSeok Go, who founded Gru I&I, helped MinHwa Lee, founder of Medison, to do a venture investment and a joint venture in the planning team of Medison. With his experiences from Medison, he has operated a venture investment company for 15 years. He said that his experiences in focusing on the three sectors (medical, bio, and IT fields), creating mutual synergy, and implementing the Transcendental-Live Firm strategy in Medison were the sources of his venture investment project. He continuously mentioned that motivating each member to implement independent entrepreneurship gave an opportunity for him to join Medison after leaving a stock company. He maintains his main businesses based on the investment, network, and consulting for the companies invested in by Medison, as led by the founder.

There are several Medison-based companies, directly checked through interviews and literature studies by the research team. As shown in Table 6, there is one firm in the 1980s, five in the 1990s, 12 in the 2000s, and 4 in the 2010s. Of course, there is a previous study saying that about 50 companies originated from Medison. Until 2010s and beyond 2003, the Intra-Venture policy and the foundation through open innovation, led by MinHwa Lee, founder of Medison, were operating channel start-ups. Medison Mafia founders, as well as Medison-based company entrepreneurs, spoke with one voice that said that around 100 serial entrepreneurs had been created from Medison with just a total of 300 employees because they have direct/indirect experiences in start-up training and open innovation channel start-ups through the internal corporate venture system.

6. Conclusion

6.1. Discussion

6.1.1. The way to successful serial entrepreneur

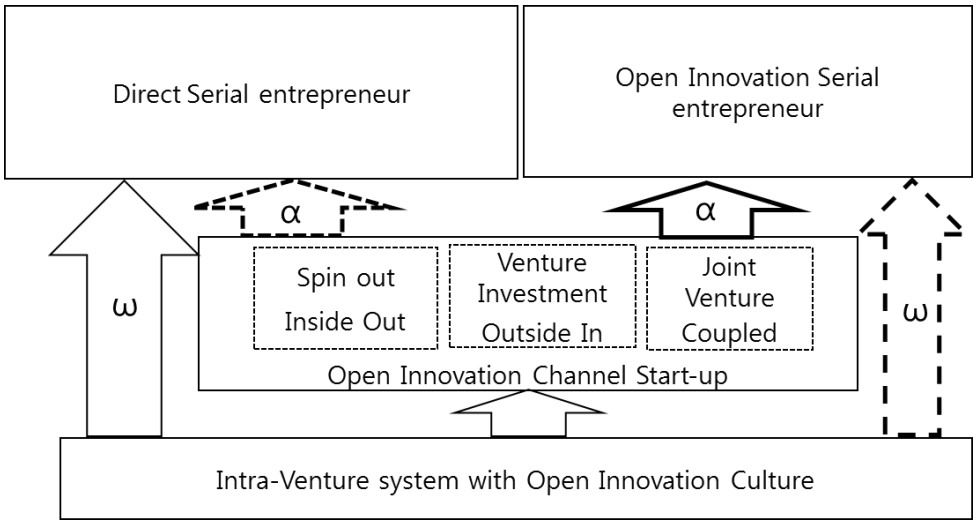

Fig. 2. Serial Entrepreneur Trigger Model: Open Innovation (α) with Intra-Venture (ω).

Even though about 300 people worked at Medison and the internal corporate venture system and the foundation through an open innovation ended around 2003, about 50 serial entrepreneurs were founded according to our study, and about 100 according to the analysis of previous studies (Lee 2016: 32). In this study, we found that there are two factors of the significant emergence of serial entrepreneurs from Medison. The first one is the open innovation culture-based strong intra-venture system. Even a functional department as well as a business department or a project department was operated as an almost independent corporate under the internal corporate venture system where the market economy principle was operated. This internal corporate venture system was operated based on the strong open innovation culture with value sharing, information sharing, and profit sharing. The open innovation culture of Medison was strongly linked with the internal corporate venture system through the book *Medison Culture*, the internal electronic newspaper called *Medison Live*, the quarterly workshops held

with all departments, and the management strategy meetings held semi-annually.
As shown in Figure 2, the activation of open innovation was combined with the strong Intra-Venture system linked with the open innovation culture that triggers both the direct serial entrepreneur and open innovation serial entrepreneur. The open innovation culture based Intra-Venture system, firstly, promoted the emergence of open innovation channel start-ups. Then the employees trained under the Intra-Venture system indirectly experienced start-up foundation while seeing the emergence of open innovation channel start-ups and could become a direct serial entrepreneur based on the experiences made in their functional departments.
The members who joined an open innovation channel start-up directly experienced all processes of a start-up foundation through the resources, human resources, and marketing networks provided by Medison, and became an open innovation serial entrepreneur based on the knowledge learned from the previous Intra-Venture system. The start of the path toward a successful serial entrepreneur, α, is open innovation, and the end, ω, is the open innovation culture-based Intra-Venture system.

6.1.2. The system to control open innovation motivation complexity

Open innovation leads to a new emergence; that is, a creative business model or a new successful business company, only after the complexity that triggers a new combination between technology and market (Yun et al., 2016). In the case of Medison, the strong open innovation led to multiple complexities. First, the overlapped business areas between open innovation channel start-ups caused conflicts. The collision and excessive competition because of the overlapped business areas emerged more strongly when serial entrepreneurs continuously increased. Second, there was a lack of feedback on the profits generated by various serial entrepreneurs from functional and business departments. In particular, as the profits generated by open innovation channel companies were low, Medison did not give enough feedback. In addition, the system that their profits should be sent as a feedback to the profits of Medison was not established. The two factors became a strong force of the complexity caused by open innovation and bankruptcy.
It was also shown that the systematic system to decide an open innovation channel start-up was not established, compared with its performance, and that an ideal open innovation culture of Medison was not systematically implemented in the company.
Open innovation is a strong way to have creative business models and new companies with a new mergence, but always causes complexity (Witt, 2017). When formulating and implementing an open innovation strategy, the system of decreasing and preventing complexity should also be established. In addition, an institutional strategy to maximize the effect of open innovation and reduce complexity should also be considered under the national innovation system. In 2000s, the enterprise value of Medison was USD 900 million and that of Medison family firms was USD 2.3 billion. However, in late 2015, the value of Medison was USD 800 million and that of Medison family firms was USD 7.2 billion. These figures show that during the receivership of Medison in 2003, there was no systematic way to control the open innovation complexity in the national innovation system of Korea (Dougherty, 2017).

6.2. Implication and future research goal

With the advent of the Fourth Industrial Revolution, the IT-based creative connection and combination between technology and market leads the explosive increase in new industries around the world. Who will entrust the triggering of start-ups for the growth of the Fourth Industrial Revolution businesses such as autonomous vehicles, smart farms, smart grids, intelligent robots, precision personalized medicine, smart cities, and high performance UAVs? This study suggests a way of successful serial entrepreneurs toward start-ups in response to the Fourth Industrial Revolution. In particular, as a response to a new business to the revolution while IT spreads across all industries, existing companies need to have the internal Intra-Venture system with the open innovation culture and the spread of the culture. In addition, it is necessary for companies to promote the entrance of new businesses through the open innovation channel start-ups by themselves, and prevent the complexity of open innovation for the serial entrepreneurship of members. Furthermore, the systems to maximize the effect of open innovation and minimize its complexity should be built under the national innovation system.
As a follow-up study, first, the strategy and channel of open innovation need to be determined, which improve serial entrepreneurship and increase its success rate. For this, an analysis of panels that target serial entrepreneurs and an in-depth interview should be conducted.
Second, the conditions and processes of successfully introducing the Intra-Venture system in the cultural context of open innovation need to be studied in depth. Moreover, additional case studies should be made on the companies with the Intra-Venture system, and research should be done on the open innovation culture and channel and the design of the Intra-Venture system through the horizontal comparative research.

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6.

Model of technology selection for international science and technology cooperation

Woon-Dong Yeo (KISTI), GyeongRan Noh(KISTI), ChangHwan Lee(KISTI), DongKyu Won(KISTI)

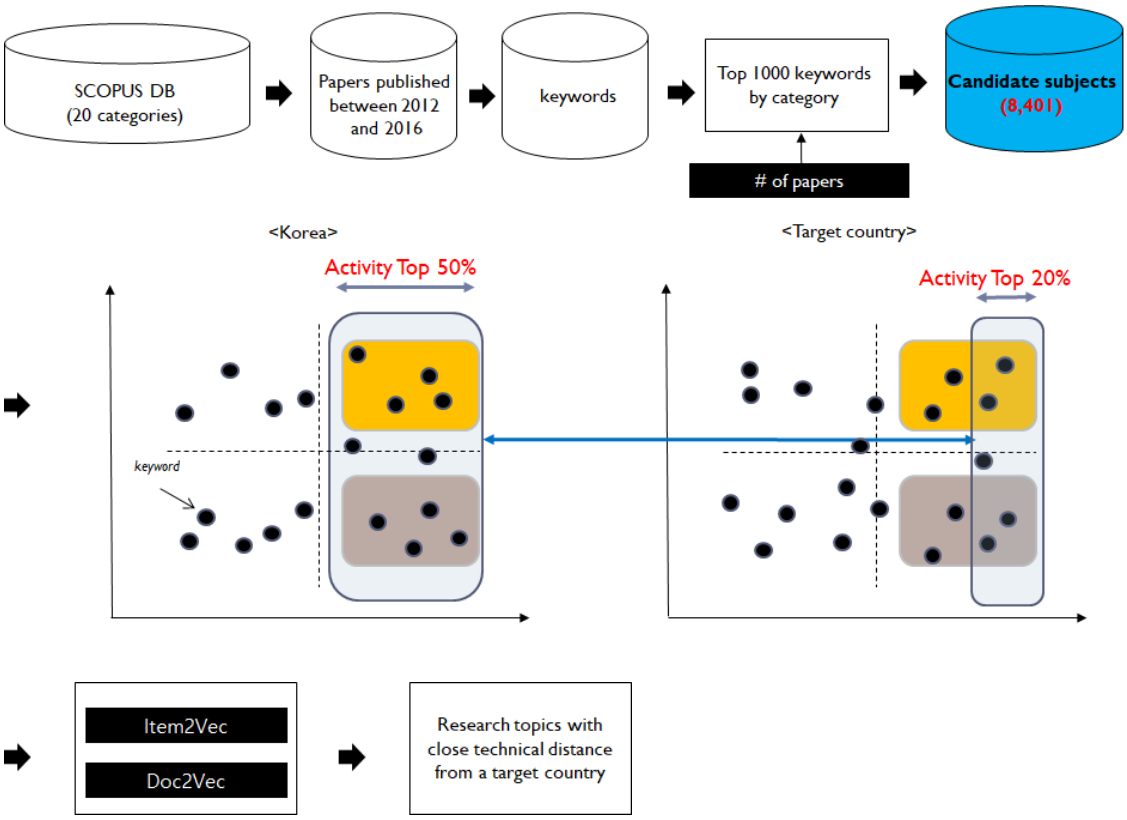
1. Objective

Science and technology are facing a big turning point of the fourth industrial revolution brought about by Big Data and artificial intelligence technology. The rapid changes in the technological environment increase the importance of information and knowledge, while the globalization phenomenon of technology is spreading and the life of new technologies is getting shorter and shorter. As a result, uncertainties and risks for new technology development are increasing, and investment for technological development is also increasing. In such an environment, international cooperation research is recognized as an important strategic tool because it is difficult to obtain a superiority in international technology competition by carrying out research and development only with the manpower and technology of one country.

One of the most important things for strategically pursuing international cooperation research is finding a research topic to cooperate with. Research on the topic of collaborative research has been mainly based on the information survey of policy institutes and opinions of scientific and technical experts. However, this type of subject search requires a lot of time and money, and the number of topics to be reviewed is limited, and the narrow knowledge and prejudice of information researchers and experts can have a wrong impact on the research results.

The Korean government is well aware of these problems based on their experiences and projects to find solutions to these problems. And the project was done by KISTI. The project uses bibliographic data from 20 science and technology categories registered in Scopus for the last 5 years. As an analysis method, not only the indies based on the Scientometrics but also the latest deep learning based algorithms have been used. The study recommended the research topics for collaboration between 234 countries and Korea. In this study, the proposed algorithm and results of the research project are introduced.

