

## Journal of Open Innovation: Technology, Market, and Complexity (Scopus)

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# 1.

## Smart Tools to Improve and Accelerate the Turfgrass Evaluation Process

Ning Wang\*

Professor, Dept. of Biosystems and Agricultural Engineering, Oklahoma State University

Peyman Nematzedeh

Graduate Student, Dept. of Biosystems and Agricultural Engineering, Oklahoma State University

Yanqi Wu

Professor, Dept. of Plant and Soil Sciences, Oklahoma State University

✘ Corresponding author should be indicated as in, for example, Gildong Hong(Corr.).

### Abstract

#### **Purpose/ Research Question:** Contents

The goal of the research is to provide innovative tools for turfgrass breeders, managers, and researchers to improve the efficiency and effectiveness of evaluation process. Conventional breeding approaches normally take a long time and a large amount of labor to develop a new variety due to the demand of sufficient field data to identify and prove the desirable traits. The field data collected are qualitative, subjective, and difficult to repeat. Hence, a field screening system which can be used to collect quantitative data for multiple traits of individual turfgrass samples in one field run is needed to accelerate the process.

#### **Key Literature Reviews (About 3~5 papers):**

Current turfgrass evaluation is a *subjective* process based on visual estimates of traits related to turfgrass performance (NTEP, 2015). Visual quality ratings of a turfgrass plot are assessed by trained evaluators on a 1 to 9 scale, where 1 indicates dormant or dead grass and 9 indicates the highest quality (Bunderson, et al., 2009). Although this approach has been used by many breeders and researchers, the collected data can be highly variable and subjective and difficult to repeat. The visual quality rating process is also time-consuming and labor intensive.

Recent developments in precision agriculture innovations and data-intensive computational approaches make it possible to accelerate the process of plant breeding with highly precise and accurate-field data acquisition and high-throughput field screening to rapidly quantify the traits of interest and to associate these traits with their genetic and genomic properties. High-resolution vision and spectroscopic systems have been installed on GPS-guided ground vehicles (autonomous or semi-autonomous) and/or unmanned aerial vehicles (UAV) and used in agronomic applications to enable trait specificity at centimeter-level or better. Research on using digital imaging analysis to evaluate color and coverage of turfgrass plots has been reported (Richardson et al., 2007; Bunderson et al., 2009). Some commercial systems have been used in turfgrass evaluation. These systems usually provide only one qualitative trait, e.g. green or no green, and one rating per plot. Details on variations within a plot are not provided. Hence, a field screening system which can collect quantitative data for multiple traits in every turfgrass plot in one field run are needed to improve the efficiency of the selection and evaluation process, which could potentially result in faster release of better cultivars.

#### **Design/ Methodology/ Approach:**

Adopted by many breeders and researchers, the testing results maintained by the National Turfgrass Evaluation Program (NTEP) will be used as a reference during the design, development, and field validations. The preliminary study showed that most of the targeted traits could be measured through color directly or indirectly. Some traits could be measured through height or the combination of height and color. Hence, sensors which can provide color and distance information simultaneously were selected and adopted.

*Ground-based Platform:* The ground-based platform included two selected camera(s), an active lighting unit, a GPS unit, a human interface, and a movable cart. The camera captured a high-resolution RGB color image (at least 1920 × 1080 pixels) and a depth image (at least 512 x 424 with 16-bit distance resolution) simultaneously. The two cameras were used to take images from different angles so that image corrections can be used to improve the measurement accuracy. An active light source was used to establish uniform lighting conditions during image acquisition. An affordable OEM RTK GPS unit with an accuracy of at least decimeter was used to provide location information of each plant stand. A user interface was designed to display the measured target in real-time so that the operator can make adjustments when needed.

*UAV-based platform:* The UAV-based platform will be used to collect large-scale multi-plant and multi-plot image data. A commercial platform will be selected which can take about 2 kg payload to carry a high-resolution RGB camera and a thermal camera with other accessories. The RGB camera will mainly capture the color-related traits (See Table 1). The longwave thermal camera will collect stress related traits (e.g. drought). Mounting brackets will be designed and fabricated for the cameras.

The software package was developed which included six software modules. The control programs was developed for image acquisition and preprocessing on both the ground-based platform and the UAV-based platform, respectively, to acquire images and other data during field operations. The user-interface software for the ground-based platform provided interactions between the operator and the developed platform. These software modules was developed using LabView program (National Instrument, Texas, USA). The image processing and analysis programs will be developed using MATLAB (Mathworks, Maryland, USA). The greenness level, color variations, size, density, and coverage of every plant stand will be extracted from collected RGB images. The height and its uniformity were calculated using the depth images.

**(Expected) Findings/Results:**

The test results showed that the developed ground based system was able to collect in field images with a speed of operation at 3-5 mph and maintained the quality of the images. The image-based indices developed during the research still need a better interpretation from practical uses.

**Research limitations/ Implications:** Contents

**Keywords:** Machine learning, image processing, turfgrass management

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2.

## **Characterizing Myocardial Infarctions with Inverse ECG Modeling and Spatiotemporal Regularization**

Bing Yao

Assistant Professor, School of Industrial Engineering and Management, Oklahoma State University

Rui Zhu

PhD Candidate, Department of Industrial and Manufacturing Engineering, The Pennsylvania State University

Hui Yang (Corr)

Associate Professor, Department of Industrial and Manufacturing Engineering, The Pennsylvania State University

### **Abstract**

**Purpose/ Research Question:** Myocardial infarction (MI), commonly known as heart attack, is among the leading causes of death throughout the world. It is shown that approximately every 40 seconds, an American will suffer from a heart attack. MI occurs due to the blockage of coronary arteries. This will significantly decrease or stop the blood flow or oxygen supply to the heart, thereby damaging the heart muscle and triggering the heart attack. According to the American Heart Association, heart disease accounts for approximately 1 in 7 deaths in 2016, and there are about 790,000 people experience heart attacks annually in the United States. MI is among the most expensive diseases for clinical diagnosis, medical treatment, and follow-up care. The economic costs of heart diseases are estimated to be around \$1,044 billion by 2030. The effective time window for MI treatments is within one hour from the onset of symptoms. Therefore, it is imperative to characterize and identify MIs in the early stage for timely delivery of medical interventions and the improvement of heart health.

**Key Literature Reviews:** The 12-lead ECG is widely used for the identification of MIs by checking abnormalities in ECG wave deflections, e.g., significant Q waves, ST depression/elevation, or inverted T waves. It may be noted that cardiac electrical activity propagates in space and evolves in time. One lead ECG captures 1-dimensional views of such space-time cardiac electrical activity. The 12-lead ECG systems provide 12-directional views of such space-time dynamics. Most existing works [1] focus on the analysis of time-domain ECG signals on the body surface for the detection of ECG wave deflections (i.e., P, QRS, T waves) on the body surface but tend to overlook spatiotemporal dynamics in the heart. Time-domain ECG is a projected view of spatiotemporal cardiac electrical activity that diminishes important spatial information pertinent to heart diseases (e.g., myocardial infarction). Because distributed sensors at various locations on the body surface respond to changes of heart

conditions differently, body surface potential mapping (BSPM) employs hundreds of sensors to achieve high-resolution ECG sensing. High-resolution ECG images from BSPM facilitate the reconstruction of spatiotemporal distribution of electric potentials over the entire torso, and therefore provide richer information than 12-lead ECG for clinical decision making [2][3].

**Methodology:** In this paper, we proposed the method of spatiotemporal inverse ECG (ST-iECG) modeling to map electrical potentials from the body surface to the heart, and then characterize the location and extent of MIs by investigating the reconstructed heart-surface electrograms. First, we investigate the impact of mesh resolution on the inverse ECG modeling. Second, we solve the inverse ECG problem and reconstruct heart-surface electrograms using the ST-iECG model. Finally, we propose a wavelet clustering method to investigate the pathological behaviors of heart-surface electrograms, and thereby characterize the extent and location of MIs.

**Findings:** The proposed methodology is evaluated and validated with real data of myocardial infarctions from human subjects. Three performance metrics are defined to evaluate the performance of the proposed ST-iECG model:

- EPD-percentage discrepancy between the extent of infarction as estimated and as given by GE-MRI images;
- SO-overlap percentage between infarct segments as estimated and as given by GE-MRI images;
- CED-distance from the centroid of the infarct area as given by GE-MRI images to that as estimated.

where the GE-MRI images provide the true location and extent of MI on the heart surface, which is the golden standard of the MI characterization. The three metrics of the proposed ST-iECG model are further benchmarked with the results provided by the existing iECG model. Experimental results show that the ST-iECG model demonstrate superior performance in MI characterization over existing methods.

**Research Implications:** This paper proposes a spatiotemporal inverse ECG model to characterize the extent and location of myocardial infarction on the heart surface. The proposed framework demonstrates strong potential as a decision-support tool to noninvasively investigate cardiac pathological activities.

**Keywords:** Myocardial infarction, inverse ECG problem, body sensor network, spatiotemporal regularization

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### 3.

## **Aligning Demographic Shifts and Student Participation in Construction Management Education**

C. Ben Farrow (Corr.)

Associate Dean, Auburn University, USA

Lauren Redden

Assistant Professor, Auburn University, USA

### **Abstract**

**Purpose/ Research Question:** Fueled by technology, the construction industry continues to advance at a rapid pace. Such innovation and a strong economy have fueled demand for qualified construction management graduates from construction undergraduate programs. The U.S. Bureau of Labor Statistics expects demand for construction managers to exceed other job opportunities through 2028. While demand is up and career opportunities for construction managers expand with changes in industry, expected demographics of college attendance is expected to decrease 15% within the United States beginning in 2026 (Grawe, 2018).

With fewer college graduates, there is a potential of losing similar numbers of construction management graduates. What opportunities exists for bolstering student numbers within the construction sector given this pending drop in enrollment? One option includes expanding the number of female and other growing minority sectors. Recently, the construction management program at \*\*\* \*\* implemented a summer camp targeted at high school females to encourage consideration of studying construction management in college.

This study first examines existing and potential number of females, non-white Hispanics, and Asian students attending regional universities in five geographical diverse states within the United States. The study then focuses this data with results from multiple targeted camps at female high school

students to outline specific measures that may limit the impact of the coming demographic shift on construction education.

**Key Literature Reviews (About 3~5 papers):**

Grawe's book entitled *Demographics and the Demand for Higher Education* moved beyond college projections based solely on population "because college-going probabilities are so heterogeneous, simple population forecasts alone are of limited value in predicting demand for college" (N. D. Grawe, 2018, p. 31). Studies prior to Grawe's work failed to address the probability of college attendance or the preferred type of institution (N. D. Grawe, 2018; Lipka, 2014; Selingo, 2018). When these additional factors are considered, some schools "win" and others "lose". Ultimately, Grawe suggests that it may be appropriate for universities to consider altering their size and/or which programs they plan to champion. Others have suggested modified recruitment approaches, changes in curricula, and expanded services (McPherson, 2017).

Summer engineering camps have had a positive impact on middle school students' understanding of technology and what engineers do in practice (Hammack et al., 2015). Other camps, like the one at California State University East Bay concluded that such a program was valuable. Specifically noted was how it emphasized high-tech aspects of the construction industry like Building Information Modeling which could be an added pathway to attract students into the construction industry (Gaedicke et al., 2016).

**Design/ Methodology/ Approach:** The program uses the National Center for Educational Statistics data <https://nces.ed.gov/ipeds/> to ascertain the number and demographic of construction management graduates in all programs in five selected states representing different census districts. Sensitivity analysis is then conducted to determine what magnitude of changes will be required by universities in these states to offset the potential decline in construction management graduates based on current trends. In addition, qualitative and quantitative feedback on summer camps was collected at two universities represented in the five-state area over the course of three summers. This data is analyzed by reporting descriptive statistics and coding qualitative data.