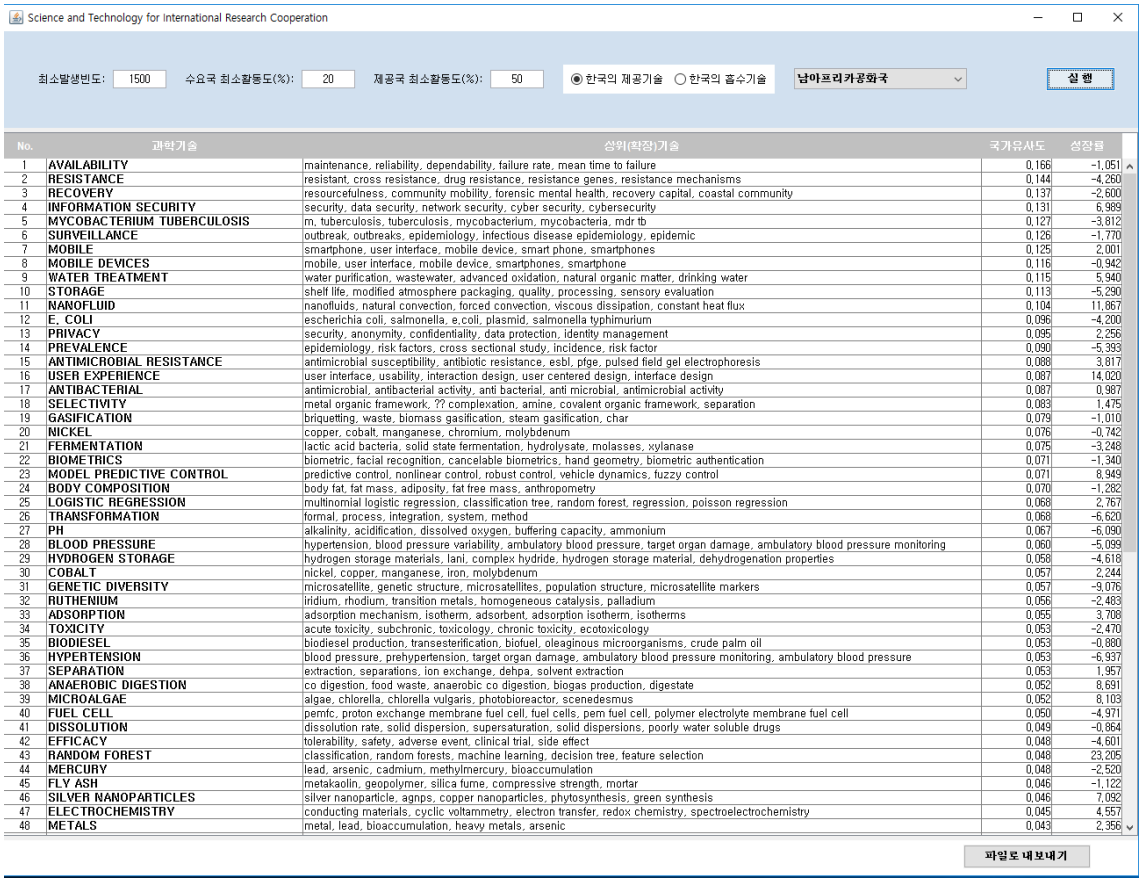
<Proposed process for research topic recommendation>



2. Research Structure

This study introduces the research project funded by the Korean government conducted by KISTI. And it recommends international collaborative research topics based on Big Data. There are two main contents. The first is the data-based analysis of whether existing collaborative research conducted in Korea is producing substantial results. The second is the algorithms proposed in the project and results of it .

<System for research topic recommendation>



3. Expected result

It suggests and introduces a method of recommending international collaborative research topic based on Big Data.

4. Implications

In recent years, some researches have been carried out to apply the recommendation system used for books and movies to the search for collaborative research topics. However, since the existing recommendation algorithms are based on finding a new similar one based on the user 's past history, it is problematic to apply it to the search of the international collaborative research topics. Since scientific and technological research is fundamentally a challenge to find new things, past joint research histories (especially success experiences) have nothing to do with current research topics.

The method of recommending research topics for international cooperation is not a merely

suggestion at the level of research, but has a policy meaning because it is a method utilized by the Korean government.

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7.

Open Innovation in the Early Development of Chaebol Conglomerates in Korea: Implications at the Intersection of Business & Culture

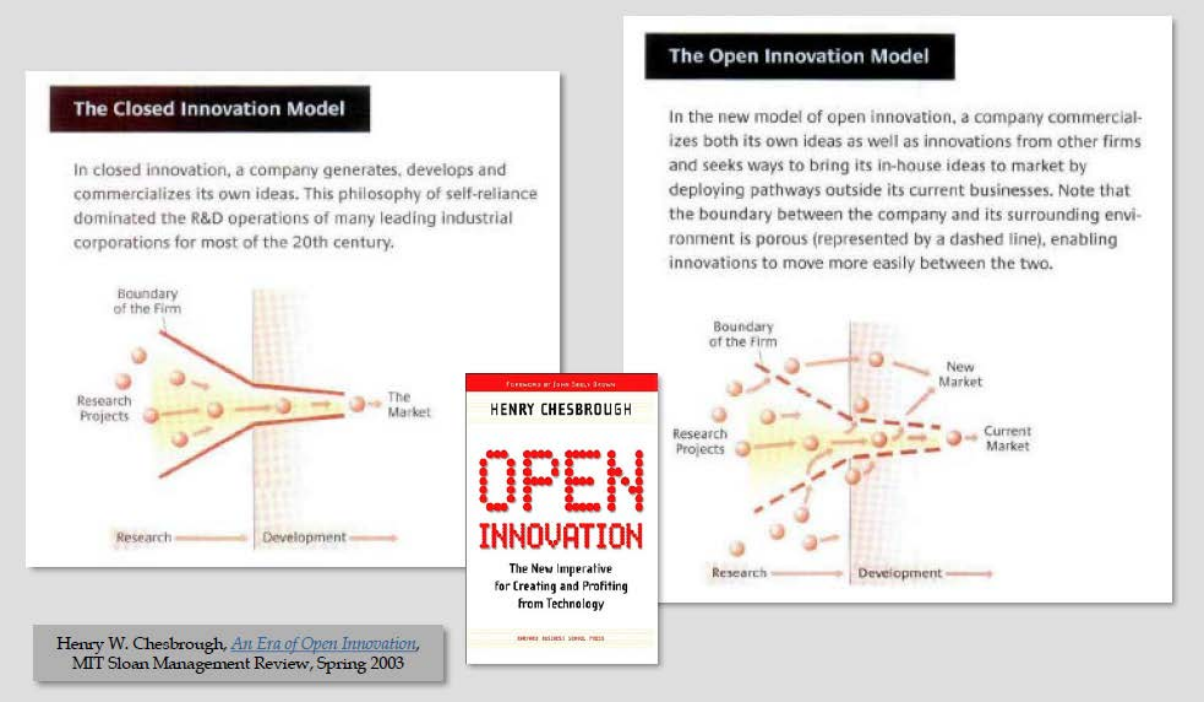
Ogan Gurel, MD

Distinguished Invited Professor, DGIST; Chief Medical Officer(Acting) at Nessa Pte.Ltd; Chair of the Advisory Board at Posture360; Chief Executive Officer at NovumWaves; Honorary Fellow at the Center for Neural Engineering, University of Melbourne; Visiting Professor at Libera Accademia Belle Arti(LABA University)

Questions

1. What is Open Innovation?
2. What is the relationship between Open Innovation & organizations?
3. Why do firms exist?
4. Is Open Innovation really new?
5. What is more important: culture or strategy?
6. What are chaebols and why did they arise?
7. What is Innovation?
8. What is the most important catalyst of Open Innovation?

What is Open Innovation?



Open Innovation 2.0

1. Measures of Open Innovation

1.1. "Width" & "Depth"

1.2. Combined measures

1.3. Patent-based analyses

2. Dynamics of Open Innovation

2.1. Economic systems

2.2. Growth dynamics

2.3. Open vs. Closed Innovation Economies

3. Open Innovation Policies

3.1. SMEs, "Big Business",

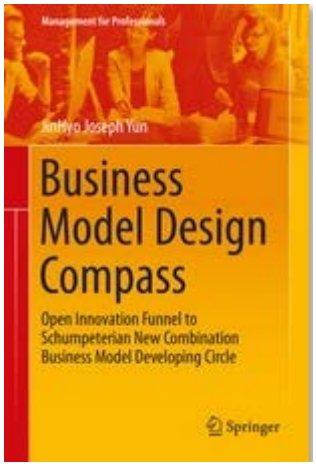
Social Entrepreneurs, Governments

4. Open Innovation Strategies

4.1. Product Life Cycle

4.2. Open Innovation Attitude

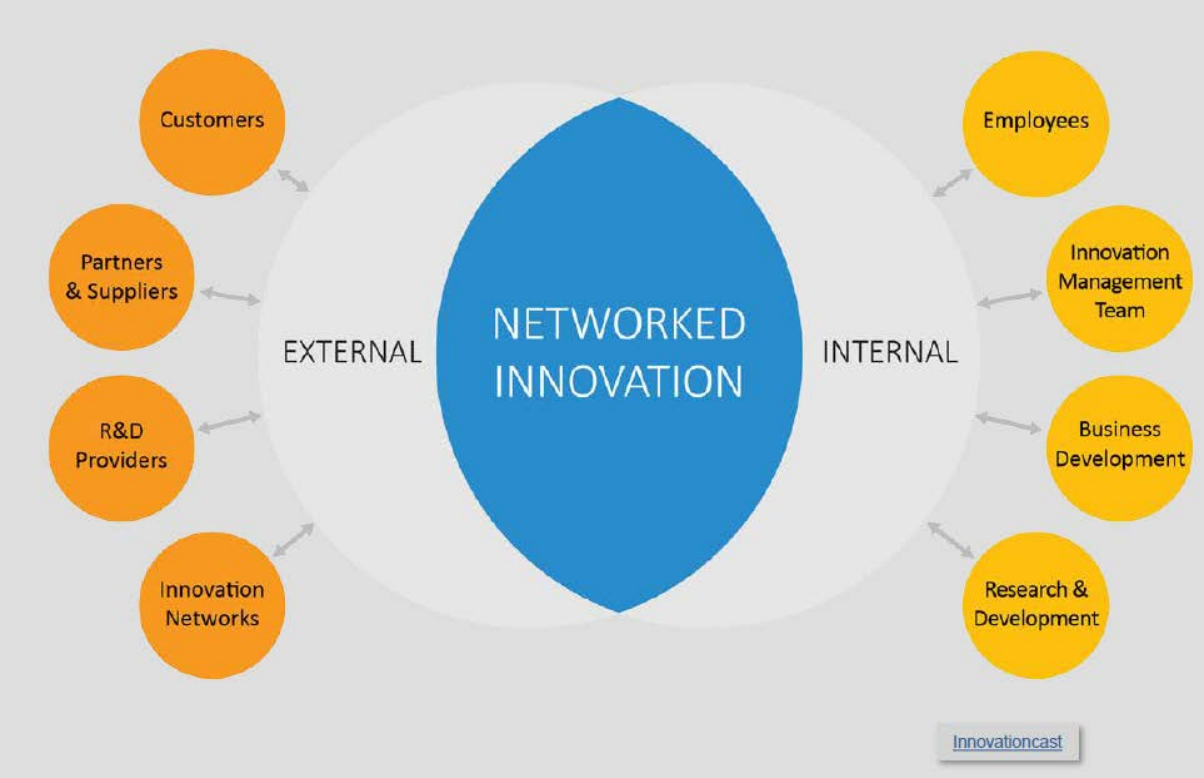
4.3. OCE model: evolutionary change



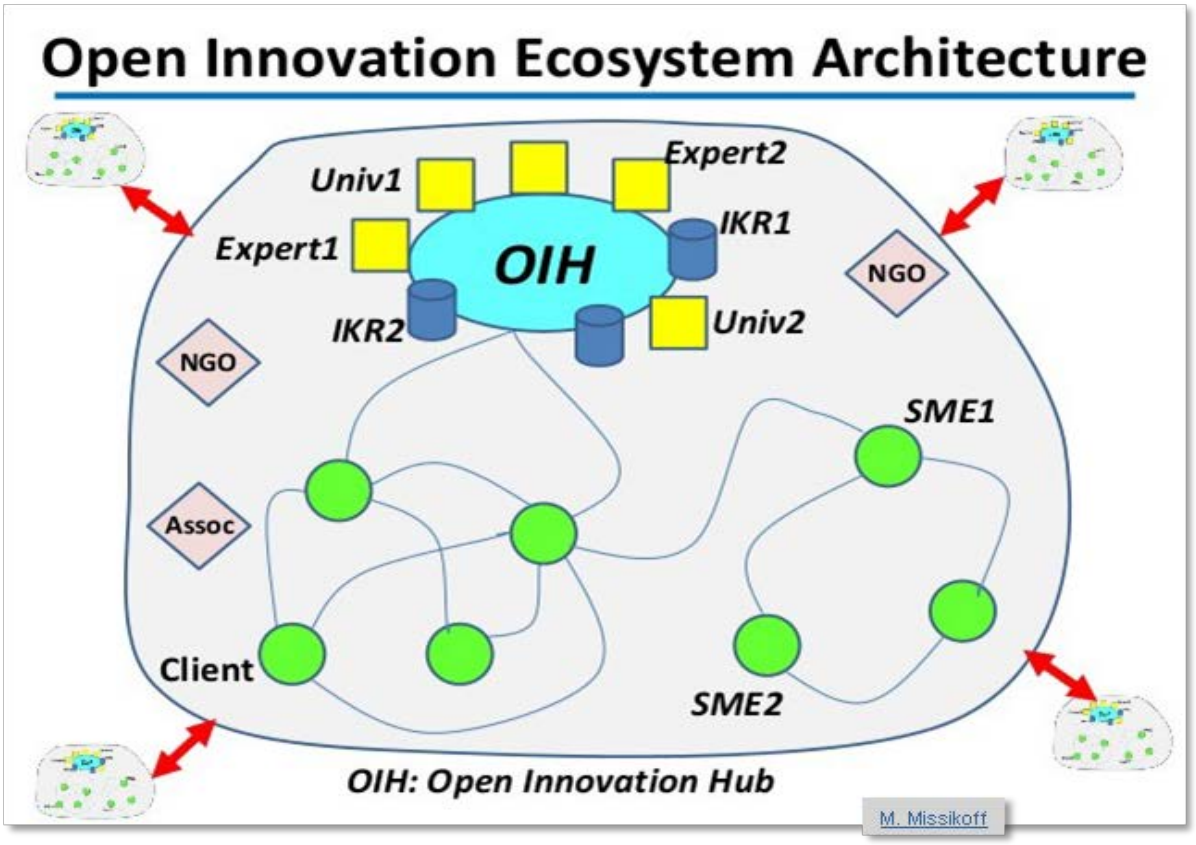
Core Element of Open Innovation is SMEs.

Innovation Attitude

Internal & External side to “Networked Innovation”



External side: Innovation hubs



Internal side: Decentralization, etc.

Information Technology and Quantitative Management (ITQM 2016)

The Effect of Organizational Structure on Open Innovation: A Quadratic Equation

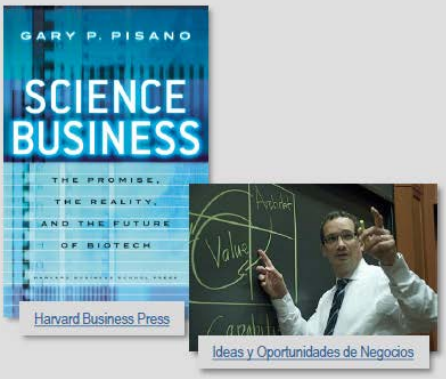
Junyeong Lee[a], Jinyoung Min[b,*], Heeseok Lee[a]

[a] College of Business, KAIST, Seoul, Republic of Korea
[b] College of Business, Chosun University, Gwangju, Republic of Korea

Procedia Computer Science 91 (2016) 492 – 501

Our study confirms the effect of decision-making structure on open innovation using data from 2,811 open source projects. The analysis results show that, first, both inbound and outbound open innovation increase as the decision-making structure becomes more decentralized. A decentralized structure reduces the probability of omission errors (the rejection of good suggestions) and increases the probability of commission errors (the acceptance of bad suggestions) [34]. Despite this tradeoff, decentralized decision-making is found to enhance both inbound and outbound open innovation, showing that omission errors are more critical for open innovation than commission errors because open innovation is still encouraged even though commission errors may occur under decentralized structure. The finding also implies that exploration, which is related to omission errors, is more important in open innovation than exploitation is.

Organizational Innovation



"Major epochs of technological innovation have always been *linked* to transformational innovations in organizational forms and institutional arrangements. For example, about 150 years ago, the creation of rail and telegraph systems gave rise to the modern corporation, which separated ownership (shareholders) from salaried) management."

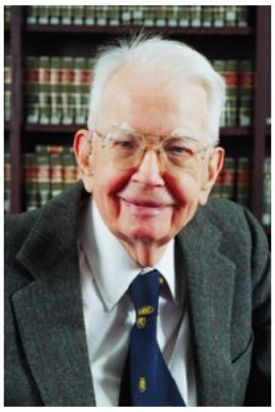
The evolution of science-based business: innovating how we innovate

Gary P. Pisano*

Industrial & Corporate Change (2010), 19(2):465

Science has long been connected to innovation and to business. As early as the late 19th century, chemical companies, realizing the commercial potential of science, created the first industrial research laboratories. During much of the 20th century, large-scale business enterprises like DuPont, GE, Westinghouse, IBM, Kodak, Xerox (PARC), and AT&T (Bell Laboratories) created in-house labs capable of first-rate basic scientific research. In recent decades, however, the connection between science and business has begun to change in important ways. While the corporate lab declined, new "science-based businesses" in sectors like biotech, nanotech, and energy emerged. Universities also became active players in the commercialization of science. In short, science has become a business. This essay examines the institutional and organizational challenges created by this convergence of science and business through a Chandlerian lens. It highlights three fundamental challenges of science-based businesses: (i) managing and rewarding long-term risk, (ii) integrating across technical disciplines, and (iii) learning. Whereas these challenges were once managed inside the boundaries of corporate R&D labs—under the auspices of Chandler's visible hand—today the invisible hand of markets increasingly governs them. An assessment of this form of governance against the requirements of science-based businesses suggests a gap and a need for organizational innovation.

Why do Firms Exist?



Ronald Coase

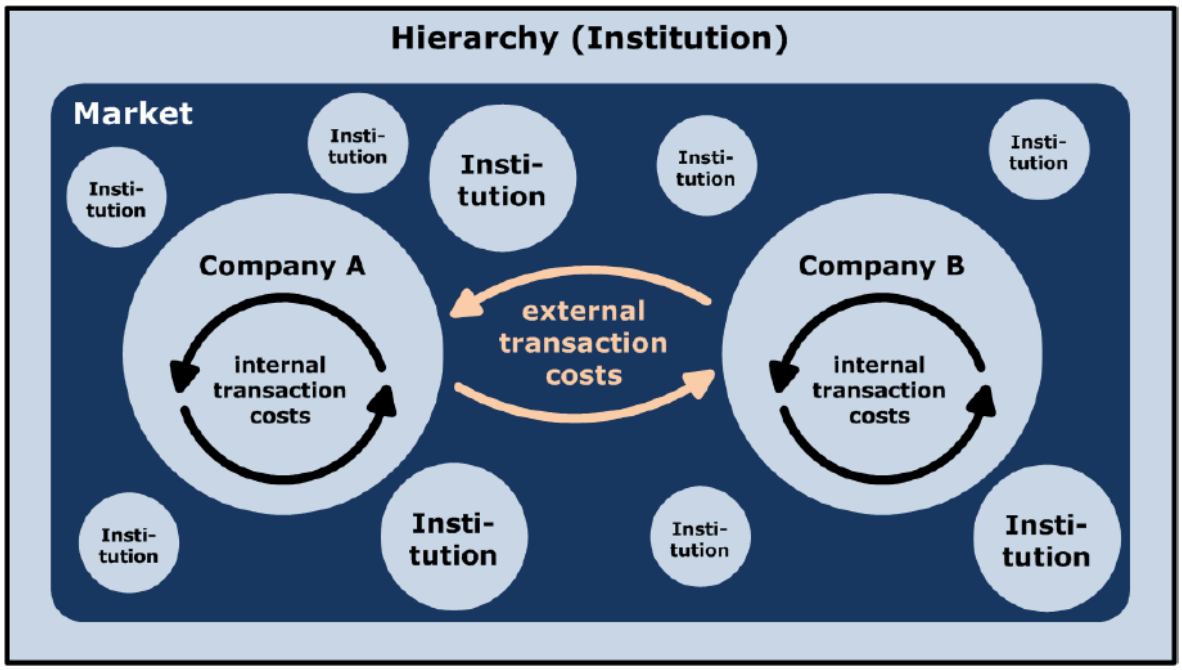
First codified by **Ronald Coase** in is 1937 work entitled *The Theory of the Firm*. Purpose was to **explain** and provide a **theoretical construct for primary economic unit of business/industry ("the firm")**.

Coase addressed and provided a framework for understanding:

- Why do firms exist?
- How are they organized?
- How do they behave?
- How do they interact with market and other market participants?

Source: David Dismukes, LSU, 2014

Transaction Cost Theory



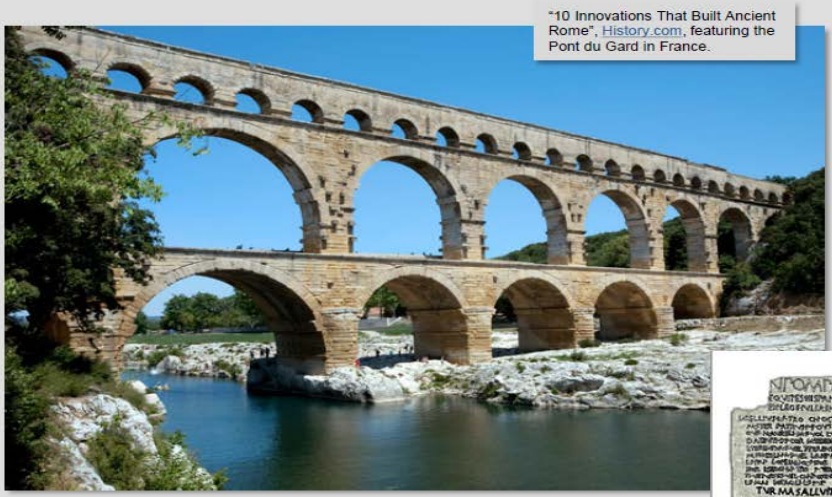
Source: David Dismukes, LSU, 2014

Transaction Cost Theory Ⅱ

- **Transaction costs**: the costs of negotiating, monitoring, and governing exchanges between people
- **Transaction cost theory**: a theory that states that the goal of an organization is to minimize the costs of exchanging resources in the environment and the costs of managing exchanges inside the organization

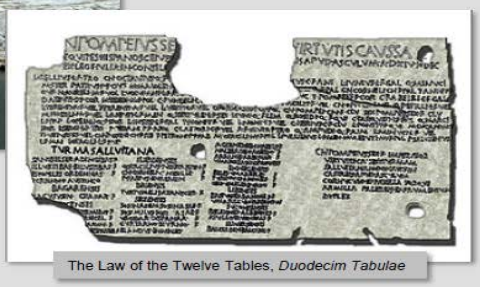
Source: Gareth Jones, *Organizational Theory, Design and Change*, 2007

Rome: The Original Open Innovator



"10 Innovations That Built Ancient Rome", History.com, featuring the Pont du Gard in France.