**(Expected) Findings/Results:** Results indicate key issues important to minority stakeholders including awareness of industry opportunities and empowerment in the field of study. In addition, the specific impact shifts in construction management's ability to recruit and retain specific minority sectors may make in five representative states are identified. Opportunities exist to expand the diversity of individuals in construction management and partially offset some of the anticipated demographic shifts within the United States construction education market.

**Research limitations/ Implications:** The results focus on demographic challenges within the United

States, but the means by which these are addressed through attracting non-traditional demographics to construction education are expandable to a broader context. Results focus on five states in nine census regions across the U.S. and may not be generalizable to all census areas. Results from camp participants are limited based on the number of participants in camps conducted to date.

**Keywords:** Student recruitment, demographics, construction education, summer camp

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## 4.

### **Business process digitalization: opportunities and challenges**

Viktorija Babica (Corr.)

Student (Ex. Prof. Researcher, Ph.D., Master, CEO, and etc.), Riga Technical University, Latvia

Deniss Sceulovs

Associate Professor, Riga Technical University, Latvia

#### **Abstract**

##### **Purpose/ Research Question:** Contents

The digitalization wave is making a significant impact on the business world. Digital technologies have affected every industry and digitalization has become a strategic priority for business process optimization. Ability to understand and employ benefits of digital transformation have become enablers of the enterprise strategy, which lead to changing business processes and even to the creation of completely new business models [5]. The study is determined by the increasing dissemination of the concept of digitalization of business processes in the world leading companies. As digitalization sustainably alters industries and societies, to remain competitive and to address the increasing complexity of customer needs, organizations need systematically exploit the digitalization potential of their business processes. Even though current and potential advantages of digital transformation are outstanding, in terms of process optimization, only a certain number of companies have developed and realized strategies to obtain the advantages of disruptive technologies [4].

Digital business transformation enables business processes simplification and optimization [1], provides opportunities to improve human resource management, thereby increasing a company's competitiveness and productivity. The authors argue, that is crucial to understand the reasons why some companies fail to implement digital transformation. Uncertainty regarding digitalization may inhibit development of entrepreneurship and innovation. Is also necessary to define to which extent flexibility of business processes is an advantage, but not a weakness.

The purpose of the paper is to study changes brought by the digital transformation of the business processes, operations, and value chains. In order to evaluate the value of changes is necessary to analyze the premises of adopting digital transformation. As some new technologies and business approaches sometimes arise with exaggerated potential by their creators and evangelists, resulting in irrational faith in their transformative power by organizational management, is necessary to set

out the comprehensible framework of opportunities and challenges of business process digital transformation.

**Key Literature Reviews (About 3~5 papers):** Savastano et al. argue that organizations frequently fail to identify a suitable starting point for digital transformation of their organizational structures, strategies, and operations, and face difficulties to manage the process. The need to define requirements of digital transformation and capabilities of an organization to satisfy those is emphasized in the paper [7]. Legner et al. affirm that organizations that aim to succeed and adjust to the rapidly changing competitive environment, that results from the development of variety of digital technologies, must reveal the potentials of digital transformation, rethink their business models and strategies [6]. Hartley and Sawaya claim that when developing a strategy for digital transformation, is crucial to identify the pitfalls of the critical business processes, then to consider which domains of digital transformation will best address and prevent problems and create new opportunities [2]. Imgrund et al. discuss the need of organization digital literacy, implying being aware of the company's distinct digital capabilities; developing a digital agenda; facilitating customer-oriented products and services by obtaining knowledge and resources from all available information sources; implementing an open-minded culture, which promotes risk-taking, but having a comprehensive defense strategy [3].

**Design/ Methodology/ Approach:** Contents

This study analyzes current trends, strategies and rates of digital transformation in a qualitative study. Through a mixed-methods systematic review, the study aims at assessing the current state of the art of the digital transformation regarding the paradigm shift occurring in the business process management, in order to provide a framework of preparation, implementation and support of the digital transformation of business processes. For the literature search, the most representative keywords, strict criteria, and classification schemes based on trending studies were used.

**(Expected) Findings/Results:** Contents

The aim of the article is to provide an overview of current trends of digital transformation, to define requirements to implement main pillars of digital transformation, understand the opportunities created through it, determine potential of an organization to execute digital transformation and set out the main reasons why some companies fail to adjust changes and to transform their processes. The expected result of the study is a framework of selecting the most suitable transformation strategy; of evaluation of the impact provided by the digital transformation on the organizational performance and the digitalization degree of the organization. The study aims to propose a method that may assist organizations in developing the digital transformation potential of their business processes. The paper seeks to set criteria for the organizational digital transformation index, which reflects competitive potential of the company. Furthermore, the paper may serve as basis for future research in the area of business process gamification.

**Research limitations/ Implications:** The possible limitation of the research is the necessity of exact

data of the value obtained straight from the digital transformation.

**Keywords:** Business process innovation, business process management, company development, digitalisation, digital economy, digital technologies, digital transformation, process mining.

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## 5.

### **Gender conditioned vision of innovation opportunities**

Karine Oganisjana

Assoc. Prof., Leading researcher, Ph.D. in pedagogy, Riga Technical University, Latvia

Konstantins Kozlovskis

Assoc. Prof., Ph.D. in economics, Riga Technical University, Latvia

✂ Karine Oganisjana (Corr.).

#### **Abstract**

Problem driven approach with customer engagement is considered to be one of the principal strategies of innovation opportunity identification. The pilot research conducted by the authors in Riga Technical University in 2017-2018 study year to explore the feasibility of engaging citizens in the collection of problems-to-be solved for creating new products and services, revealed that such an approach could bring to positive outcomes (Oganisjana & Kozlovskis, 2019). The qualitative content analysis of the problems suggested by respondents from different countries brought to sixteen groups of problems which cover a broad range of challenges highlighted as topical and worthy of solving. In 2018-2019 study year the research was continued in order to collect more data for shedding light on the question whether there are principal gender-related differences in the perception of problems and their solutions given by male vs female. The analysis of the qualitative and quantitative data collected from more than 1100 respondents from different countries in the autumn semester will be conducted in January-February. Therefore, the findings of the research will be presented in spring 2020.

#### **Research Questions:**

1. What are the male vs female specific problems highlighted for solving and generating innovative products?
2. Which characteristics of potential new products are male vs female particular?
3. Are there principal gender conditioned differences in the perception of innovation opportunities?

#### **Key Literature Reviews (About 3~5 papers):**

Some scholars argue that gender stereotypes are underlying cultural beliefs that can be presented as natural or inevitable (Ridgeway and Correll, 2004). Either normatively or stereotypically differences in behaviours, attitudes and interests are associated with one or the other gender (Yancey Martin, 2006). Ample research has been conducted on exploring gender related differences which in several cases gave confirmative results. Male-female differences have been revealed related also to their visions and perceptions, like: risk-taking perceptions (Garg & Duvenhage, 2014); personal values (Chusmir, Koberg & Mills, 2001); perception of ethical behavior (Kidwell, Stevens & Bethke, 1987); etc. While the temptation is high to link these differences to mainly cultural norms, some other findings of research reveal brain hemispheric functional differences in males and females (Jalili, 2015). So, male-female vision and perception differences might be caused both by social and biological factors.

Therefore, if in open economy and open innovation the costumers play multiple roles in different stages of a new product and service development as: experience creator; innovator; co-ideator; co-evaluator; co-tester; co-designer, etc. (Agrawal & Rahman, 2015), it becomes important to research differences, similarities and commonalities of the gender-related vision / perception of problems and their solutions as sources for innovation opportunities.

#### **Design/ Methodology/ Approach:**

Research methods applied for data collection and analysis:

1. Electronic survey for data collection.
2. Qualitative content analysis for systemizing and classifying male and female specific or common problems.
3. Expert group analysis for revealing gender conditioned differences of perception of innovation opportunities based on five characteristics - usefulness, social impact, customer base, frequency of use, and novelty of products which could be created from problems highlighted by the respondents.
4. Statistical analysis for exploring significant differences among the genders' vision of innovation opportunities.

#### **(Expected) Findings/Results:**

The expected findings are to reveal whether male and female perceive problems in principally different ways and whether they accentuate more: usefulness, social impact, customer base, frequency of use or novelty of the products that could be created having solved the problems.

**Research limitations/ Implications:**

- 1) As the survey language (English) was not the mother tongue for the majority of the respondents, they experienced difficulties in expressing their thoughts; that worsened the quality of their responses.
- 2) Not all the respondents shared a "good problem". Many of them wrote their answers formally.

**Keywords:** gender conditioned vision, innovation opportunity, open innovation, usefulness, social impact, customer base, frequency of use, and novelty

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**A note from the authors.** When there is clarity in which journal this paper is going to be published, it will be complemented with a number of papers from that very journal.

## 6.

# Game Theory and Risk Management Strategies on Switching Open Source Licenses

Tao.Li (Corr)

Ph.D. Candidate, Nanjing University of Sci&Tech, School of Intelligence Property, Nanjing, 210094

Lei.Ma

Ph.D. Professor, Nanjing University of Sci&Tech, School of Public Affairs, Nanjing, 210094

Ben.Zhang

Ph.D. Lecturer, Huazhong University of Sci&Tech, China Europe I.P. Research Institute, Wuhan, 430074

LiYing.Wang

Ph.D. Professor, Zhejiang University Of Technology, China SME Research Institute, Zhejiang, 310023

## Abstract

The unilateral trade protectionism of the United States leads to restrictions on the provision of Google service core components to Huawei, ARM stops licensing, and a series of actions against the spirit of the open source movement, which ring an alarm bell for Chinese manufacturers based on open source. With the owner and developer of open source as the innovation subjects, the sequential game model of open source knowledge disclosure and open source license switch is constructed, the game equilibrium of digital innovation behavior of open source platform is derived, and the risk management strategy of innovation subject is discussed. Then, the case of Redis and MongoDB changing the open source license is analyzed. These facts support the equilibrium solution of the game. Through the sequential game analysis, it is found that the change of the open source license agreement by the open source owner may be unrelated to the political purpose, but related to the purpose of the open source owner to maintain the intellectual property rights of the source code, and to maintain the sustainable development of the open source platform and collating interests. The open innovation collaboration paradigm of the open source platform lowers barriers for individuals or organizations to enter the digital technology industry and helps new entrants to stand on the shoulders of giants and form late-mover advantages. Due to the borderless nature of open source platform innovation collaboration, developers privatize the source code of derivative works and then deploy the products in the local market for excessive profits, which harms the

sustainable development of open source platform and the overall interests. The owner of the open source platform changes the open source license agreement from permissive to restrictive, which pushes the incompleteness of the open innovation cooperation contract to a complete step. From the perspective of risk management, a stricter open source license agreement means a shift from full risk retention to risk transfer. The owner actively searches for evidence of the developer's breach on behalf of the open source platform, so the owner must help himself first and then get other help from the law. Research results can provide reference for China's open source platform development Suggestions, i.e. there will be more and more technology companies to use existing influential platform for open source (community), because of the emerging technology industrialization of achievements in the field of patent preference is low, so technology industrialization policy incentives of intellectual property rights achievements appraisal way should be changed, to adapt to the free open source ecology and business model, and reduce the risks of intellectual property of open source, guide the embedded source emerging transformation of patent technology implementation. Considering the construction of independent open source platform and open source ecology may be a corporate strategy that Chinese technology enterprises with digital innovation characteristics have to face. The initial state of the open source agreement is tolerant, which may eventually cause the business organizations without independent innovation and ecological scale to face strategic risks and operational risks under the "tolerance + replacement license" strategy of the owner of the open source intellectual property.