- Concrete
- Newspapers
- Welfare
- Bound books
- Roads
- Arches
- Julian Calendar
- Roman Law
- Battlefield surgery



The Law of the Twelve Tables, *Duodecim Tabulae*

Asian Western culture

1. Relationship vs. Transactional
2. High-context vs. Low-context

The Key Problem

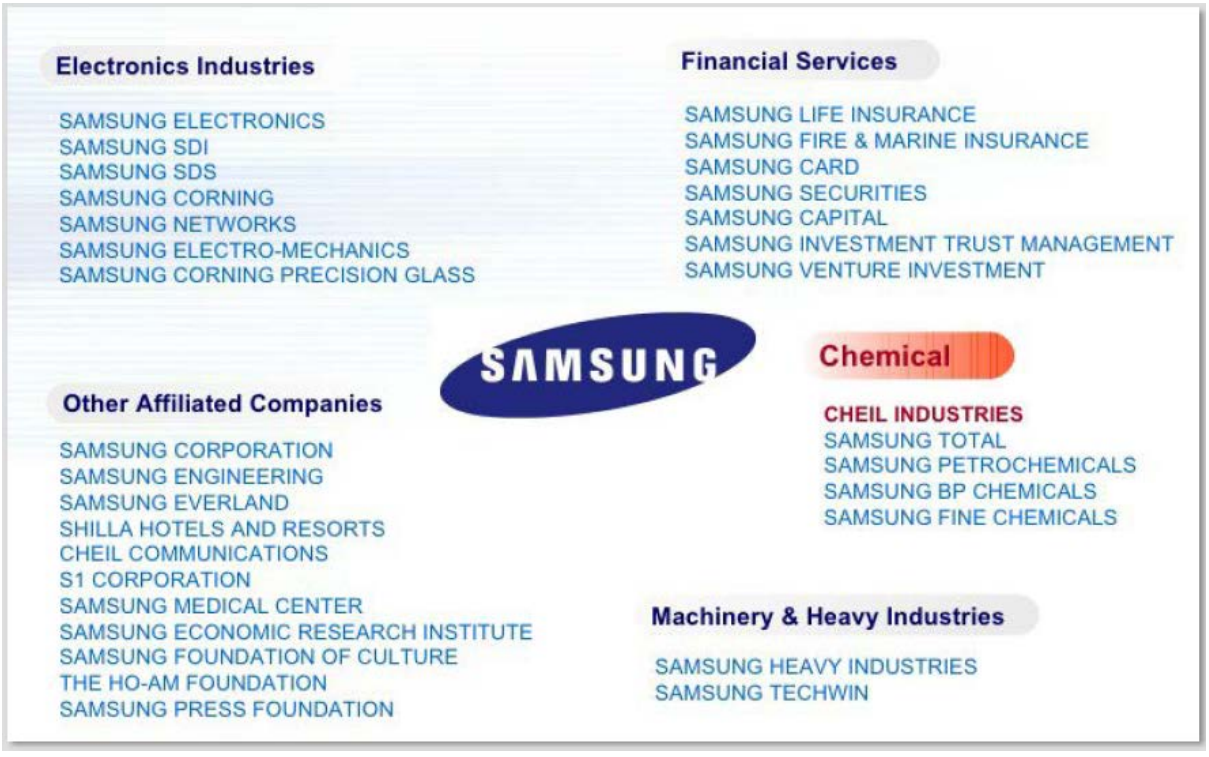
How do you reduce transaction costs in a highly relationship-based culture?

What are Chaebols?

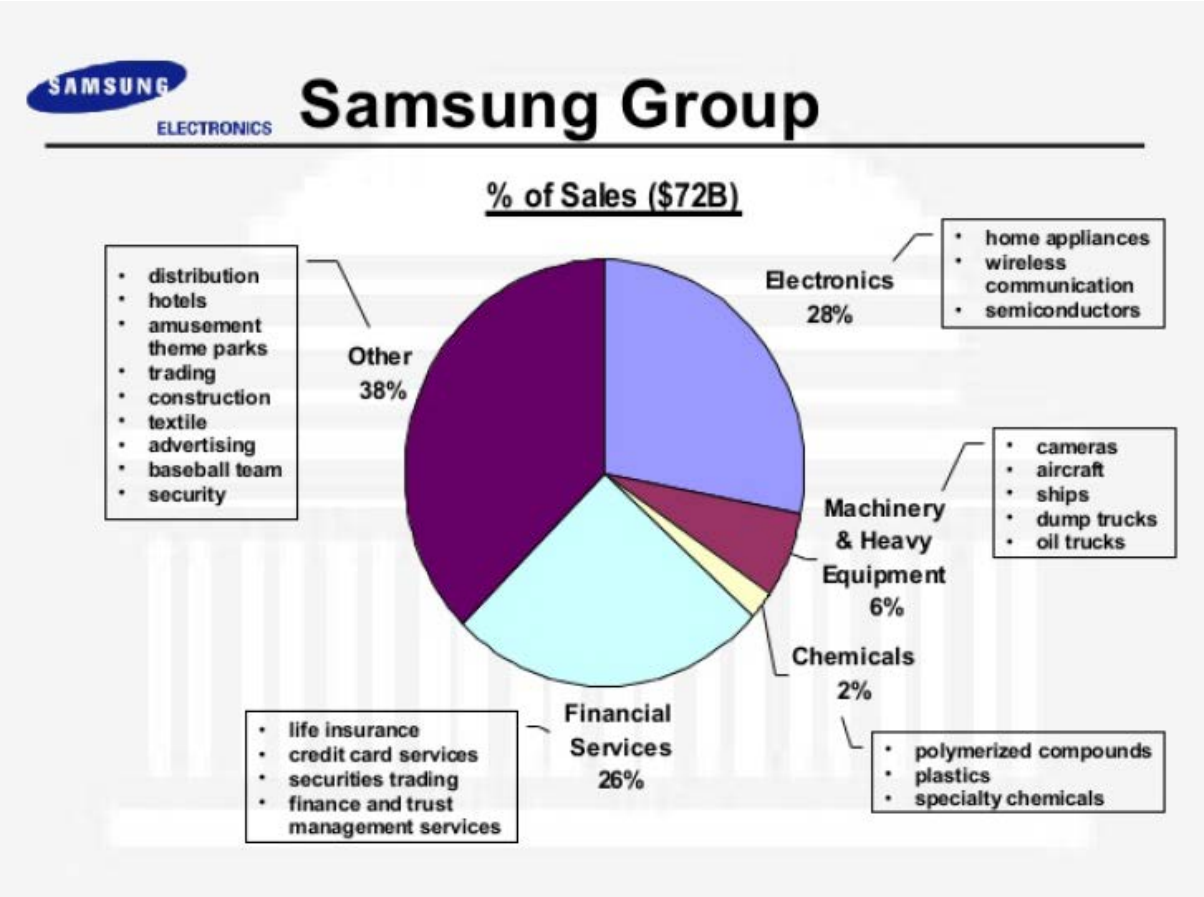
A **chaebol** (/ˈtʃeɪ.bɒl/ ***TCHAY**-bol*;[1] /ˈdʒɛ.bəl/ ***JEH**-bəl*;[2] from Korean *jaebeol* [tɕɛ.bʌl] (listen)) is a large industrial conglomerate that is run and controlled by an owner or family in South Korea.[2] A chaebol often consists of a large number of diversified affiliates, controlled by an owner whose power over the group often exceeds legal authority.[3] The term is often used in a context similar to that of the English word "conglomerate".[*citation needed*] The term was first used in 1984.[2] There are several dozen large Korean family-controlled corporate groups which fall under this definition.

Chaebol by each Groups	Won	Euro	Total Assets	Industries
Samsung Group	221 trillion	180 billion	317.5	Electronics, insurance, card, construction & shipbuilding
LG Group	115 trillion	94 billion	69.5	Electronics, insurance, chemicals, telecom & trade
Hyundai Kia Automotive Group	107 trillion	87.5 billion	128.7	Motors, steel & stock
SK Group	105 trillion	85.85 billion	85.9	Energy, telecom, trade, construction & semiconductors
GS Group	49.8 trillion	40.7 billion	39.0	Energy, shopping & construction
Lotte	41.4 trillion	33.85 billion	54.9	Construction, food, energy, Hospitality & Shopping
Hyundai Heavy Industries Gp	31.3 trillion	25.6 billion	42.8	Heavy industry (including Hyundai Mipo Dockyard)
Hanwha	27.24 trillion	22.27 billion	75.7	Explosives, chem, insurance
Hanjin	26.1 trillion	21.34 billion	29.1	Korean Air, Jin Air, shipping, heavy industry
Kumho Asiana Group	23.4 trillion	19.13 billion	43.9	Asiana Air, Air Busan, construction, petrochemical, tire
Doosan	21.4 trillion	17.5	32.7	Heavy industry, atomic energy[26]

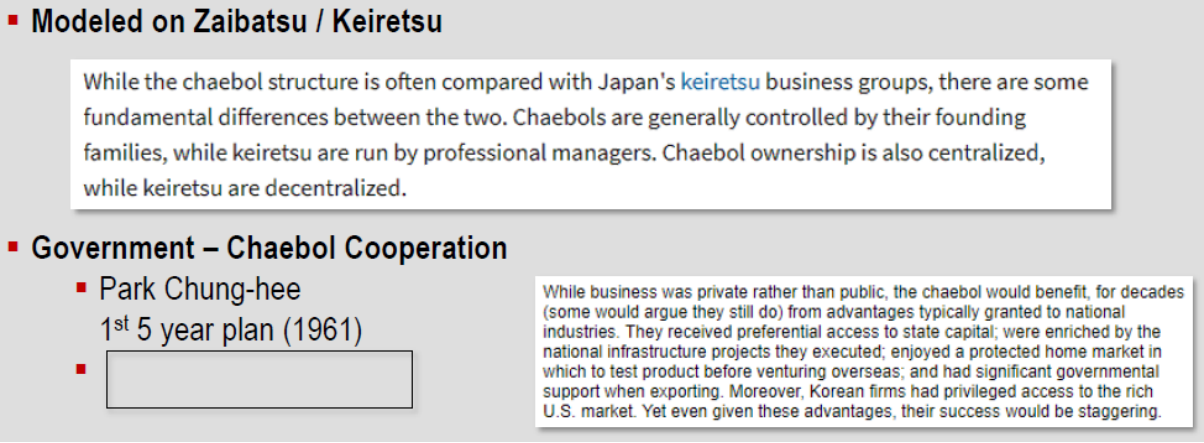
Samsung Group Affiliates



Samsung Group by Function



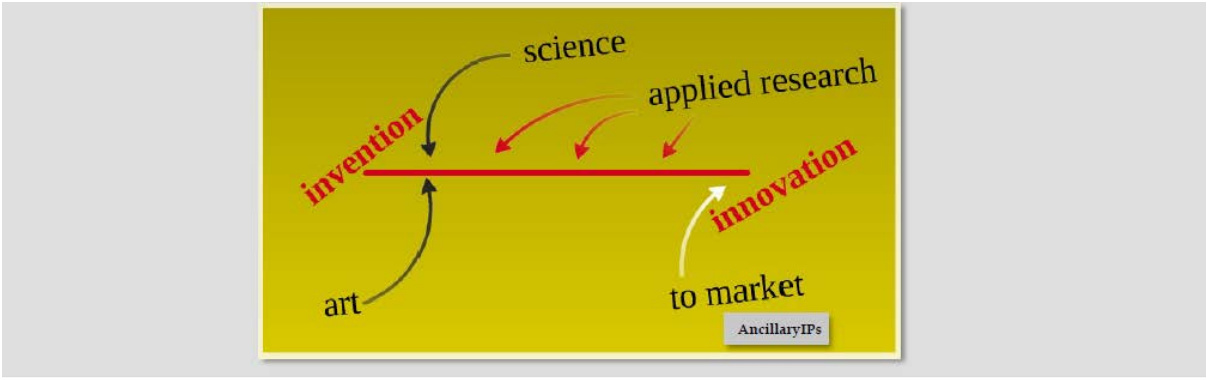
How did the chaebol arise?



What is the real reason?

THE HYPOTHESIS: Chaebols developed, gained strength, were sustainable and remain significant because they reduce transaction costs that arise from a strongly relationship-driven culture

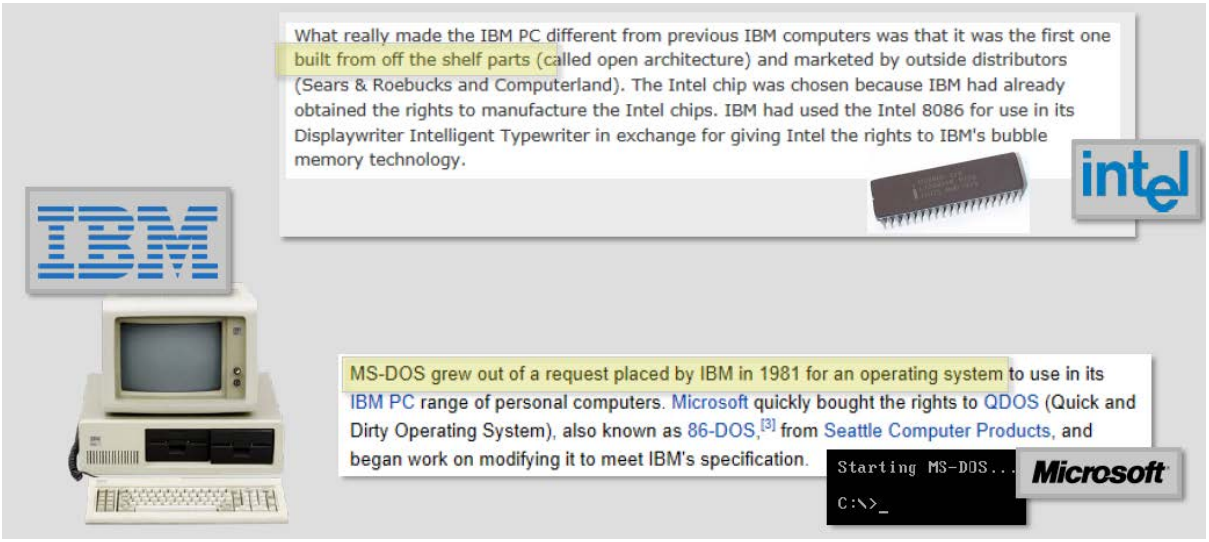
What is Innovation?