**Keywords:** Digital Innovation; Open Source License; Intellectual Property; Game Theory

**Research on the Construction of Innovative Ecosystem in High-tech Industrial Park—  
—With Nanning high tech Industrial Development Zone**

**Huang Xiaojing**

School of Intellectual property, Nanjing University of Science and Technology, P. R. China 210094

**ABSTRACT**

**Purpose/Research Question:**

Regional collaborative innovation platform is an important carrier for local governments to promote the high-quality development of regional economy. This paper regards all kinds of high-tech parks set up by local governments as the platform subject to promote regional collaborative innovation, by analyzing the interactive relations among the participants of the platform innovation ecosystem, this paper describes the formation mechanism, operation mechanism and internal development logic of the regional collaborative innovation platform innovation ecosystem. Based on the analysis of the innovation-driven development mode of Nanning high-tech zone, this paper puts forward some policy Suggestions for constructing innovation ecosystem in high-tech zone.

**Key literature Reviews:**

1. Open innovation.

In 2003, Henry W. Chesbrough put forward the concept of “open innovation” for the first time in the book “Open innovation: the new imperative for creating and profiting from technology”. Today, open innovation has become a hot issue in the field of innovation management. Open innovation refers to the innovation factor exchange relationship which is closely related to the external environment while the enterprise innovates itself, and covers the value innovation of technological innovation, mode innovation, management innovation, system innovation and so on. The main modes of open innovation include: (1) introverted innovation that is the open innovation within the organization, which is manifested in the whole staff participation within the organization, fully mobilizing the internal resources, and organizing the innovative modes closely linked and closely cooperated among all departments. (2) integrated innovation, that is the excellent innovation team or project outside the organization, which involves the external innovation mode of obtaining the latest technological resources in different fields. (3) platform based innovation, that is building an open innovation platform, coordinating and coordinating internal staff and external stakeholders, through the establishment of platform, truly achieve the synergy innovation mode of internal and external interaction and sharing.

2. Innovation ecosystem

Moore ( 1996 ) first defines the connotation of innovation of ecological system, and

based on certain rules and clearly points out that the innovation enterprise group which is formed by the ecological and orientation is the innovation ecosystem. Iansiti & Levin ( 2004 ) believes that every individual in the innovation ecosystem has its own niche in the system, and the change of the niche of the individual enterprise will inevitably lead to the change of the whole system. Adner ( 2006 ) pointed out that the external innovation environment is very important for the construction of innovation ecosystem, and a good external environment endows innovation ecosystem with high reliability. Etzkowitz ( 2013 ) emphasizes that the elements of innovation ecology form an isomorphic system, in which the elements interact and depend on each other, and coexist to create new advantages. The proposition of innovation ecosystem originates from the deepening of the understanding of innovation system and the deepening of innovation practice. Innovative ecosystem theory is a theoretical system which absorbs the main points of ecological theory and evolutionary economics theory, and is the latest achievement of deepening the development of innovative system theory. Open innovation can offset the profit losses from risk aversion by sharing revenues in supply chains( Yoon and Jeong ,2017). Innovation ecosystem, like biological system, evolves from random selection of elements to structured community, which is the ecological metaphor of innovation system ( YANG Hutaο , 2011 ) .For analyzing effects of open innovation strategies, S Yoon(2017) modeled reverse supply chain environments using system dynamics approach and compared the gap of profits between non-coordinative (decentralized) and coordinative activity. In addition, some scholars clearly pointed out that the innovation ecosystem is composed of multiple body elements, including government, scientific researchers, intermediary organizations, enterprises and industrial incubators. Platform theory holds that innovation ecosystem is built on platforms that can create performance and value for ecosystem members, such as services, tools and technologies. ( Moore , 1998 )

### 3. The new model of opening innovation 2.0

With the open innovation 1.0 in a partnership, open innovation 2.0 is the cycle of ecological system for enterprise, University, scientific research institutions and other stakeholder cooperation to create a multilayer, and open innovation 1.0 to improve the development efficiency and open up new formats for the purpose of innovation 2.0 to solve social problems for common purpose that is to reflect the new mode of political research. The user of the main introduction of this model, and makes the market gradually from the products to the center into service and platform, the user needs and user experience into the enterprise service innovation and R & D, which also form a user collaborative innovation concept. In this process, users get rid of the past as passive analysis objects, directly intervene in the R & D of enterprises, become one of the main body of collaborative innovation mechanism, and further activate the effect of market innovation elements.

### **Research design / Research methodology / Approach**

In this study, from the perspective of platform innovation ecosystem, as a regional collaborative innovation platform, the development of the innovation ecosystem of high-tech zone depends on the division of labor and cooperation among platform members. This functional connection is mainly composed of two correlation relations: One is the composition of enterprises in the industry chain based on vertical correlation; the other is the formation of enterprises producing similar products based on horizontal correlation. It is these two kinds of relations that constitute the main frame of technological innovation. In the regional collaborative innovation platform, the division of labor of knowledge chain composed of scientific research institutions and industrial enterprises is also relatively detailed, undertaking the tasks of high-tech research, industrialization and scale respectively. It is precisely because of the division of labor and collaboration between the main bodies of the industrial chain and the knowledge chain that high-tech achievements, high-tech industrialization and high-tech products constitute a virtuous cycle of organic system, namely, the innovation ecosystem. Only when the structure of such a system is reasonable, can the evolution and development of high-tech industrial clusters be realized. The connotation of the evolution process of such a system is the development of levels, namely, levels and their mutual interaction and inclusion relations. Based on the above analysis, we define the ecosystem of regional collaborative innovation platform as four levels, namely, composition of innovation species (enterprises), innovation population (enterprise set), innovation community (platform participants) and innovation environment.

Based on the understanding of platform innovation ecosystem in high-tech zones, and according to the availability and scientificity of data, this paper establishes a set of indicators and variables system of platform innovation ecosystem in high-tech zones, including innovation input, innovation output and innovation environment. Starting from the analysis of innovative ecosystem, the index system of innovative input is constructed from three aspects: innovative species input, innovative population structure input (industrial structure), innovative population relationship input (industry-university-research relationship) ; the index system of innovation output is constructed from two aspects: economic benefit and sustainable development. And the index system of innovation environment focuses on three aspects: policy and financial environment, knowledge environment and intermediary service environment. In order to reveal the quantitative relationship between input, output and innovation environment of platform innovation ecosystem in high-tech zones as comprehensively and systematically as possible, based on domestic and foreign literature and integrating the concept of innovation ecosystem, this paper preliminarily designs an index system including 20 indicators of

innovation input, 12 indicators of innovation output and 16 indicators of innovation environment.

**(Expected) Findings/Results:**

Aiming (1) From the perspective of input and output, the input of innovation ecosystem in Nanning High-tech Zone largely determines the quantity and quality of innovation output of regional collaborative innovation platform.

(2) Although the direct impact of innovation environment on innovation output is relatively small, it does have a great impact on innovation input and further promotes innovation output by promoting innovation input. Therefore, the promotion effect of creating a good innovation environment on innovation output cannot be underestimated.

(3) The development of Nanning High-tech Zone should start from two aspects: innovative ecological input and innovative ecological environment, analyze the actual situation of the main factors in each aspect, find the shortcomings that restrict the development, and follow its own development path according to the actual situation.

**Research limitations/ Implications:**

Admittedly, there are also some shortcomings in this study, such as the limitations of data availability, and the lack of representation of research samples in national high-tech zones, which makes it difficult to fully and objectively reflect the real-time situation of China's high-tech zones. In the following research, we will continue to make up for the deficiencies, explore other factors affecting the regional collaborative innovation platform and its mechanism of action, and accelerate the guidance of rational application and effective implementation of China's high-tech zones in the process of innovation ecosystem construction.

**Key word:** Innovation ecosystems; Collaborative innovation platform; High-tech zone.

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## 8.

# **An Open Innovation Model for University-Industry Knowledge Transfer: A Case Study of Thailand**

Opas Piansoongnern

Assistant Professor, Faculty of Business Administration, Ramkhamhaeng University, Thai

Rungluck Naksung

Lecturer, Faculty of Management Science, Thepsatri Rajabhat University, Thai

✂ Corresponding author: Opas Piansoongnern

### **Abstract**

**Purpose/ Research Question:** The key purposes of this research are to illustrate and provide an understanding of what Open Innovation means within the university-industry context. The focuses are put on the roles universities and business organizations believe they should play in Open Innovation. Because knowledge exchange and transfer between universities and business firms are becoming imperative to survival and growth of firms in most industries and countries especially emerging economies like Thailand. There are three research questions which need to answer: What roles universities believe they should play in open innovation? Why business firms do collaborate and invest in universities? Which open innovation model should be adopted to develop and drive knowledge transfer in the university-industry based innovation context.

**Key Literature Review:** Since 2015, Innovation-Driven Economy (IDE) policy has been implementing to drive Thailand's economic growth but there is no wide synergy of universities, firms, and the government. Until May 2020, Thailand's elected government officially established the new ministry which is actively responsible for the IDE mission named "Ministry of Higher Education, Science, Research and Innovation. This is an integration of the Office of Higher Education and Ministry of Science and Technology with the ultimate goal of encouraging and accelerating some new patents and innovations among universities as well as the collaboration between academic institutions and private sector. It is beneficial for all parties because firms can access to technology, knowledge, and talent, while universities can obtain external funding and practical application of their knowledge produced in academic labs which will help them for strengthening their research experience. According to Sadoi (2019), the open innovation form of industry-academia-government is needed to implement to cope with the rapid advancement in technologies such as the Internet of Things

(IoT) and artificial intelligence (AI). Japanese government's 5<sup>th</sup> Science and Technology Basic Plan (FY2016-2020), for example, has set open innovation as the core working concept aiming to bring and link together universities, firms, and the public sector to share country's future vision and proactive collaboration. From a quadruple-helix model proposed by Yun and Lui (2019), open innovation in the national innovation system (NIS) should be initiated because an increase of open innovation can motivate economic growth. In this regard, the concept of the entrepreneurial university must also be considered because universities play a key role as a trusted intermediary or open innovation hub that drives innovations through knowledge transfer. However, the question of open innovation between universities and firms has received less attention, particularly in the Thai context. Universities and their business alliances usually collaborate producing innovation by tailoring the expertise to fit industry needs on a casual or short-term basis. As mentioned by Perkmann and Walsh (2007), the relationship-intensive links between universities and firms are more important than casual or short-term collaboration. Another important point, open innovation should not be only acknowledged and exercised within science-based universities but it should widely spread to social sciences and humanities, too. Because a variety of human behavior research is another important factor in the large stages of the innovation cycle for product and service improvement and differentiation. Nonetheless, the rise of innovation awareness in Thailand leads to changes for universities, private and public sectors. Some questions about open innovation and effective collaboration between them remain unanswered and seek. Based on Sadoi (2019) and Yun and Lui (2019), this study aims to develop an open innovation model for university-industry knowledge transfer and to answer some questions as mentioned above. It can also be considered as a pioneer empirical study in the field of open innovation in Thailand.

**Design/ Methodology/ Approach:** An exploratory study based on the in-depth semi-structured interview of Vice President or equivalent level of leading Thai public universities and C-level executives of leading Thai business firms will be used as the principal research methodology.

**(Expected) Findings/Results:** The expected findings of this research are to recognize roles universities play in Open Innovation; the reasons and difficulties for collaboration between universities and business firms in the knowledge transfer process; to obtain an appropriate Open Innovation model for enhancing the development and acceleration of knowledge transfer in the university-industry context.

**Research limitations/ Implications:** The number of interviews is not sufficient for generalization. Future researchers are encouraged to collect data from a large number of persons involved in the university-industry based innovation context both the highest-ranking executives and operational ones.

**Originality/Value:** This research is considered as a pioneer empirical study aimed at investigating how Thai universities and business firms understand and involve in open innovation as well as their collaboration in transferring knowledge to create innovations.