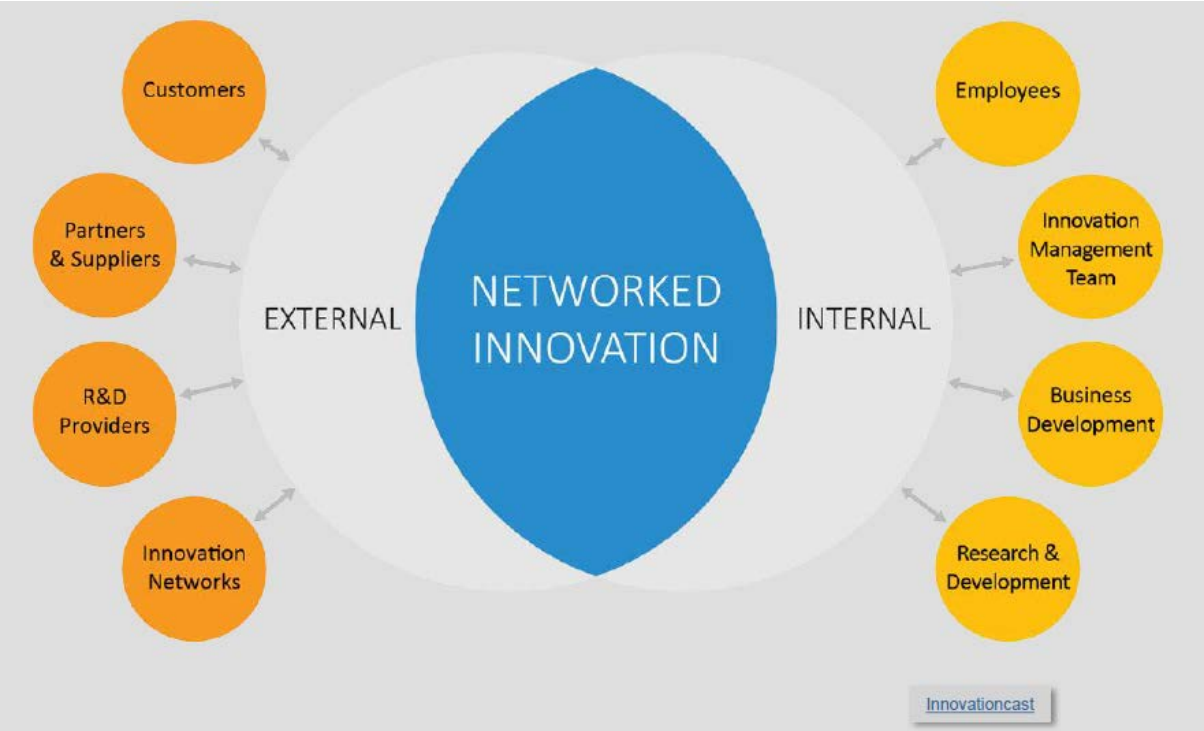
Invention refers to the discovery or creation of a new idea. It is usually the work of an individual. Invention is, by definition, ***outside*** of reality.

Innovation refers to the combination of inventions and/or institution of processes around a core invention. Innovation is typically the work of groups – not individuals – since a variety of capabilities and resources are required. Innovation, by definition, takes invention ***into*** reality.

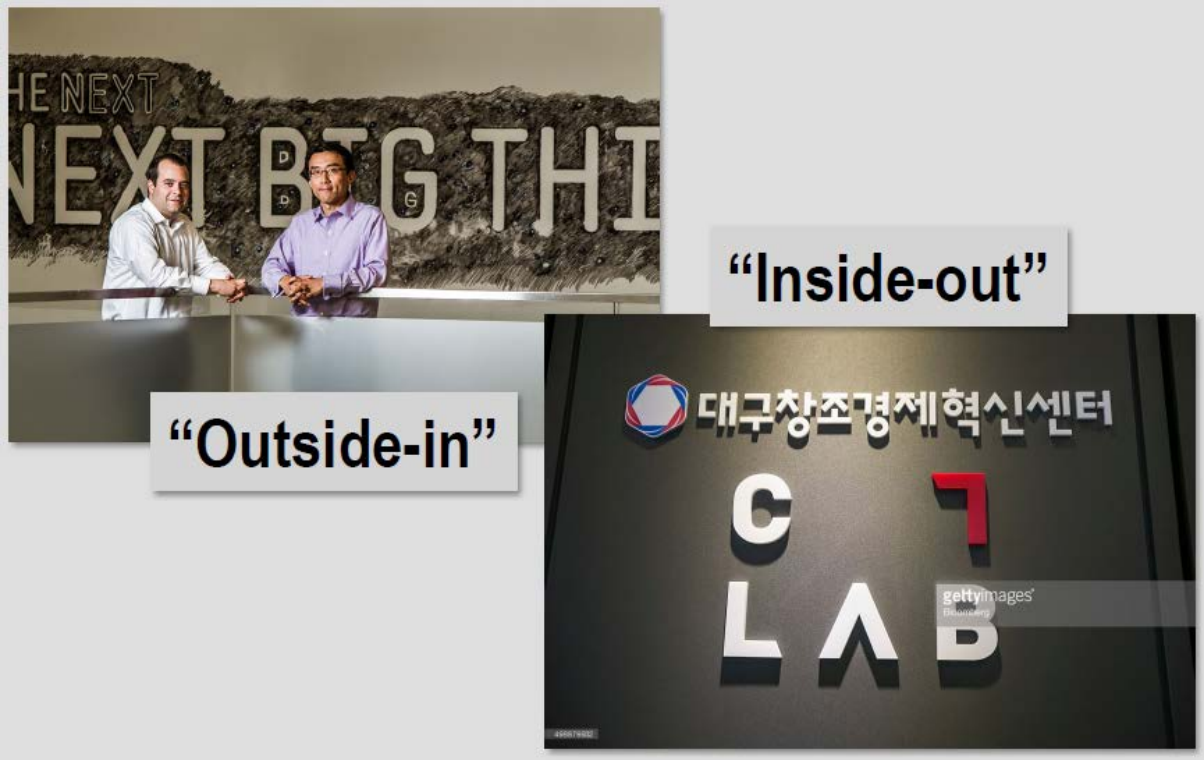
Back to Open Innovation



The Chaebols were also Open Innovation “hubs”



The “new” Samsung Open Innovation is about interacting “outside the system”



Implications- Open Innovation is about Culture

1. Open innovation is fundamentally about organizational structure
2. Organizational structure is ultimately about transaction costs
3. Therefore, any theory of open innovation must involve a consideration of transaction costs
4. Culture plays an important role in transaction costs, particularly among “unrelated” individuals
5. Therefore, the most powerful catalyst for open innovation are cultural changes
6. Of course, these are among the most difficult to achieve

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8.

Towards increasing affective commitment of partners in SME strategic networks

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Anna Nosella
Associate Professor, University of Padova, Italian

Karen Venturini
Assistant Professor, University of San Marino, Italian

Abstract (2000-2500 words)

Purpose/ Research Question: Despite the increasing number of strategic networks recorded in the last years, many of them still fail. Consequently, researchers (e.g. Agostini et al., 2016) have started to examine the effective management of networks and their performance; in this perspective, behavioral aspects such as trust, conflict management and resolution, and commitment have been investigated as fundamental antecedents of network performance (Christoffersen, 2013). Among these elements, commitment has received little attention from scholars as the recent literature review carried out by Gomes et al. (2016) has shown, particularly in the context of SME strategic networks. SMEs strategic networks, composed of multiple, legally independent partners (both horizontal and vertical), are loosely coupled systems in which the polycentric spread of the make decisions' authority creates ambiguous and uncertain situations for the network members (Winkler, 2006). In these contexts, it is therefore important to cement relation between partners through commitment.
Commitment has been mentioned among the behavioral elements that play a major role in enhancing strategic network survival and performance (Roxenhall, 2011; Christoffersen et al., 2013). At the same time, considering the coordination problems, one cannot assume that high levels of commitment will occur naturally (Perry et al., 2004). Therefore, it is important to understand how partners may achieve high levels of commitment in SME strategic networks, because the high degree of complexity inherent when multiple partners are involved prevents us from simply extending findings from studies of dyadic or hub driven networks to the SME strategic network domain (Agostini et al., 2015).
Furthermore, achieving commitment is not an "on/off" condition, but it implies a change based on the dynamic evolution of other conditions over time. Hence, this article aims to unveil how partners may increase their level of commitment along the network development process in the SME context. More particularly, we focus on affective commitment based on the rationale that different components of commitment (i.e. affective, calculative, normative) are associated with different types of collaborative outcomes and affective commitment has been identified as the main component through which network performance might be increased (Clarke, 2006). On such basis, this article intends to answer the following research question: *how can affective commitment be increased along the strategic network development process in the SME context?*

Key Literature Reviews (About 3~5 papers): The term commitment at the inter-organisational level was theorised by Morgan and Hunt (1994) in their "Commitment-Trust theory". They defined relationship commitment "as an exchange partner believing that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship is worth working on to ensure that it endures indefinitely" (Morgan and Hunt, 1994, p. 23).
On such grounds, within the growing body of literature on networks, the concept of network commitment has been shaped as a coordinating mechanism to compensate for the lack of behavioral control processes often found within such organising structures (Clarke, 2006). Based on Meyer and Allen (1991), authors have looked into the different components of commitment, namely affective, calculative and normative. Affective commitment refers to the emotional attachment to and identification with an organization; calculative or continuance commitment points to the state of attachment to a partner cognitively experienced as a realization of the benefits sacrificed and losses incurred with leaving an organization; and normative commitment pertains to the state of attachment to a partner experienced as a feeling of allegiance and faithfulness (e.g. Gilliland and Bello, 2002).
Therefore, network commitment is better viewed as "a psychological state or force that directs individuals to adopt behaviors consistent with attaining collaborative outcomes, comprising three independent mind-sets of affective, continuance and normative commitment" (Clarke, 2006, p. 1185).

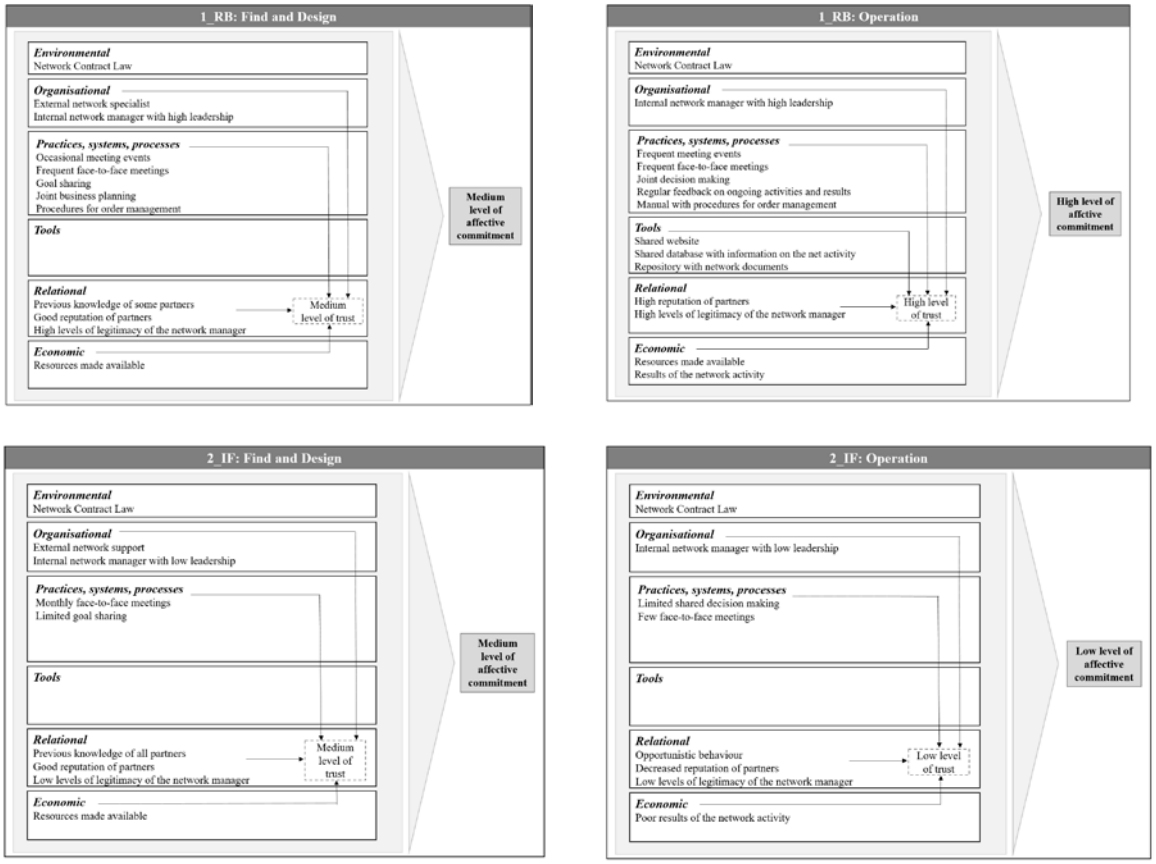
Scholars suggest that these components are very different from one another, each with differing antecedents and relationships (e.g. Roxenhall, 2011; McElroy et al., 2001), and affective commitment has been identified as the main component through which network performance might be increased (Clarke, 2006).
Most research (e.g. Sherer, 2003) has looked at commitment as a determinant of network success, which is widely agreed upon at this point. However, commitment cannot be taken for granted, thus understanding its antecedents is important to favor the development of this healthy attitude. Beyond a few contributions (e.g. Roxenhall and Andrésen, 2012; Roxenhall, 2011), the literature on the antecedents of (affective) commitment is still scarce and deserves deeper investigation. Therefore the aims of this article is to bridge the gap regarding the particular antecedent conditions that give rise to commitment, which was raised by Clarke (2006) and recently confirmed by Kurt et al. (2016), with a specific focus on affective commitment.

Design/ Methodology/ Approach: The "how" question calls for a qualitative analysis based on case study allowing to understand a recent and real-life phenomenon in depth which encompasses important contextual conditions (Yin, 2009). We conducted a qualitative research using a descriptive and processual case study approach, which makes it possible to unveil how affective commitment of partners changes throughout the network development process.
Criteria for case selection are established adopting a theoretical sampling approach (Eisenhardt and Graebner, 2007): two SME multipartner strategic networks are selected, where one has an increasing and another a decreasing affective commitment of partners throughout the development process, so that also the "polar types" theoretical sampling approach suggested by Eisenhardt and Graebner (2007) is respected.
Data for this study were collected from both interviews and secondary sources, including company briefings, corporative websites, press releases and internal reports, in order to allow data triangulation and increase the validity of the research (Patton, 2002). Interviews were carried out following a semi-structured protocol that was developed based on the literature review and our research question. In particular, we asked respondents some questions regarding the five groups of antecedents of commitment as well as trust, paying attention to other potentially relevant factors, and the dynamics relating these factors to commitment, trying to make interviewees free to tell their story while guiding them towards our research interest, i.e. affective commitment and its antecedents.
As far as the development process of strategic networks is concerned, we took inspiration from Agostini's (2016) model, dividing the find and design phase (i.e. engaging potential partners and structuring and negotiating an agreement with partners) from the operation phase (i.e. developing an effective working environment with the partner in order to facilitate completion of the work).
Totally, we carried out 10 in-depth interviews with different actors (i.e. partner firm representatives and network manager) involved in the networks. To capture network dynamics, we reconstructed and analyzed the history of the network upon the moments of interviews using a retrospective approach, in parallel with real time analyses. We conducted, recorded and transcribed all interviews during the period from January 2013 to January 2017.
In this study, due to the fact that this is not a totally unexplored field, the coding process was mainly 'theory-driven' (Ryan and Bernard, 2000) since many constructs (i.e. affective commitment and antecedents) were not totally unknown to the literature.

Findings/Results: Looking at the comparative analysis of cases, our empirical study shows that, despite departing from a medium level of affective commitment, there are different factors that may push or hinder it.
More specifically, the first relevant evidence is that in the find and design phase the previous knowledge of partners and their reputation are the factors that seem to determine initial affective commitment. This is reasonable, because SMEs are usually reluctant towards collaboration with other firms, so doing it with firms they already know enhances the initial level of trust among partners, which in turn, increases affective commitment. In addition, the presence of an external impartial entity, supporting firms in the network establishment, seems to increase their trust in the network and can also stimulate their affective commitment in order to make a good impression on the external entity. Furthermore, the fact that from the beginning all partners dedicate resources to the network makes them more trustful.
However, the initial level of affective commitment is not likely to be self-nurturing. It could decrease if other factors do not intervene in the later stages of the development process. Practices, systems and tools seem to influence the development of affective commitment. Indeed, meeting frequently, taking decisions together and receiving regular feedbacks on the network activity stimulate partners' attachment to the network and make them feel more confident on the other partners' behavior. Instead, being unaware of what happens feeds partners' doubts on the others' behavior and induces negative feelings about the network. The use of tools, as a shared website and database with information on the network activities, increases trust on the others and make partners feel the network problems as their own problems. The fact that there is a network manager whose power and leadership are legitimated by all partners, contributes to strengthen the positive effect on trust and affective commitment.

Finally yet importantly, receiving the first positive feedbacks from the network activity stimulates partners to feel it is right to continue with the network. Contrarily, if partners do not gain any benefit from the network, they will not be willing to invest further. See Figures 1 and 2 for a visual comparison of the two cases.

Figure 1: Antecedents of affective commitment in Case 1_RB



Research limitations/ Implications: The study offers different contributions to the field of SME's strategic networks, from both a theoretical and practical perspective.

Looking at theoretical contributions, the paper enlarges the literature on the antecedents of commitment with a particular focus on affective commitment through an in depth analysis of two cases showing opposing behaviors as far as affective commitment is concerned. While the literature has mainly taken a quantitative perspective investigating hub driven networks, our article approaches strategic multipartner networks characterized by a shared distribution of power among members. In this type of networks, achieving affective commitment is a difficult matter that needs to be nurtured throughout the development cycle with a variety of tools, procedures and systems acting in a synergic manner. These findings pave the way towards a more complex view of the literature on commitment suggesting that qualitative longitudinal studies are needed to shed light on the topic; creating and maintaining affective commitment is a dynamic process that implies the adoption of many methods and tools, thus keeping in touch with all the members of the network.

As concerns practical implications, firms belonging to multipartner networks should consider that affective commitment cannot arise by itself but it is the result of an aware decision on the part of the network manager who voluntary choses to dedicate time and efforts to build it up; neither affective commitment springs up by itself nor it is risen by itself. Trust seems to be at the basis of affective commitment, so previous experience and knowledge among partners are important antecedents, which should act with a set of other methods and tools that support and strengthen each other. In this perspective, the opportunity offered by the ICT tools are not devoid of interest; on the contrary, they offer great chance to managers to share knowledge, to make partners be informed on the network evolution, and to organize the work with and among partners.

Considering the limited generalizability of this exploratory study due to the analysis of two cases, future studies with a larger number of strategic multipartner networks can expand the understanding of the dynamics leading to increasing (affective) commitment. More particularly, the issue related to the mediating effect of trust on the relationship between other types of antecedents and (affective) commitment deserves further investigation. To this

regard, also investigating the relationship among antecedents and their relationship with different dimensions of commitment may reveal useful insights.

Keywords: Affective commitment, Networks, SMEs, Trust, Case study.

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9.

A Methodology for analyzing the Resource-Stakeholder Relationships based on Start-ups Business Process Log Data

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Abstract

Purpose/ Research Question

: Despite many startups starting every year, most of them fail to start their own business. Given the various factors of the start-up failure element, the lack of start-up founders ' initiative and start-up know-how, including start-up know-how, was the biggest problem. It is necessary to study the methodology that can provide the necessary information and help the business process for startups. Based on the Entrepreneurial Business Process Model (E-BPM) which provides support for effectively searching necessary resources and stakeholders from the viewpoint of Know-why, Know-what, Know-who(where), and know-how(when), it establishes the startup process repository based on start-ups business process log data. It is possible to analyze the collected log data to effectively provide the information needed for the startup.

Key Literature Reviews (About 3~5 papers)

: Most entrepreneurship studies have concluded that startup companies fail due to the lack of resources and the absence of network with external stakeholders. Early-phase startups face difficulty in obtaining the knowledge and information about how to systematically secure and manage insufficient resources. Systematic management of resources can be achieved by Business Process Management (BPM) proposed to improve business efficiency, that is, by specifying procedures to use the existing resources efficiently.

Existing business process research mainly assumes large organizations setting with large-scale resources dedicated to bringing about the large-scale business process changes. There has been some doubt as to whether large scale business process reengineering is applicable to SMEs due to resource constraints. Business process management is still a relatively new management approach, but the theory and praxis has not yet to fully reach smaller firms.

Entrepreneurial process has close relation with entrepreneurship, and can be regarded to be series of process of creating value, searching business opportunity for developing into business idea, and commercializing it for management of resources and organization. Leading entrepreneurial process model can be classified by three models, but these models have limitations in providing the information required by the startup operations.

Entrepreneurial Business Process (EBP) provides support for effectively searching necessary resources and stakeholders from the viewpoint of Know-why, Know-what, Know-who(where), and know-how(when) on activities necessary for managing startups. Entrepreneurial business process notation can effectively represent the Activity-Resource-Stakeholder of the startup operations by using UML Activity Diagram Notation.

Design/ Methodology/ Approach

: In this study, we will collect various process-based data of start-up and extend the methodology to make meaningful analysis from start-ups business process log data. Based on the existing Entrepreneurial Business Process Model (E-BPM), we develop an analytical methodology that explores key resources and stakeholders in entrepreneurial activities using data logs. In particular, we will expand the analysis methodology and data mining methodology based on social network analysis and apply them to research. Especially, we will design analytical methodology based on analysis methodology based on social network analysis and data mining methodology.

Specifically, we define an extended data model that can more effectively reflect the diverse entrepreneurial activities, resources, and interests that are not reflected in existing Entrepreneurial Business Process Model (E-BPM). The existing entrepreneurial process data has difficulty in deriving the process because it does not contain information about the activities and resources required for startups operations. Start-ups business process log data is used as the E-BPM methodology to implement the Startup Process Repository concept so that startups can access information by each point of view presented in E-BPM.

Based on the log data collected through the data model, we derive a Resource-Stakeholder Relation matrix for each entrepreneurial activity and construct a Social Network based on this matrix. Through this analysis, we derive the most influential resources and stakeholders for entrepreneurial activities. In addition, a variety of methodologies for constructing the Startup Process Repository and analyzing the collected Startup Process-based Data are presented to effectively provide the information needed to the startup companies.

In this paper, we will design prototypes that can automatically derive process modeling and resource - stakeholder relationships from data logs using extended data logs and entrepreneurial resource and stakeholder analysis. The model supports extracting information from the startup company to generate process log data, and provides resource-stakeholder analysis that reflects various business operations elements. In addition, the validity of the methodology is verified by designing the prototype based on the analysis methodology and applying the data collection log data.

(Expected) Findings/Results

: In this study, we use start-up process data as E-BPM methodology to implement Startup Process Repository concept. Also, we develop an analytical methodology that can be meaningful information from the start-up perspective by utilizing SNA-based analysis method and data mining technique based on the start-ups business process log data. We extend the existing entrepreneurial business process methodology to develop an integrated and systematic analysis methodology that considers various activities, resources, and stakeholder elements and construct a prototype system to support them.

By analyzing and improving the existing business process modeling techniques, it can be used as a startup perspective, and a methodology developed to be effectively applied to companies in the future can be provided as

a business process related framework. It can be developed as a simulation tool that can be extended to a methodology that can be helpful to the early stage startups.

Research limitations/ Implications

: They will be able to support start-up processes and innovation activities to adapt to changing environments and markets. The proposed model is expected to be able to systematize the experience and knowledge needed for the startup process, and it will be able to efficiently search the resources required for the startup operation and the related stakeholders. It will be necessary to take concrete measures to develop methodologies and modeling tools that can help start-up operations.

Keywords: Entrepreneurial Business Process, Process Repository, Startup Business Process Log

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10.