**Keywords:** Knowledge transfer, University-industry collaboration, Open innovation

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## 9.

### **Human Resource Development of SMEs in Myanmar**

Yuri Sadoi (Corr.)

Prof. Dr. Faculty of Economics, Meijo University, JAPAN

Ye Tun Min

Ph.D, Myanmar

#### **Objectives and Research Question**

Myanmar has open its market in 2012 and has been focused its development possibilities from developed countries.

The purpose of the paper is to determine the current situation of local SMEs to evaluate and points out the problems to hinder the development of Myanmar.

The objectives of this study are 1) to identify the problems of manufacturing industry in Myanmar; 2) to assess the performance of industrial policy, 3) to identify and present improvement activities to upgrade Myanmar in manufacturing industries.

#### **Key literature review**

Michael E. Porter (2000) Location, Competition, and Economic Development: Local Clusters in a Global Economy

Porter (2000) proposed the notion of location as a competitive advantage, a way to generate advantages for regions, nations, and even firms. Small and Medium Enterprises (SMEs) are one factor in the quest to pursue national prosperity. SMEs may create competitive advantages for countries as well as at the regional level, a point that is understood by the Association of Southeast Asian Nations (ASEAN) even though public sector support for SMEs is very limited, especially in the internationalization process. Lack of consistent policy initiation and implementation has led to uncertainty for business firms.

-HRD in developing countries

Myanmar is the area that other ASEAN members may explore to find opportunities for international market expansion.

Dan Popescu (2010) How to transform small and medium enterprises into learning, Economic Science Series. 2010, Vol. 19 Issue 2, p990-996. 7p.

Ogunyomi, Paul (2016) Human resource management and organizational performance of small and medium enterprises (SMEs) in Nigeria, *International Journal of Human Resource Management*. Mar2016, Vol. 27 Issue 6, p612-634. 23p.

-Organizational creativity

Woodman (1993) defined organizational creativity as “the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system”.

Human resource management practices and organizational creativity are the important aspect to built on individual creativity as well as an essential precondition for a firm’s innovation (Amabile, 1996; Woodman et al., 1993). Organizational creativity plays an important mediating role in transforming individual creativity into organizational innovation.

### **Research Methodology**

Interview survey by authors at SMEs in Mandalay industrial zone was conducted from 2019 October to 2020.

The purpose of choosing Mandalay industrial zone for collecting data for this study was all the factories in the zone are belong to Myanmar local owners compared to the Yangon Thilawa special economic zone in which full of foreign factories.

Furthermore, Mandalay is a second largest city and a formal capital of Myanmar. Mandalay is also a major trade hub of Myanmar to its central geographical location with a major highway from the border with China and India running through the region and onwards to Yangon. Along this route, which serves as one of the country’s primary trade arteries, agricultural products as well as jade and gemstones are exported to nearby countries.

-Interview survey at Mandalay Industrial Zone

The total factories in Mandalay industrial zone are 1257. Among them, there are 385 manufacturing factories are large-sized industries; 311 medium-sized industries and 561 are small-sized industries.

There are 3 industrial zones in Mandalay industrial zone: zone 1 was established in 1990 with 700 factories, zone 2 was established in 1999 with 670 industries and zone 3 was established in 2003.

The total size is 1,306 acres and there were 15,944 loabours in the zone in 2017. The Overall private factories investment in Mandalay Industrial Zone was 1.7 Billion USD. The following are some types of industries in the zone;

food processing, garments , constructions , basic commodities , home commodities, raw

materials, farm equipment & machineries, transportations, Agriculture Equipment, Printings, Wear-resistance casting steel balls, Flour, Detergent , Materials from Oil , and So on.

## **Findings**

The interview survey results shows the following findings.

The majority of the SMEs in Mandalay in Myanmar are family business.

Human resource management system is based on traditional way of family business.

Human resource development is ad hoc bases only for new employees.

Machineries and technologies are largely depends of Chinese machineries.

Maintenances are depends on Chinese technicians.

## **Research limitations / Implications**

This research survey was done in Mandalay area. It can be applied in Yangon in future and compare the trend.

Keywords: Human Resource Development, Myanmar, SMEs, Organization learning.

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10.

**Corporate mission, board innovation strategy and firm growth**

**--a moderated mediation model**

Feiran Dong

Ph.D. student, Shandong University, Chinese

Yongzhen Xie (Corr.)

Professor, Shandong University, Chinese

Xin Li

Master student, Shandong University, Chinese

**Abstract**

Purpose/ Research Question:

The decision-making ability of the board of directors is the fundamental guarantee for enterprises' continuous growth. Board diversity affects the decision-making of the board. However, most existing researches discuss board diversity from the perspective of board members' age, education background, professional background and other horizontal attributes, but fail to consider board diversity from a holistic perspective and taking the structure, functions and tasks of the board into consideration. Also, the vertical characteristics of power and status of the board members. In fact, regional economics and corporate mission jointly restrict the innovation decision of the board. However, there are few literatures concerning this field. As a result, this paper explores the mechanism of the impact of board diversity on firm growth through the influence of innovation strategy under the mediating effect of corporate mission and regional economics. To interpret this mechanism, this paper introduces situational embeddedness theory and relational contract theory and also adopts "structure-conduct-performance" paradigm and hierarchical analysis method. Overall, this paper aims to build a theoretical model of the influence of board diversity on firm growth and to verify its effect, so as to guide enterprises to achieve sustainable growth from multiple dimensions including corporate mission, board's team building, and innovation strategic decision.

**Key Literature Reviews:**

In its report to the 19th National Congress of the Communist Party of China (CPC), the CPC called for accelerating the transformation of the economic development model and shifting the focus of promoting development to improving quality and efficiency. Existing research on the influence of firm growth mainly discuss the internal and external factors. Internal factors

include capital structure (Lang et al., 1996; Liu, 2016; Wang and Luo, 2017), governance structure (Morck et al., 2005; Suo and Li, 2017; Xie et al., 2018; Li et al., 2018; Zhang et al., 2018), technological innovation (Niu and Li, 2016; Guo and Han, 2019; Meng et al., 2019) and enterprise culture (Song et al., 2011; Qin et al., 2015; Xu Ming, 2019) et al., external factors include local policy system (Beck et al., 2005) and regional innovation network (Zhang and Liu, 2009; Wang and Chen, 2018), etc. Although there are many factors influencing the growth of enterprises, it is impossible to identify which variables have a consistent impact on the growth of enterprises (Wiklund, Patzelt and Shepherd, 2009). In the current fierce market competition environment, firm growth has evolved into the overall utilization of firm resources, namely the competition of strategic ability. Also, the strategy making or decision-making ability of firms is the fundamental guarantee for the sustainable and healthy growth of enterprises (Ding et al., 2015).

As the main body of corporate strategy decision making, the impact of board of directors on the growth of the company is often overlooked. As the center of corporate governance, the board of directors influence corporate strategies and corporate performance deeply (Forbes and Milliken, 1999), and is responsible for the effectiveness of corporate governance. The core function of the board of directors is to make strategic decisions to ensure that the company's business activities run on the right track. As a bridge between shareholders and managers, the board of directors plays an essential role in the corporate governance structure. If there are problems in the governance of the board of directors, it will inevitably affect the sustainable development of the company. As the strategic decision-making body of an enterprise, the board of directors is directly responsible for the strategic decision-making of innovation, and determines the innovation input, innovation mode and innovation performance of the enterprise (Lu and Hao, 2012). Penrose (1959) believes that the internal growth mechanism of enterprises is based on the logical framework of "firm resources -- firm capacity -- firm growth", and he emphasizes the importance of innovation ability to enterprise growth. Firm growth is a dynamic process of integrating enterprise resources through innovation, transformation and other means to promote the sustainable development of enterprises. The foundation of enterprise survival and development lies in innovation. Innovation activities are characterized by uncertainty and task complexity. Without effective guidance and sufficient resources, it is difficult for firms to develop effective innovation capabilities (Dalziel, Gentry and Bowerman, 2011), which is not conducive to the growth of enterprises. Existing researches on the characteristics of the board of directors and corporate performance mostly establish a direct relationship between them from a single perspective, such as board members' age (Platt and Platt, 2012; Mercier-suissa and Aziz, 2015), gender (Campbell and Vera, 2010; Mahadeo, Soobaroyen and Hanuman, 2012; Hafsi and Turgut, 2013) and professional background (Tuggle, Schnatterly and Johnson, 2010; Anderson, Reeb and Upadyay, 2011; Li, 2012), etc. However, the existing studies have not reached a consistent conclusion. In order to avoid the limitation of a single theory, multiple theories are needed to explain the governance of the board of directors (Hillman and Dalziel, 2003), which helps to understand the relationship between the board of directors' capital, power hierarchy and resource supply capacity and the growth of enterprises. Additionally, the existing research paradigm of "structure-performance" fails to reveal the process of board conducts and its acting mechanism (Pettigrew, 1992), which leads to the bias of theoretical research

conclusions. Compared with the former, the research paradigm of "structure-conduct-performance" (SCP) consists better with the realistic logic of the role of the team of the board on governance performance (Xie et al., 2013). Besides, according to the theory of situational embedding, enterprises are region-rooted (Pfeffer and Salaneik,1978). Different levels of regional economic development restrict the concept of regional green governance and the richness of resources, and thus affect the innovation strategy making of the board. Meanwhile, the strategy formulation and resource allocation of the board of directors (Cochran et al., 2008) are bound to be constrained by corporate mission (David, 1989; Dong et al., 2019).

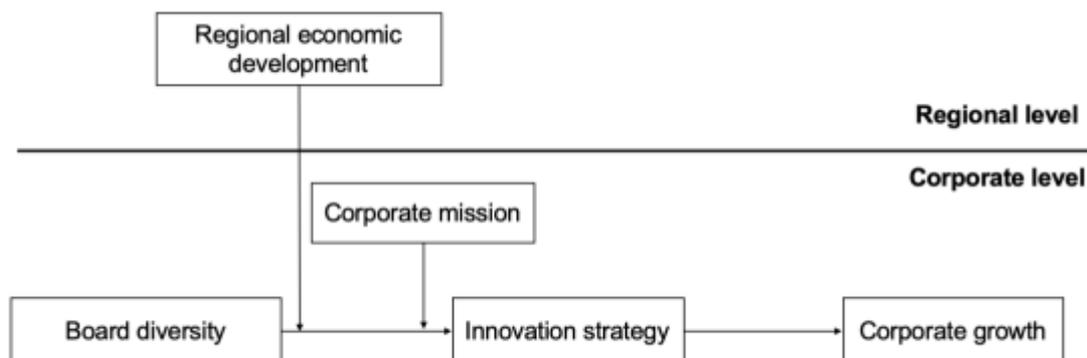
Based on the above analysis, this paper believes that as a decision-making institution of corporate governance, strategy decisions of the board have an important impact on firm growth. And the research paradigm of "structure-conduct-performance" is better consistent with practical logic. As a result, based on the paradigm of ‘structure-conduct-performance’, this paper builds a theoretical framework of firm growth, into which corporate mission, board diversity, innovation strategy and regional economics are introduced. Through this model, this paper aims to explore the mechanism and impact of board diversity on firm growth under the moderating effect of corporate mission and regional economics.

**Design/ Methodology/ Approach:**

1. Research hypothesis

Based on green development theory, scene embedding theory and relational contract theory, this paper argues that board diversity determines the innovation strategy of the board, and board diversity plays a vital role on firm growth through the innovation strategy of the board. Additionally, the implementation of innovation strategy by the board is constrained by corporate mission (David, 1989). As enterprises are region-rooted (Pfeffer and Salaneik,1978), different levels of regional economic development restrict the concept of regional green governance and the richness of resources, and further affect the green governance conducts of the board.

Based on the above analysis, we build a mechanism model as shown in Graph 1, and put forward Hypothesis 1-5 as shown in Table 1.



Graph1. The Mechanism diagram of the effect of board diversity on firm growth through innovation strategy

Table1. Research hypothesis

H1 The board diversity is positively correlated with innovation strategy.

H2 The innovation strategy is positively correlated with firm growth.

H3 Innovation strategy plays a mediating role between board diversity and firm growth.

H4 Corporate mission positively moderates the influence of board diversity on innovation strategy.

H5 Regional economics moderates the influence of board diversity on innovation strategy across the layer.

## 2. Main variables

This paper takes Chinese listed companies from 2015 to 2017 as samples. According to David's nine-factor analysis (David, 1989), corporate missions are interpreted by collecting the public annual report of listed companies, website home page and other public information. Corporate missions are assigned and graded by methods of content analysis and document coding. The main variables and their measurements in this paper are shown in table 2.

Table2. Main Variables

| Variable Type        | Variable Name   | Abbreviation | Measurements   |
|----------------------|---|--------------|--|
| Dependent variable   | Corporate growth  | CG           | The growth rate of sales revenue for the year  |
| Independent variable | Board diversity (BD)  | BDdage       | Board age diversity is measured by the standard deviation of the age of board members  |
|                      |   | BDaage       | The average age of the board of directors is measured by the average age of the board members  |
|                      |   | BDdedu       | $1 - \sum P_i^2$ ( $P_i$ is the proportion of board members whose education level falls into the category $i$ ) is used to represent board education diversity   |
|                      |   | BDaedu       | The average education level of board members is represented by the average education of board members  |
|                      |   | BDpro        | $1 - \sum P_i^2$ ( $P_i$ is the proportion of board members whose professional background falls into the category $i$ ) is used to represent board professional background diversity   |
|                      |   | BDfun        | $1 - \sum P_i^2$ ( $P_i$ is the proportion of board members whose functional background falls into the category $i$ ) is used to represent board functional background diversity   |
|                      |   | BDfp         | The variation coefficient of the power structure of the board of directors is used to represent board formal power hierarchy diversity   |
| BDfp                 | The Gini coefficient of the number of part-time board members is used to represent board informal power hierarchy diversity |              |  |
| Mediating variable   | Innovation strategy   | R&D          | The ratio of R&D expenditure to sales revenue  |
| Moderating variable  | Corporate mission   | CM           | According to David (1989), corporates which reveal information concerning each of the elements (customers, products or services, location, technology, concern for survival, philosophy, self-concept, concern for public image, concern for employees) in public report will be encoded as 1, otherwise be encoded as 0. Then, the scores of each element of corporates are counted as the total scores of the corporate mission. |
|                      | Regional economics  | RE           | The natural logarithm of GDP in the province where the company is headquartered.   |
| Control variable     | Proportion of independent directors   | IBR          | The ratio of the number of independent directors to the size of the board of directors.  |
|                      | Board incentive   | BI           | The natural logarithm of the remuneration of the first three directors.  |
|                      | Number of board   | NOB          | The number of board meetings held within the year.   |

|                      |      |  |  |
|----------------------|------|--|--|
| Meeting              |      |  |  |
| Equity concentration | EC   |  | The sum of the shareholding ratios of the top five shareholders.                               |
| Corporate type       | CT   |  | The value of state-owned enterprises is 1 and that of private enterprises is 0                 |
| Corporate age        | CA   |  | The number of years from the year of registration of the company to the time set by the sample |
| Corporate size       | CS   |  | The natural log of the company's total assets  |
| Year                 | YEAR |  | Based on 2015, Year16 and Year17 are set as virtual variables.                                 |
| Industry             | IND  |  | Dummy variable.  |

### 3. Theoretical model

Based on the above assumptions, this paper constructs theoretical models as follows:

Table3. Theoretical modes

| Hypothesis         | Theoretical modes   |
|--------------------|---|
| H1                 | $R\&D = a_0 + a_1BD + \sum a_{i0} controls + \varepsilon$ ( model 1 )   |
| H2                 | $CG = b_0 + b_1R\&D + \sum b_{i0} controls + \varepsilon$ ( model 2 )   |
| H3                 | $CG = c_0 + c_1BD + \sum c_{i0} controls + \varepsilon$ ( model 3-1 )<br>$CG = d_0 + d_1BD + d_3 * R\&D + \sum d_{i0} controls + \varepsilon$ ( model 3-2 )   |
| H4                 | $CG = d_0 + d_1BD + d_2CM + d_3 * R\&D + \sum d_{i0} controls + \varepsilon$ ( model 4-1 )<br>$CG = e_0 + e_1BD + e_2CM + e_3 * BD * CM + e_4R\&D + \sum e_{i0} controls + \varepsilon$ ( model 4-2 ) |
| H5                 | $R\&D_{ij} = \gamma_{00} + \gamma_{01} * RE + \gamma_{02} * BD + \gamma_{03} * RE * BD + \sum \gamma_{0i} controls + \varepsilon$ ( model 5 )   |
| Total factor model | $CG_{ij} = \gamma_{00} + \gamma_{01} * RE + \gamma_{02} * BD + \gamma_{03} * RE * BD + \gamma_{04}CM + \gamma_{05}CM * BD + \gamma_{06} R\&D + \sum \gamma_{0i} controls + \varepsilon$ ( model 6 )   |

#### (Expected) Findings/Results:

- 1.To set up the measurement system of corporate mission.
- 2.To establish the measurement system of green governance conducts.
- 3.To set up the construction of the theoretical model of corporate mission, board diversity,

innovation strategy and firm growth.

4.To examine the effect of corporate mission on the strategic decision-making of board's and the effect of innovation strategy on firm growth under the adjustment of external governance scenario, namely regional economics.

More specifically, this paper expects that regional economics and corporate mission have important influences on innovation strategy and firm growth: when a firm is situated in the area where regional economics and corporate mission of this firm are at higher level, the board is more likely to conduct positive innovative behavior and make decisions conducive to improving enterprises' innovation ability, so as to improve firm growth.

**Research limitations/ Implications:**

Currently, the measurements of corporate mission in China are based on classic foreign literatures and public disclosure information. However, foreign measurements are not necessarily suitable to the context of China to some extent. Therefore, a scale suitable for Chinese situation should be developed, and questionnaire should be adopted in future research.

**Keywords:** Firm growth; innovation strategy; board diversity; corporate mission; regional economics.

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## 11.

### **Benevolence spirit, CEO personality and firm innovation**

Lin Zhao

Associate professor, Shandong Jianzhu University, Chinese

Yujin Wang(Corr.)

Lecturer, Qingdao University of Science and Technology, Chinese

#### **Abstract**

##### **Purpose/ Research Question**

More and more strategy scholars are interested in the impact of CEO personality on firm strategy. However, firm innovation which is important to organizations' long-lasting success has been relatively little studied. Upper echelons theory predicts that organizational outcomes are 'reflections of the values and cognitive biases of powerful actors' and that individual executive have a significant influence on corporate policies and activities (Hambrick and Mason, 1984). But when and how CEO personality will impact firm innovation is still unknown. This paper will establish the theoretical framework of the effect of CEO personality on firm innovation integrating upper echelons with personality theory. Also, we will discuss how the situational factor of benevolence spirit will influence the association between CEO personality and firm innovation, especially in Chinese traditional culture context of Confucianism.

##### **Key Literature Reviews**

CEO narcissism in one of the overall personality assessment of CEO personal traits that most previous literatures focused on. The researchers find that CEO narcissism has the impact on corporate performance (Reina, Zhang and Peterson, 2014), corporate social responsibility (Tang, Mack and Chen, 2018; Ahn et al., 2019; AI-Shammari, Rasheed and AI-Shammari, 2019), corporate governance and corporate strategy (Zhu and Chen, 2015) and so on.

However, A more comprehensive trait framework will be required to understand CEOs'

personalities and their effect on a broader range of strategic outcomes more deeply (Barrick, Mount and Judge, 2001). Strategy scholars are increasingly employing the framework of CEO Big Five personality traits (openness, conscientiousness, extraversion, agreeableness and neuroticism). A growing body of research develops the linguistic measure of CEO personality that is a comprehensive and robust approach to personality assessment (McCrae and Costa, 1987). And they find links between CEO Big Five personality and corporate strategy change (Harrison et al., 2019), audit fee (Hrazdil et al., 2019). However, relatively little research attention, just Raja and Johns (2010) and Gal(2017), has been paid to the personality traits of top managers in driving firm innovation.

Psychology literature (Furr and Funder, 2018) and upper echelons theory suggest that characteristics of the CEO should interact with the situation to jointly determine strategic outcomes. Two of the prior researches on CEOs' Big Five traits considered situational factors (Benischke, Martin and Glaser, 2019; Harrison et al., 2019). Even so, study incorporating contextual factor into the association between personality factors and innovation is quite limited.

Newbert (2017) states that business decisions have no moral content and moral decisions have no business content. Benevolence is a central concept to the main ethical trends, which appears a much-needed corrective to the dominant idea of the self-interested maximize (Mercier and Deslandes, 2019). It can be defined as care and concern for the good, well-being, and development of others, another-oriented disposition or behavior (Smith 1970). However, benevolence has not yet been studied in the corporate strategy of innovation. Especially, it seems a paradox about the association between benevolence spirit and innovation in Chinese Confucianism culture context, which regards benevolence spirit as dominant moral virtue. It will be interesting to analyze the combined effect of CEO personality and benevolence in profitable organizations attaching importance to innovation and creativity.

**Design/ Methodology/ Approach:** This article will employ the Big Five personality framework, the dominant method for understanding individuals' broad set of personality traits, to discuss how the Big Five personality traits impact firm innovation. Also, how these relationships may vary based on the situation of benevolence spirit. The notion of CEO personality, benevolence and firm innovation has several dimensions separately. And so far, there is no common conclusion about the content and extension of benevolence that is newly

studied in corporate strategy. We will opt for qualitative methods which is the most pertinent manner investigating a construct as complex as CEO personality, benevolence and firm innovation, and to reveal the “black box” of mechanisms underpinning the relationship among the three factors.

### **(Expected) Findings/Results**

According to the prior researches in psychology and corporate strategy, some of CEO Big Five personality traits may lead to greater creativity for CEO individually which will benefit the firm innovation. Also, the risk propensity and the propensity to lead an organization to break the rules of the industry are important in an innovative CEO. We will explain our model that links the CEO personality and firm innovation in more detail. In our model we put forward the propositions as follows:

Proposition 1: Openness is assumed to be positively to firm innovation.

Proposition 2: Conscientiousness is assumed to be negatively to firm innovation.

Proposition 3: Extraversion is assumed to be positively to firm innovation.

Proposition 4: Agreeableness is assumed to be negatively to firm innovation.

Proposition 5: Neuroticism is assumed to be negatively to firm innovation.