Survival factors in the valley of death: Inside views of innovation and behavioral perspectives

Purpose/ Research Question:

Entrepreneurship not only reduces the unemployment rate through job creation, but also promotes market competition in terms of the commercialization of new technologies, contributing to the improvement of people's lives and national economy. In a number of empirical studies on entrepreneurship and employment, it has been shown that an increase in entrepreneurial rate positively affects economic growth and employment growth (Kim, 2014), proving that entrepreneurship plays an important role in economic growth (2005). The current government has set the first goal of the five national goals as a 'job-centered creative economy' and is strengthening its business activation policy as a key strategy for realizing a creative economy. However, according to the National Statistical Office (NSO), the one-year survival rate of enterprises (survival rate of new enterprises a year ago) is steadily decreasing to 59.8%, and the start-up survival rate is the lowest among the 17 major OECD countries. This shows that it is difficult to sustain growth due to lack of competence and funds needed for start-up, and furthermore it is difficult to achieve social economic effect, job creation, and contribution to national economic growth. In this way, we face the "Valley of Death", which is the period when we are unable to enter the market due to lack of funding and lack of commercialization capability at the early stage of the start-up. This generally means that basic research results fail or are delayed in commercialization and commercialization, leading to the phenomenon that excellent ideas and technologies are not delivered to the industry. In spite of these social phenomena and problems, investment in early-stage and technology-based venture companies has not been done properly, and policy and support measures for sustainable growth of start-up companies are still insufficient. In addition, there is a lack of research on the Death Valley and its theoretical basis, and many studies have limitations that are limited to financial support and case analysis.

It is important to identify the risk factors that can occur in the valley of death, such as what capacity and support is required to increase the survival rate of technology startup companies, what is the growth engine for sustainable growth, and how to overcome the valley of death. In particular, it is necessary to investigate what start - up companies are capable of survival and sustainable growth, and to provide support measures and alternatives to strengthen the survival power of start - ups. This study

can be an important data that can be used as a driving force of growth by changing the crisis like Death Valley into opportunity.

Therefore, in this study, we investigated the causes of Death Valley in technology - based venture companies facing Death Valley through the literature and developed and tested a theoretical model that reflects these factors, And to propose countermeasures. Through this study, we try to find support policy and policy direction for survival and sustainable growth of entrepreneurship, and provide theoretical model and research foundation for securing self.

In the early stage of the start-up, the survival rate of the enterprises is falling sharply in the technology commercialization process. This explains the lack of competence in funding and market access in the stage of start-up growth, making the survival power weak. Despite the urgent need for growth ladder and support for entrepreneurs to overcome the valley of death, the theoretical background and the empirical research on it are very scarce. It is not easy to study the valley of Death because the valley of Death occurs at various points and exhibits unpredictable properties as the R & D process and start - up stage of the start - up companies are complicated and diversified. Most of the studies on Death Valley and technology commercialization are limited to case studies and analysis of success factors, and there are many studies focused on government and institutional short-term support policies. In addition, there is a tendency to concentrate on financial aspects of the lack of funds pointed out as the greatest factor in the death valley, so problems such as erroneous investment practices due to technology commercialization and lack of competence of start-up firms tend to be overlooked.

Key Literature Reviews

The reason why startup companies can not overcome the 'valley of death' is that lack of technology transfer and commercialization capability, insufficient R & D strategy for commercialization, lack of entrepreneurship, mismanagement of investment, lack of support for angel investment, The tendency of the investment company to be conservative, and the lack of professional investment services.

The way to overcome the valley of death can be divided into financial capacity (partnership between public institutions and private companies, venture capitals) and innovation capacity (commercial capacity, open innovation). According to Auerswald and Branscomb (2003), research

suggests that the infrastructure necessary for commercialization, finance, knowledge, trust and commercialization is needed to reduce the gap between knowledge and resources, which is called the valley of death. In other words, financial and financial resources are needed to invest in the early stage of technology development, where costs and uncertainties are high, and it is emphasized that expertise and trust are needed to narrow differences in motivation between engineers, entrepreneurs and investors. In order to overcome the valley of death, it is urgent to construct a potential market and build resources and infrastructure to commercialize the technology.

Watkins (2013) explains the gap between invention and innovation, the reason for the death valley, as a lack of resources and knowledge, It is said that it has an adverse condition to the overcoming of the valley. In other words, it points out that resources (finance, facilities, etc.) and expertise (technology, market, commercialization, etc.) are needed to reduce this gap. He also emphasized the role of investment intermediaries, including angel investors and venture capital firms, including the government, in order to overcome the valley of death.

Hur and Kim (2013) also classified government support service types into non-financial support (education support, management support, financial support, counseling support) and financial support, internal process improvement). The results show that differentiated non - financial support at each stage affects customer performance, learning growth and internal process improvement, but financial support does not affect performance at all stages. In the UK's Technology Business Activation Research Report (2013), innovation is defined as the ability to commercialize enterprise ideas and technologies, and explains that the success of an enterprise is determined by an innovation system that causes complex interactions of multiple factors. Innovation involves effective interactions of knowledge (technology), finance (finance), services (law, consulting), and manpower. In addition to Mone et. al. (1998), Calantone et. al. (2002) have also identified innovation as an important influence on firm performance.

Question 1: Does the financial and non-financial capacity of a technology-based start-up company differ in coping with death valleys?

The report by Branscomb and Auerswald (2002) emphasizes the importance of angel investment and government support in supporting initial venture technology development. In particular,

it is reported that the financial support of the early stage of technology development, in which there is a gap between invention and innovation, is mostly made up of angel investment, enterprise and government support. In a study of the pharmaceutical industry, Frank et al. (1996) focused on the financial barriers in Death Valley. In the case of the pharmaceutical industry, the government will provide funds to support the continuous development of technology development from the initial R & D to medical service support, and encourage commercialization of technology through private sector investment to induce the Death Valley. Hellmann and Puri (2002) also found that venture capital financing affects corporate specialization, organizational structure, and professional management as well as funding of startups.

In the process of technology commercialization, policy funding such as government subsidy tends to concentrate in the R & D stage, and private investment tends to be active in the stage of growth maturity after the valley of death. However, in the stage of entering the market of start-up companies, both government and private investment are weak, and there is insufficient understanding of market and customer, resulting in additional costs due to the inability to meet quality standards, difficulty in securing customer trust, (Kwang-Kwang Choi, 2013). In particular, research and research on angel investment that can provide important help in overcoming the valley stage of death through creation of cash flow in the beginning of business are insufficient. Therefore, it is necessary to study how to share and cooperate with the public sector such as the government to overcome the valley of death and the role of the private enterprise.

Question 2-1: Does the financial capability of a technology-based start-up company affect the overcoming of the valley of death?

Question 2-2: Are there any differences between the financial support of the government and the ability of private support (angel investment) to overcome the valley of death?

Throughout the valley of death, there are cultural differences that differ in character and purpose. Mrkham, S.K. et al. (2010) explains that the main interest of developers in R & D is in the development of value discovery and new technology, while the focus of market-oriented experts in the business segment is on product sales and profit generation. Therefore, we argue that to overcome the valley of death, we must narrow the differences of different cultural values and appropriate resources and support for various forms of death valley at each stage. The research of Choi Kwang-mo (2013) that investigated the valley of death in the process of commercialization of the pharmaceutical industry technology has developed the mind-driven mindset and strategy based on the business model and the

market-led mindset.

Osawa and Miyazaki (2006) conducted empirical studies on 17 R & D projects, and classified the causes of failed projects into two categories: technical problems and market related problems. In other words, the technical problem is that commercialization of technological innovation has failed, and the failure to reduce the cost required for innovation has failed to overcome the valley of death. The market-related problem is the lack of continuous development due to lack of understanding of the market . Many scholars emphasize innovative entrepreneurship as a key element for growth and survival in a common, uncertain and rapidly changing market environment (Mark Carsson, 2004).

Question 3-1: Does the non-financial capability of a technology-based start-up company affect the overcoming of the valley of death?

Question 3-2: Are there any differences of overcoming valley of death according to entrepreneurship ability, commercialization ability (market driven type), and technology ability (technology driven type)?

Research limitations/ Implications:

Therefore, this study focuses on non - financial support such as entrepreneurship, commercialization ability as well as financial support, analyzes the factors for securing the self - sustaining power of entrepreneurs and suggests the theory of overcoming the valley of death. Specifically, it analyzes and evaluates the situation for overcoming the valley of death, and examines the factors of resources and capacity required in the valley of death through the literature survey. Based on this, a theoretical model for overcoming the valley of death can be designed and analyzed through empirical data and data, providing a theoretical research base as well as providing realistic data.

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11.

Comparing Disjointed and Concentrated Policy Knowledge Ecosystems as a Natural Experiment: Separating Two Different Central Government Complexes from Two Different Cities of South Korea

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<Abstract>

The purpose of this study is to investigate how the spatial separation of ministries of central government in Seoul city from those in Sejong city can influence learning process of policy ecosystem. This study examines how the spatial segregation by the relocation of Sejong city generates various obstacles to policy learning as a natural experiment. There are various learning advantages when all ministries of central government communicate closely when they are located at one place. However, if a large number of ministries are separated into different spaces, the spatial advantage that allows close cooperation in one place disappears. This spatial severance can create considerable time and space constraints on communication and information exchange. A temporal and spatial constraint hinders profound and mutual collaboration among ministries. This restriction may destroy collaborative ecosystems and delay policy coordination and learning. We compare differences in collaboration and learning process of departments of central government before and after the relocation of Sejong City. This natural experiment provides a good source to test how spatial separation can present various obstacles to collaboration and learning processes. This study uses a difference-in-difference (DID) method to identify the causal mechanism of spatial separation on the process.

Keywords: Spatial Separation, Relocation of Sejong City, Policy Learning, Policy Ecosystem, Difference-in-Difference Method

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12.

Serial analysis of the effect of collaboration on new drug development in Korea

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Abstract

R&D process of new drug development requires a lengthy long-term development period between 12 to 15 years and a development cost that can reach about USD 13 billion. Among the number of drug candidates only a few candidates can be approved as a new drug. The drug development process is categorized by drug discovery, preclinical testing, phase I, II, and III in clinical trials, submission for approval and phase IV. To sum up it is expensive, timeconsuming, complex, and risky. (Jeong Hee Lee et al, 2016) A key part of the cost increase is clinical trial studies, particularly the cost of perfoming clinical trials from phase II and phase III is growing rapidly (Orloff et al, 2009). Since 2000s, R&D productivity is issued continuously, and it causes to make pharma and biotech firms licensing in & out. Most of pharmaceutical firms tries to select the open innovation model to develop new drug and save the money. For this reason, the demand for open innovation is increasing in the pharmaceutical industry.

In this study, we will use the clinical trials database(ClinicalTrials.gov) to analyze the pharmaceutical network of collaborations. Because clinical trials database contains some information source widest coverage for new drug development to be introduced into the market, we could understand the current state of pharmaceutical sector and key players involved in clinical trials.

We apply Social Network Analysis to the available and valid data for collaborations of research subjects such as firms, universities, research institution and hospitals in Korea. Social Network Analysis is widely use in research area of social science. This study is the first longest-term analysis of clinical trials in Korea. We analyze the characteristics of the collaborative network of clinical trials and identify the network parameters and major players of a network for several decades. We could examine partnerships of major players and their movements on the collaboration networks. This understanding could be helpful to know the characteristics of pharmaceutical innovation.

Purpose/ Research Question: The purpose of this study is to understand characteristics of structure and evolution mechanism of long-term collaboration network based on clinical trial database in Korea using Social Network Analysis method. How it makes the structure of collaboration network? Who is the major players to do the clinical trials and which mechnisms are working for it? What is the affecting factors to keep the partnership?

Key Literature Reviews (About 3~5 papers): Lee et al(2016) suggests a way to estimate the proper royalty rate and up-front payment using a formula derived from the regression of historical royalty dataset in the life sciences area. For the anticancer (antineoplastics) and cardiovascular drug classes, the formula to predict the royalty rate and up-front payment is used. This study provides implications that allowed valuation of a drug specific to a drug class and proved that the royalty rate can be a variable according to drug class and licensee.
Chul-Young Roh and SangHeon Kim(2017) argues that the most critical factor that increases healthcare expenditures during last 50 years has been the advent, adoption and diffusion of new medical technologies that

include new drugs, equipment and healthcare delivery systems. This study introduces various examples how medical innovations influence to increase healthcare expenditures. To provide effective analysis of medical technology, authorities have to be independent, have to evaluate the evidence-based assessment, and have to be well-coordinated.
Abiodun Egbetokun et. al. (2017) discusses that with respect to developing countries, discussions on innovation systems are yet to be exhausted. Against this background, the paper takes an objective look at the innovation systems approach and suggests an agenda for studying innovation systems in developing countries. In the background of the continued relevance of the systems approach to the study of innovation, This paper is that modifications to the innovation systems approach present viable opportunities for understanding the innovation process in the developing world.

Design/ Methodology/ Approach: We apply Social Network Analysis to sponsor-collaborator relationship data of ClinicalTrials.gov, about 23,500 trial studies performed in Korea. This research analyzes collaboration networks for a period of time and examine network properties, community features, characteristics trends from time series analysis. Considering the change of clinical trials number, we divide into the 3 periods from 1988~1997, 2008~2012 and 2013~2017.