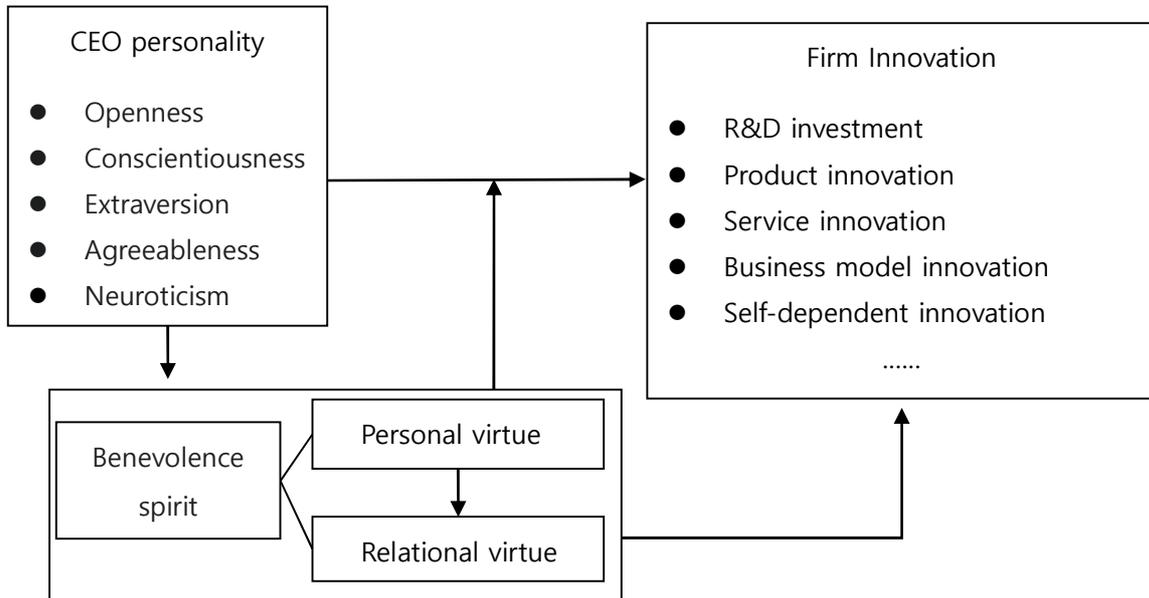
In our model, we choose benevolence spirit as the situational factor which contains two categories of personal virtue of CEO and relational virtue. The researches in the field of organizational behavior find that the benevolence leadership can stimulate employee innovative behavior (Gu, Hempel and Yu, 2019) based on Amabile's views on the intrinsic nature of creative motivation (T. M. Amabile, 1988). Also, it can prompt TMT to make strategic decision about R&D investment persistently and substantially, which will improve the self-dependent innovation properly increasing the happiness of consumers and then the welfare of society for a long time. The positive relationship between benevolence spirit and innovation is well-supported by the famous Chinese enterprise of Fotile. Here, we seek to construct the notion of benevolence spirit in the context of profitable organization and set out to analyze how benevolence impact firm innovation and also how benevolence spirit may differentially activate or constrain the various dimensions of CEOs' Big Five personality traits affecting innovation, especially in Chinese Confucianism context.

Proposition 6: Benevolence spirit is assumed to positively to firm innovation.

Proposition 7: Benevolence spirit is assumed to impact the relationship between the CEO

personality and firm innovation.

The model of benevolence spirit, CEO personality and firm innovation can be expressed as the following diagram:



### Research limitations/ Implications

There are some limitations of our research. We have not tested the model empirically using the samples of listed company in China. And also, we have not discussed how CEO personality impacts the benevolence spirit yet.

Even though, our research will have several implications. First, we contribute to the growing literature on CEO personality and firm strategy by focusing on innovation that is seldom studied. It can enrich the knowledge about psychology-based decision making and upper echelons theory through the understanding of how CEO personality can affect their strategic decisions of innovation.

Also, a new and important situational variable of benevolence spirit is introduced into the framework of CEO personality and firm innovation. It will extend our understanding of how CEO personality influences firm-level change and how both person and situation-based factors interact to jointly influence innovation.

Finally, the framework suggests what kind of CEO the organizations need to hire and promote to improve the innovation and creativity in practice.

**Keywords** CEO personality; Big Five traits; Benevolence spirit; Innovation; Upper echelons theory

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## 12.

### **Research on the Impact of Cultural Genes on Enterprise Innovation Behavior in Perspective of Quantum**

Feifei Yuan

Ph.D., School of Management, Shandong University, Chinese

Yongzhen Xie(Corr.)

Prof. , School of Management, Shandong University, Chinese

#### **Abstract**

#### **Purpose/ Research Question**

Innovation is the power source to realize the sustainable development of economy and society, especially in the context of the new scientific and technological revolution of quantization, digitalization and intelligence, the role of technological innovation is more prominent. Based on the philosophy of quantum holism, on the one hand, both national innovation and regional innovation are fundamentally inseparable from enterprise innovation. Enterprise innovation is related to the long-term competitive advantage of the enterprise in microcosmic and the sustainable development of the national (regional) economy and society in macro. On the other hand, the theory of scenario embedding reveals that the innovation behavior of enterprises must be restricted by the regional scenario factors, and the exploration of the pre factors affecting the micro enterprise innovation cannot be separated from the regional factors. "Culture is an important factor in understanding human behavior. People's beliefs and values are influenced by others around them. " Therefore, the "invisible hand" that comprehensively reflects the regional history, society, humanities, science and technology and other factors regional culture will imperceptibly penetrate into the innovative strategic decision-making behavior of board members. As Daniel Patrick Moynihan, an American statesman and sociologist said, it is culture, not politics, that determines the success of a society. Therefore, to explore the innovation behavior of micro enterprises, we must pay attention to the situational role of culture. In addition, as the core of corporate governance, the board of directors plays an important role in the formation and creation of corporate value. Since the end of 1960s, western scholars began

to study the effect of the structure and mechanism of the board of directors on corporate governance, revealing the path relationship between the role of the board of directors in corporate governance, and then affecting the strategic decision-making and business performance of the company. Although these studies confirm the important role of the board of directors in corporate governance and guide the operation of the board of directors in practice, they are still difficult to explain why the board of directors with the same structure and mechanism has great differences in corporate decision-making and performance. Informal structural factors (such as personal power, relationship between members, emotional conflict, etc.) also play an important role in the process of board decision-making interaction. He et al. (2011) first proposed the concept of informal hierarchy of the board of directors, that is, the members of the board of directors spontaneously form an invisible tower type hierarchy according to their personal ability and influence, and take it as an agent variable reflecting the interaction process of members. Under the social and cultural background of "relationship standard" and "authority obedience", people are very sensitive to formal power and authority figures. The individual interaction differences caused by power levels have more prominent impact on the team. The different cultural atmosphere in different regions makes the recognition and acceptance of the informal level different within the board of directors, that is, the role of the informal hierarchy of directors plays will be influenced by regional culture. Starting from the quantum philosophy, based on the quantum entanglement and quantum transition, this paper analyzes the influence of regional culture gene on the innovation investment and innovation performance of enterprises, and integrates the external meso level regional culture into the micro level logic system of the board's innovation decision-making and its implementation effect, and explores the role of the board of directors in the adjustment of the regional risk-taking spirit through the innovation strategy decision-making The mechanism and effect of innovation performance.

### **Key Literature Reviews**

According to the theory of organizational hierarchy, in an organization, especially in a task oriented team, hierarchy has two main functions: one is to establish organizational order and promote internal coordination. By being empowered, team leaders influence decision-making and guide other people's behavior. Team members at lower levels are expected to comply with them and retain their own views. Power levels help teams effectively make decisions and avoid

conflicts (Magee and Galinsky, 2008). Hierarchy can clearly divide the resources and influence owned by team members, which is conducive to the effective flow and integration of information among team members (Anderson and brown, 2010). Second, it can motivate individuals in organizations or groups. High level can bring more material benefits and spiritual rewards and consolations. Therefore, individuals always try to pursue a higher level in the team or organization. The continuous promotion of formal power level can provide career ladder for employees, and the expectation of higher level can motivate lower level people to work harder to achieve organizational goals. In the elite team of the board of directors, each director has different management and professional abilities, influence and respect from other members, thus forming an informal power hierarchy (he and Huang, 2011). Like other work teams, board members implicitly and automatically generate an informal hierarchy, or status level, in the team based on their evaluation of each other's capabilities and influence (he and Huang, 2011). Because directors usually spend little time together and the tasks are ambiguous, they cannot be effectively guided by formal rules (Finkelstein and Mooney, 2003), and this informal hierarchy may have a great influence on communication and coordination (Magee and Galinsky, 2008). When the informal hierarchy is larger, that is to say, the more unequal the informal power distribution is, the more respect the board members receive. There is a clear hierarchical order, which can provide clear guidance for the board members, such as when to speak, how to speak, who to talk with, and the lower level board respectfully allows the directors at the higher level to speak, but they are more By focusing on task related issues and contributing constructive ideas in a cooperative way, we can minimize unproductive conflicts among directors, improve the efficiency and efficiency of team interaction, and improve the possibility of the company's innovation strategy. On the contrary, if the informal hierarchy of the board team is small, the team interaction will become chaotic, inefficient, frustrating, and even difficult to coordinate (Magee and Galinsky, 2008), which will lead to negative social emotional behavior, which is usually not task driven and may escalate to "emotional conflict", even if the team is composed of "Star" Directors (Groysberg and Lee , 2009 ) 。

According to the theory of innovation elements, enterprise innovation is the result of the comprehensive effect of various elements. As the basic element outside the enterprise, regional environment has an important impact on enterprise innovation. Regional innovation environment will provide enterprises with a variety of resources to promote the production and

development of innovation activities. Such resources include system, economy, culture and other dimensions in the region. Among them, regional culture represents the overall cognitive characteristics, thinking mode and value orientation in the region. If the region has a good innovation culture atmosphere, it will help to promote innovation activities and improve the utilization efficiency of innovation resources. In addition, the regional culture will affect the behavior cognition of people in the region, and the humanistic factor is also an important content of innovation elements. Wang Sulian et al. (2018) pointed out that the risk-taking tendency of entrepreneurs will have an important impact on enterprise innovation.

#### Hofstede's cultural theory

Hofstede (1980), a famous psychologist in the Netherlands, pointed out that culture can influence corporate decision-making in four ways. Culture influences enterprise decision-making by influencing the distribution of rights among organizations; culture influences the values of main decision-makers; culture affects the ordinary employees of the enterprise; culture influences the values of external personnel of the enterprise and then affects the enterprise. All of these four ways show that culture will affect corporate behavior, and the spirit of adventure, as an important cultural factor, will also affect corporate decision-making by influencing the values of internal and external personnel.

#### Schwartz's cultural theory

Unlike Hofstede, Schwartz (2012) believes that culture mainly affects people as an important factor of external environment. Schwartz believes that in a specific social system, culture influences individuals' attitudes, beliefs, behaviors and thoughts. People are the carrier of culture. The influence of culture on enterprises is mainly realized by influencing the values of its employees, including ordinary employees and decision makers. The atmosphere of regional risk-taking spirit will affect the values of board members, make their risk-taking tendency and attitude to innovation different, and then affect the results of board decision-making.

### **Design/ Methodology/ Approach**

**Design:** This paper intends to establish an all factor model in which innovation input plays an intermediary role between the informal hierarchy of directors and innovation performance under the regulation of regional risk-taking spirit, so as to conform to the holistic thinking in the philosophy of science, and further reveal the mutual restriction of various relationships among variables. Nonlinearity is determined by the properties of quantum itself. The change

of microparticles from one state to another is often a jump. The world is full of quantum transitions, complexity and sudden influx of chaos. Nonlinear change is the essential attribute of the objective world. The relationship of business ecosystem is complex, and its direction is difficult to predict and control. The board of directors needs to establish the awareness of nonlinear change to avoid the disaster brought to the enterprise by linear thinking mode, such as the failure of Kodak and Nokia. According to the "chaotic" quantum thinking, the effect of the informal hierarchy of directors on enterprise innovation is non-linear, showing an inverted U-shape. At the same time, innovation input plays a non-linear intermediary role between the informal hierarchy of directors and innovation performance, and the Oriental philosophy of "too much is not enough". In addition, based on the cognition of quantum entanglement and holistic view, variables will interact with each other. This paper holds that regional culture, as the external cultural atmosphere of an enterprise, has an important impact on the decision-making of the board of directors. Risk-taking spirit regulates the impact of the informal hierarchy of directors on the innovation input of an enterprise, as well as the intermediary role of innovation input.

Based on this, we put forward relevant assumptions, as shown in Table 1.