(Expected) Findings/Results: We figure out major players by each time period in pharmaceutical industry from the collaboration network of clinical trial studies in Korea. We understand their collaborative strategy and change of structure for partnerships by each time period. And also we could expect which Bio-medical Innovation polices are affected to make the partnerships.

Research limitations/ Implications: It could be difficult to compare another countries of collaboration network in clicnial trials. However, it could provide sources to establish firm's straties and to make policies for Korea government. There are implications about clinical trials in Korea cases focusing on the relationships between research players.

Keywords: Clinical collaboration network, collaborative strategy, pharmaceutical industry, clinical trials, Bio-medical innovation

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13.

Does being part of geographical clusters matter in fostering the crowdfunding of innovative start-ups? An explorative study

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Abstract

Purpose: Crowdfunding is a relatively new phenomenon, which disrupted the classic way to fund a venture. It consists in retrieving the capital needed to start an entrepreneurial activity drawing funds from a large base of small investors rather than from the traditional financial sources. Although many studies have been conducted on this topic, little focus has been put on the geography of this phenomenon. This paper addresses this issue analyzing whether regions characterized by the presence of geographical clusters are able to generate a better crowdfunding performance for projects located there. Specifically, drawing on a dataset of 300 crowdfunded projects we conduct an explorative study aimed at answering at the following research questions: Does being embedded in a geographical cluster foster the crowdfunding of new entrepreneurial ventures? In case it can, what cluster features do influence a successful crowdfunding?

The results offer insight into the phenomenon of crowdfunding, and in particular shed light on the role of geographical proximity in the crowdfunding of early-stage entrepreneurial projects.

Literature Background

This paper is a first attempt to determine whether some regions are more likely to host early-stage entrepreneurial projects that successfully raise funds via crowdfunding, and what are the features that foster the crowdfunding of innovative start-ups. In particular, the research explores the attractiveness of geographical clusters (GCs) in terms of their capacity to attract investors in crowdfunding, investigating which are the key features that drive the crowdfunding process. Two streams of studies grounded this research, the literature on crowdfunding and on GCs.

Although there is a growing literature that examines the role of crowdfunding in sustaining innovation (Gupta et al., 2017), its dynamics and the determinants of success of crowdfunding campaigns (Ahlers et al., 2015), only few studies have been developed to explore the role of geography in the crowdfunding of early-stage entrepreneurial projects (Agrawal et al., 2014; Mollick, 2014; Mollick and Robb, 2016). These studies offer valuable contributions, however they do not consider a specific characteristic of regions, namely the existence of GC. These are

are geographically

defined production systems, characterized by a large number of small and medium sized firms highly specialized in one or more phases of a production process and associated institutions, integrated through a complex network of inter-organizational relationships, and linked by commonalities and complementarities (Becattini, 1990). By neglecting this issue the existing literature does not investigate if and to what extent the belonging of a start-up project to a GC may be related to its ability to attract funding through crowdfunding.

There is a wide and consolidated literature on GC that has explained the reasons of GC competitiveness and recognized that the existence of GCs within a region is a distinctive characteristic of that region that positively affects its overall performance (Rothgang et al., 2017). Specifically, it has been proved that GCs allow for promoting national, regional, and local competitiveness (Porter, 1998); impact on the creation of new ventures (Rocha and Sternberg, 2005); foster innovation (Cooke, 2016; Saxenian, 1994); and assure the success of traditionally-funded entrepreneurial ventures (Chen et al., 2010).

Drawing on this, one can argue that studying the geography of crowdfunding without considering the effects of the localization of a start-up project in a GC may not give rise to some interesting insights and bias the results.

Both the streams of study induce to think that there may actually be a relationship between the location of a project within a GC and its probability to success in a crowdfunding campaign, although, to our knowledge, there are no studies to date that have investigated this issue. In this study, we attempt to fill this gap by answering at the following three research questions: Is being embedded in a GC positively related with a successful fundraising on crowdfunding platforms? Does the level of specialization and the size of GCs influence the success gained on crowdfunding platforms? Does the GCs' level of innovativeness ability affect on the success of crowdfunding campaigns?

To answer these research questions an econometric analysis on 300 crowdfunded projects is applied. This is presented in the rest of the paper.

Data and Methodology

As an exploratory empirical study, the goal of this paper is to develop initial evidence about the role of geographical proximity in the crowdfunding of early-stage entrepreneurial projects, rather than to test theoretical hypothesis. With this aim and, in particular, to answer our three research questions an empirical research has been conducted on a dataset of 300 crowdfunded projects.

Data

Data about crowdfunding campaigns – such as the total amount collected and the location where they were started – have been retrieved on Kickstarter and Indiegogo, the two largest and dominant crowdfunding platforms. In order to obtain a sufficiently wide sample, the 150 most funded projects of each website have been selected.

The main source of data regarding the geographical clusters has been the U.S. Cluster Mapping Tool (CMT), powered by the Institute for strategy and competitiveness of the Harvard Business

School and the US Economic Development Administration. The CMT proposes a classification of clusters according to the North American Industry Classification System (NAICS), so that each cluster corresponds to an area of specialization referring to a single sector or to a small group of connected industries. All data retrieved refer to the period 1998-2015.

The geographic unit used in our analysis are the Bureau of Economic Analysis's (BEA) Economic Areas (EA), which define the relevant regional markets surrounding Metropolitan or Micropolitan Statistical areas. EAs consist of one or more economic nodes – Metropolitan or Micropolitan Statistical areas that serve as regional centers of economic activity – and the surrounding counties that are economically related to the nodes.

The empirical analysis refers to a dataset of 300 crowdfunded projects, classified into two categories depending on the nature of the project: "Tech & Innovative" and "Fashion & Creative". The former includes projects related to technological innovation, the latter is made of creative products and projects related to fashion, apparel, and community projects. Based on the information about the location where projects were started gathered on Kickstarter and Indiegogo, each project has been assigned to an EA.

Dependent variable

As the phenomenon under study is the ability of a project to collect funds on a crowdfunding platform, the dependent variable of the model is the percentage of funds raised over the amount requested (Funding Level%). This is a proxy to measure the success of a crowdfunding campaign used by previous scholars was.

Independent variables

The explanatory variables have been introduced to answer the three research questions. Therefore, they have been classified as proxies for the level of specialization, size, and level of innovativeness of each EA.

Level of specialization

The level of specialization has been measured by using the Industry Location Quotient (LQ). Industry LQ is a way of quantifying how "concentrated" an industry is in a region compared to a larger geographic area, such as the state or nation. The LQ for each area is calculated by the industry's share of local employment divided by the industry's share of national employment as follows:

$$LQ = \frac{E_{i,j}/E_i}{E_{US,j}/E_{US}}$$

Where:

E_{ij} is the employment in industry j for the area i

E_i is the is total employment in area i

$E_{US,j}$ is the employment in industry j for the US

E_{US} is the total employment in US

A percentage of regional employment in an industry over the total regional employment higher than the US average indicates that the region is specialized in a certain industry. Thus a LQ greater than 1 denotes the existence in a region of a GC specialized in a given industry. The

index provides more than simple information whether a GC exists or not. It offers a measure of the specialization of the cluster: the higher its value, the more specialized the cluster.

Size

To measure the size of the GC we use the number of firms located in the area, approximated by the number of establishments (ESTABLISHMENT COUNT - EC) - where an establishment is a physical location where business is conducted. The variable offers a picture of the attractiveness of a given region for companies making a location choice and an insight of the competition existing within the area.

Level of innovativeness

The variable adopted as a proxy for the level of innovativeness of GC (PATENT) relates to the patents registered in the area. Patents are widely used to assess the ability of an industry, a firm, and a geographical area to come up with valuable and marketable innovations. Considering that different industries provide different opportunities to register patents, we have defined the variable as follows:

$$Patent = \frac{P_{i,j}}{max_{k=1,\dots,m}[P_{k,j}]}$$

Where:

$P_{i,j}$ is the number of patent registered in industry j for the area i

$\max_{k = 1\dots m} [P_{k,j}]$ is the highest number of patents registered in a k area in industry j.

The closer this indicator gets to 1, the more innovative is that region compared to others.

The econometric model

An Ordinary Least Squares (OLS) model is applied in order to estimate what role, if any, GCs play in the crowdfunding success, measured by the percentage of funds raised over the amount requested, and which GC features may foster the crowdfunding of innovative start-ups.

Empirical Results

Descriptive statistics and correlation coefficients are reported in Table 1.

Variables	Location Quotient	Establishment Count	
Location Quotient	1		
Establishment Count	0.815	1	
Patent	0.320	0.339	1
Observations	300	300	300
Minimum	0	6	0
Maximum	11.3	6283	1

Mean	1.946	964.805	0.524
Std. deviation	1.896	1138.24	0.385
VIF	3.04	2.99	1.14

The correlation matrix shows that the variables are not significantly correlated, furthermore the variance inflation factor (VIF) test has been performed to check for multicollinearity between independent variables. All independent variables got the value of lower than 5 in this test. Therefore, it is expected that multicollinearity does not bias the regression results.

The empirical findings obtained from the estimation are reported in Table 2. In regression 1, all the projects are considered. In order to take into consideration in the analysis the possibility that funders would invest differently depending on the features of the projects and their personal preferences, two additional regressions were run. In particular, in Model 2 only the 201 projects classified as "Tech & Innovative" are considered, whereas in Model 3 the remaining 99 projects classified as "Fashion & Creative".

Table 2. OLS estimation results

Variables	Model 1	Model 2	Model 3
Location Quotient	-1.499	-2.931	-4.004
	(-0.09)	*(-0.11)*	*(-0.38)*
Establishment Count	-0.0139	-0.021	-0.007
	(-0.50)	*(-0.46)*	*(-0.39)*
Patent	75.614*	88.005	59.377*
	(1.49)	*(1.12)*	*(1.64)*
Observations	300	201	99
R^2	0.008	0.007	0.048
Adj-R^2	-0.002	-0.009	0.018

t-value in parentheses. *$p<0.10$

As an overall result, the regressions show that being part of a GC does not have any significant effect on the success of a crowdfunding campaign and, contrary to our expectations, the Location Quotient shows an estimated coefficient that is negative. Hence, it would seem that not only being part of a GC does not increase the likelihood to obtain funds via crowdfunding, but also that higher is the GC specialization lower is the probability for a new venture to collect money through a crowdfunding campaign. Such a result may be interpreted in light of the "risk of excess of specialization", which reduces the GC knowledge variety and creates empty of experience and know- how related to other industries. This might become critical when a project requires, to be developed, a set of entrepreneurial skills, resources, and know-how that aren't limited to the sole sector where the project belongs, but range along different industries.

In relation to the effects of the size of the GC, Establishment Count again has no significant effect and its coefficient, contrary to our expectations, is still negative: apparently, the higher the number of firms within a GC, the lower is the likelihood that projects started in that GC will succeed in a crowdfunding campaign. This finding may be explained by the fact that the

intensity of local rivalry, together with the presence of a large number of incumbents, may make it harder for a new venture to emerge and gain a relevant position within the GC. Entrepreneurial ventures started in regions with strong established GCs paradoxically could count on a more limited set of resources, with the most advantageous being captured by the incumbents.

Finally, as far as the level of innovativeness we found that the variable PATENT shows an estimated coefficient that is positive in all three models and significant at $p<0.1$ for Model 1 and Model 3. Hence, the most innovative a GC is, the higher is the likelihood that a project raises at least its goal or more than that. Furthermore, the difference between the coefficients in *Model 2* and *Model 3* suggests that the level of innovativeness has a stronger influence on those projects that rely on *Tech & Innovation*, while the effects is mitigated when considering *Fashion and Creative Projects*.

Discussion and conclusion

The research offers some exploratory insights on the role played by GCs in fostering the crowdfunding of new entrepreneurial ventures. Our data suggest that it is not being embedded in a GC that matters, but the level of GC innovativeness that increases the chance for new ventures to succeed in a crowdfunding campaign, by raising the amount of requested funds or more.

While these results are intriguing, they have a number of limitations. The first limitation is related with the structure of our sample that includes the most funded projects on Kickstarter and Indiegogo. We recognize that this choice may in general create bias, as the sample is not random. By collecting random projects from the two crowdfunding platforms and by enlarging our sample, future studies could reduce this bias and strengthen the robustness of the results.

Second, the analysis did not consider a number of factors that may influence a successful crowdfunding. Further analysis will be devoted to address this issue by controlling for those relevant aspects could influence investors' decisions in crowdfunding new entrepreneurial projects.

Keywords: Crowdfunding, Geographical Cluster, New ventures, Entrepreneurial finance, Startups Geography.

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