Table 1 Research Hypothesis

|  |
|--|
| H1 : The influence of the board informal hierarchy on the innovation performance is inverted U-shaped.   |
| H2 : The impact of the board informal hierarchy on the innovation input of enterprises is inverted U-shaped.   |
| H3 : Innovation input has a positive impact on innovation performance.   |
| H4 : Innovation input plays a non-linear intermediary role between the board informal hierarchy of directors and innovation performance.               |
| H5 : Regional risk-taking spirit positively regulates the board informal hierarchy of directors in promoting the innovation investment of enterprises. |
| H6 : Regional risk-taking spirit will regulate the intermediary role of innovation input.  |

## Methodology

The company level data takes the listed companies in Shanghai and Shenzhen stock markets from 2012 to 2017 as the initial sample, and excludes the companies that are not covered by ST, board characteristics and financial data. R & D data mainly comes from the annual reports and balance sheets of each enterprise, and innovation performance related data comes from the website of National Bureau of statistics and guotai'an enterprise innovation database; the characters included in the board of directors' capital mainly come from guotai'an listed company database, wenchai.com and guotai'an characters' resumes, which are collected and supplemented manually through Baidu search. The data at the regional level are mainly from the website of the National Bureau of statistics, and the missing part is sorted out manually. Considering the availability of data and the effectiveness of analysis, this study excluded two special administrative regions and Taiwan Province with different social forms, involving 31 administrative regions. See the table below for specific variable measurement.

Table2 Variables and Measurement

| Type of Variables   | Name of Variables         | Abbreviation | Measurement  |
|---|---------------------------|--------------|--|
| Dependent   | Innovation Performance    | CPer         | Number of patent authorizations  |
| Independent   | Board Informal Hierarchy  | Ginia        | $Gini = \frac{2 \text{cov}(y, r_y)}{n y}$  |
| Mediate   | Innovation Input          | RDR          | R & D ratio=R&D expenses/Total Assets  |
| Moderate  | Regional Adventure Spirit | Adv          | CPEA = Number of new private enterprises in three years * 10000 / population aged 15-60b |
| <p>a Gini is the part-time Gini coefficient of directors: y is the part-time number of each director in the board of directors, <math>\bar{y}</math> is the average part-time number of the company, considering that the degree of gaining respect with the increase of part-time number may have marginal utility decline, this paper uses the processing method of he and Huang (2010) for reference, and takes the part-time number of the board of directors as the natural logarithm; <math>r_y</math> represents the part-time number of each director in the board of directors of the company according to</p> |                           |              |  |

the part-time number of each director Cov (y, ry) is the covariance of y and ry, and N is the total number of board of directors.

b Jeffrey A. Timmons (2008) pointed out that entrepreneurship is a way of thinking, reasoning and luck. It is driven by the opportunities brought by luck, and requires overall consideration in methods and harmonious leadership. Regional Entrepreneurial vitality is an important measure of regional risk-taking spirit. This paper uses the calculation method of rural and Wang Zheng (2016) on the level of Regional Entrepreneurial vitality for reference, and uses CPEA index to measure regional risk-taking spirit.

### Approach

In this paper, the Medcurve program in SPSS macro is used to test the non-linear mediating effect of innovation input between the informal hierarchy of directors and innovation performance, and the Process program in SPSS macro is used to test the mediating effect of regional adventure spirit on innovation input, so as to fit the gap between theory and practice through the innovation of holistic thinking, research paradigm and variable relationship, Enhance the value of theoretical research. Table3 shows the models.

Table3 Models

| Hypothesis | Models   |
|------------|--|
| H1         | $CPer = a_0 + a_1Gini + a_2Gini^2 + a_3 \sum \text{controls} + \varepsilon$ ( Model 1 )  |
| H2         | $RDR = b_0 + b_1Gini + b_2Gini^2 + b_3 \sum \text{controls} + \varepsilon$ ( Model 2 )   |
| H3         | $CPer = c_0 + c_1RDR + c_2 \sum \text{controls} + \varepsilon$ ( Model 3 )   |
| H4         | $CPer = d_0 + d_1Gini + d_2Gini^2 + d_3RDR + d_4 \sum \text{controls} + \varepsilon$ ( Model 4 )                                   |
| H5         | $RDR = e_0 + e_1Gini + e_2Gini^2 + e_3Gini * Adv + e_4Gini^2 * Adv + e_5 \sum \text{controls} + \varepsilon$ ( Model 5 )           |
| H6         | $CPer = f_0 + f_1Gini + f_2Gini^2 + f_3RDR + f_4Gini * Adv + f_5Gini^2 * Adv + f_6 \sum \text{controls} + \varepsilon$ ( Model 6 ) |

### **(Expected) Findings/Results**

This paper expects to establish an all factor model of innovation input playing an intermediary role between the informal hierarchy of directors and innovation performance under the regulation of risk-taking spirit, in order to fit the holistic thinking in the philosophy of science, and further reveal the mutual restriction of various relationships among variables.

This paper expects to conclude that the effect of the informal hierarchy of directors on the innovation input of enterprises is inverted U-shaped nonlinear relationship, and innovation input has a positive role in promoting innovation performance. At the same time, innovation input plays a non-linear intermediary role between the social capital and innovation performance of the board of directors, and the Oriental philosophy of "too much is not enough" is fully reflected. In addition, the conclusion of this paper shows that adventure spirit, as the external cultural atmosphere of an enterprise, has an important impact on the decision-making of the board of directors. Adventure spirit regulates the impact of the informal hierarchy of directors on the innovation input of an enterprise, and also regulates the intermediary role of innovation input.

**Research limitations/ Implications:** Simple regional division at provincial level does not fully represent the barrier of cultural differences. In the future, relevant research can make more detailed regional division for cultural attributes and regional cultural characteristics.

### **Keywords**

Regional Adventure Spirit; Board Informal Hierarchy; Innovation Input; Innovation Performance; Moderated Mediating

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## 13.

### **An Analysis of Regional Innovation Ecosystem and Development Strategy**

Kangjin Ju

Chef Researcher, KCERN, Korea

Yeji Kim

Researcher, KCERN, Korea

...

Minhwa Lee

Chairman, KCERN, Korea

The transition of paradigm from the centralized pursuit strategy to decentralization became a demand in the time of national development. Especially the creation of a regional innovation ecosystem is becoming an important strategy for national competitiveness. In order to create a regional innovation ecosystem, a precise diagnosis of the regional innovation ecosystem and a policy should be prepared based on this. However, until now objective indicators for the innovative ecosystem have been insufficient

This study applies to Quad Cycle model as an analysis model and extracts six indicators. Based on these, this study examines five regional areas and suggests radial dimension model. To do qualitative analysis, this study conducts focused group interview and surveys for regional innovation ecosystem

This study suggests customized policies region by region. Also, this research have implications of proposing new regional innovation indices based on Quad Cycle model in order to compare regional innovation ecosystem and suggesting individual policies.

**[Keywords] Regional Innovation, Regional Innovation index, Innovation Ecosystem, Quad Cycle Model**

## How to solve the Conflict in Sharing Platform Economy

### :The case of Korea

YEJI KIM

Researcher, KCERN(Korea Creative Economy Research Network), Republic of Korea

#### Abstract

Sharing economy has been growing explosively as one of the hottest issues. Only 5% of national GDP took up in sharing economy in 2013, which will be growing up to 50% of national GDP in 2025 and will occupy almost the same value as traditional industry sector (PWC, 2015). There is no doubt regarding this huge market valuations of sharing economy.

In the meantime, it is argued that sharing economy is affecting and disrupting traditional industries across the globe. For proof, Airbnb makes much higher value over Hyatt hotel chains and Uber is more valued than Hertz. On the one hand, ardent customers are enjoying diverse services of sharing economy, on the other hand, most of sharing platform businesses could have big power in market and are being affected against previous regulations such as labor, tax and etc. This means that a thriving sharing economy will drive new conflicts with traditional economy.

This study analyzes sharing economy focusing platform business, which is centered of the conflicts in the era. Understanding the basic of platform business itself is to help figuring out sharing platform economy. The objectives of this study are to analyze challenges and impacts from sharing economy. Ultimately, this study suggests new directions to resolve these conflicts. This study will contribute to provide with directions towards a virtuous cycle of sharing economy to overcome the conflicts.

#### Purpose/ Research Question:

##### \*Hypothesis

1. Sharing platform businesses face conflict against traditional industry in the era of sharing economy.
  - (1) Sharing companies affects traditional economy in market.
  - (2) Sharing companies affects traditional jobs.

##### \*Research Question

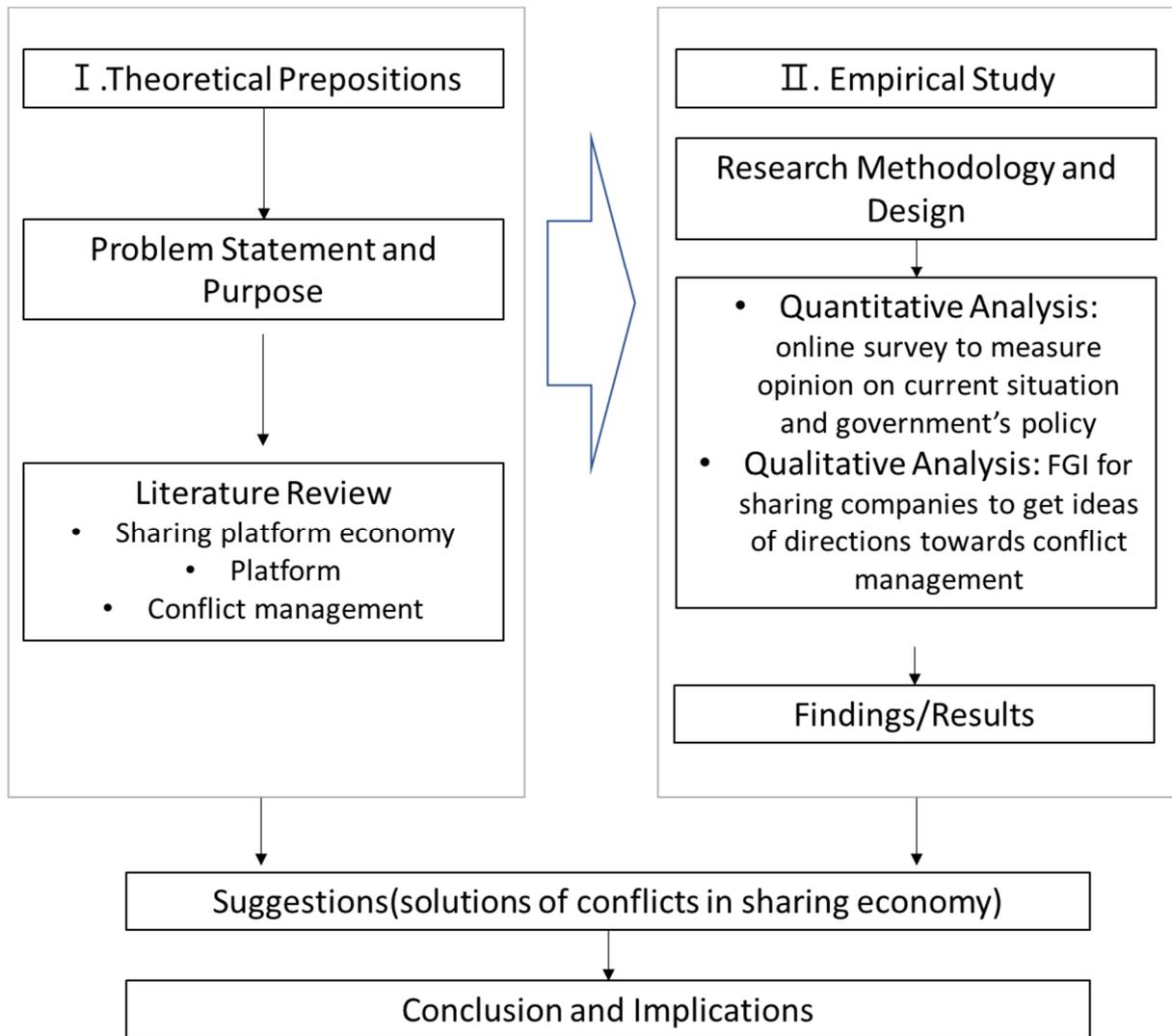
1. What are main challenges and what are common conflicts in the era of sharing economy?
2. How has the sharing economy affected traditional economy?
3. Why should we consider sharing "platform" economy when we deal with these challenges?
4. How can we solve these challenges(conflicts) occurred in sharing platform economy?

**Key Literature Reviews (About 3~5 papers):**

A Tencent researcher (2016) defined sharing economy as an economic phenomenon when one shares idle resources (whoever owns it) with others utilizing community platforms. Arun Sundararajan (2016) defined 'crowd-based capitalism' as exchanges based on public networks; in short, the true nature of an exchange is considered as an activity that could resolve the contradiction between objective-directed gift economy and the profit-directed market economy. This shows we should consider sharing economy with the basis of platform in common.

The biggest problem is regulated real economy competitors is fight the sharing newcomers and unfair advantages, conflicts and regulatory pushes could be occurred in this process (Daniel and David, 2015). Sharing Economy tend towards monopoly such as "rentier capitalist" (WEF,2019). In addition, there is an argument that profit-platforms are described as super-exploiters of labor. This is partly due to their practice of classifying providers as independent contractors rather than employees, which absolves them of responsibility for expenses, benefits and employment security (Juliet, 2017).

**Design/ Methodology/ Approach:**



**(Expected) Findings/Results:**

1. Classification of conflicts in sharing economy from case study in Korea
2. Feedback from the site, workers of sharing platform companies
3. Relationship between current conflicts and platform business

**Research limitations/ Implications:** Contents

Online survey mostly will be conducted for nationwide in order to find out how they consider conflicts against traditional industry. However, this research does not carry out survey on site such as sharing companies or traditional industry. So, the results seem to be insufficient, and additional survey will be required for further study.

In the meantime, this study contributes a direction of conflict management because it suggests the essence of conflicts in the era of sharing economy. This study classifies the type of current conflicts which simplifies these complex conflicts. Final goal of this study is to provide policy makers with directions when dealing with these conflicts.

**Keywords:** Sharing Economy, Platform, platform business, Conflict management policy

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## New Paradigm of Corporate Organization in the 4<sup>th</sup> Industrial Revolution

Achim Jang

Researcher, KCERN(Korea Creative Economy Research Network), Republic of Korea

### Abstract

#### Purpose/ Research Question:

As the national economy entered into the complex system, the planned economy system had failed. The market economy system is the typical complex adaptive system which has successfully adapted to the complex change of the economic systems. For the businesses to survive in the complex environment such as the 4<sup>th</sup> Industrial Revolution, the enterprises should understand the national level principles of the market economy through the corporation's viewpoint.

#### Key Literature Reviews (About 3~5 papers):

The system which can adapt to the complicated, complex system through complexity is called the Complex Adaptive System, or the CAS. According to Yoon, divides the classification of the characteristics of the Complex Adaptive System into more than five constituents, which are 1) composed by the agents, 2) controlled by the distributed processing management model, 3) open system, 4) self-organized critical phenomenon, 5) emergent evaluative self-organization and others [1]. The market economy system is the primary example for the complex adaptive system and the economic system which adjusted itself to complex transition. The core agent of the complex adaptive system called the market economy is the corporation. Within the economic system, the corporations emerge and self-organize through nonlinear and open interaction between the various enterprises. Analogous to the businesses as core elements inside the market system, the intrapreneurs of each corporation are the main agents inside the corporate level.

In economics, market failure is a situation in which the allocation and the distribution of goods and services by the free market is not efficient. Mainly the market failure is due to the collapse of the free market's functions. In this context, Kim categorizes the market failure into two cases as the primordial market failure and the situational market failure [2]. Based on this context, this research will classify the market failure of the business organization into the three types: 1) the monopolization of values, 2) asymmetric information, 3) imbalance of rewards and study about the resolution methods for each unbalanced condition.

In this regard, Jinhyo Joseph Yun and Min-Hwa Lee analyzed the Medison and its related

100 corporates through their research. According to Yun and Lee, the three main factors about how the Medison could produce more than 100 serial entrepreneurs among the around 300 employees were, 1) strong interior venture environment based on the open, innovative culture (venture platform within the company), 2) independent management of each project departments (like a one firm), 3) sharing of the Value, Information and Profit, or the VIP [4].

### **Design/ Methodology/ Approach:**

In order to achieve the internal marketization inside its business organization, the corporate should establish a market system within the organization first. Therefore the research proposes 1) sharing values, 2) sharing information, 3) sharing profits as a method for internal marketization and resolving the unbalance problem of the corporate organization.

### **(Expected) Findings/Results:**

First of all, this research proposes to share the information inside the organization. For information sharing, the business should establish governance through consultation and sympathy based on the leadership. Along with establishing the governance of consultation and sympathy, the authoritarian power of the company should be divided and given away to the processes, instead of the power focused as the dictatorial power of the leader.

As the organization grows up, the value becomes various. Therefore, the governance goes through careful consultation about different values, based on the necessity called as the organization's profit and the sufficiency condition named as the personal profit. However, this process is costly in the offline world. As the high expenditure on offline governance through discussion and sympathy is inefficient, the research proposes to adopt the blockchain system, which also holds the name of the technology of reliability, as an alternative. By sharing the values, the business organization can prevent the political power conflicts such as autocracy by establishing the order and the members can feel the unity with the group coincidentally, through the value made by the governance.

Secondly, the research proposes to share all of the information that is related to the corporate organization. The information as wholes and parts can be synchronized real-time through the cloud and smart devices.

The organization should share the reliable information as the data, as the false information leads to wrong decision making. As mentioned above, the role of the blockchain is assuring trustworthiness to the data. When the fingerprint is registered to the data through blockchain technology and shared, the fabrication of data is impossible. Moreover, the efficiency will be

promoted by sharing the data between the different departments. The first step towards organization innovation is by sharing the information. The information sharing is essential as the foundation for trust and cooperation among the members while increasing the probability of members discovering the organization innovation.

Lastly, the distribution of profit proposes to approach the salaries on the perspective of profit distribution, not from the expenditure viewpoint. Therefore, the company should change its object from net profit to the virtuous cycle of added values. Most of all, the changed purpose should be systemically specified and practiced through various compensations. Transparent asset management and distribution are possible through the blockchainification of business's properties. At this moment, the symbiotic sensation of corporate's profit is equal to member's gains can be settled and the organization develops together with its members.

In summary, the research proposes the sharing of Value, Information, and Profit, in short, "VIP" as the measure to establishing the market internalization and overcoming the confused values, asymmetric information and unfair profit distribution.

#### **Research limitations/ Implications:**

The research proposes the way of survival and sustainable innovation of the corporate in the age of the 4<sup>th</sup> industrial revolution, accelerating the complexity change. By prospecting the lessons from the survival and development of market economy system on the national level on the business perspective, the study emphasizes that the internalization should have priority within the corporate innovation through its main actor, intrapreneurs. However, as the research is exploratory research, verification, and proving of the context through further continuous researches such as various case studies is required.

#### **Keywords:**

the 4<sup>th</sup> Industrial Revolution, Internalization, Intrapreneur, Business Organization, Organization Management

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## 16.

### Rectangular Compass for Business Model Enlargement

- Schumpeterian New Combination of open innovation

JinHyo Joseph Yun (DGIST, Corr.)

Xiaofei Zhao

#### 1. Research Question

How can we design new business model more easily from our own thinking experiment at the states of ourselves in the open innovation knowledge funnel?

We want to answer to this question by building up concept model, and doing social experiments of applying this model at the social reality.

#### 2. Literature reviews and research framework

##### 2.1. Literature reviews

Business model research has been developed from the e-commerce which was set up from the developing of information technology and internet in 1990s (Zott, Amit, & Massa, 2011). As customers are increasingly demanding to interact with companies anytime and anywhere, the importance of business model is becoming more important right now (Weill & Woerner, 2013). Though business model was defined as a kind of description or statement until 2000-2001, after then until recently it has been accepted as a kind of concept model or architecture (Osterwalder & Pigneur, 2010; Teece, 2010; Yun, 2017). Recent business model studies such Business model prism for arts and cultural organizations, open principles in new business models, dynamics in business model frameworks, or emerging new business model of artificial intelligence including platforms are all nearly about concept model or architecture (Čirjevskis, 2019; Lee, Suh, Roy, & Baucus, 2019; Müller, Vorraber, & Slany, 2019). Common definition of business model from the concept model, or architecture perspective is “the concept model or architecture which provide value proposition, and revenue creation” (Schneider & Spieth, 2013).

Right now, business model research has been moved to the way to analyze existing business model, and develop new business models with concrete components of business models. After business model canvas set of 9 factors of business models such as value propositions, customer relationships, customer segments, key partners, key activities, key resource, cost structure, and revenue streams, most of business model concept models are keeping business model canvas even though the approach to the business model are diverse (Osterwalder & Pigneur, 2010). There are several examples such as 6 functions of business model such as the value proposition, market segment, the value chain, the cost structure and profit potential, the value network, and competitive strategy ; business model compass model with 5 W and 1 H such as who as customer segmentation, what as value proposition, how as technological system with key resource, key partners, key activities, and why as cost and revenue, and when and where as the customer relation and channels ; or the market value framework with target market, value proposition, and market offering; or the 4 elements of a successful business models such as customer

value proposition, key resources, key processes, and profit formula (Chernev, 2017, p. 14; H. Chesbrough, 2006, p. 109; Johnson, Christensen, & Kagermann, 2008; Yun, 2017, p. 158)

By the way, the business model as a cognitive map across domains for open innovation serves as an intermediate construct that links the technical and economic domains which is the descendent concept of new combination which means to combine diverse materials and forces differently and covers 5 cases such as the introduction of a new good, the introduction of a new method of production, the opening of a new market, the conquest of a new source of supply of raw materials of half-manufactured goods, and the carrying out of the new organization of any industry like the creation of a monopoly position (H. W. Chesbrough, 2003, p. 69; Schumpeter, 1982, pp. 65-66). Open innovation as open connection between technology and market over the firm boundary include the business model which means new combinations or recombination between technology and market because open innovation requires each company to open up its business models to let more external ideas and technology flow in from the outside and let more internal knowledge flow to the outside (H. Chesbrough, 2006, p. xiii; H. W. Chesbrough, 2003, p. 9; Yun, 2017, pp. 152-153).

The starting idea about the relation between open innovation, and business model is from the open innovation model concepts of Henry Chesbrough(H. Chesbrough, 2006, 2010). Business model is not just about technology anymore because open innovation business model motivate increase of new revenues such as sale/divestiture, spin-off, license, and decrease of cost like cost and time savings from leveraging external development(H. Chesbrough, 2006, p. 17; 2007). Like open innovation to business model, which is a kind of new perspective to connect between technology and market; or business models for open innovation , which match heterogeneous open innovation strategies with business model dimensions, open innovation is appearing as the way to build up new business model(Saebi & Foss, 2015; Yun, Yang, & Park, 2016).

With the relation to open innovation, several ideas about enlarging business model including business model transformation, and business model new creation were developed. The value proposition canvas creates new business model by connecting value proposition, and customer segmentation such as gain creators, or pain relievers(Osterwalder, Pigneur, Bernarda, & Smith, 2014, p. 61). The customer development model proposes the way to launch lean start-up which means the enlargement or new building of business model through iterating 4 steps such as customer discovery, customer validation, customer creation, and company building(Blank, 2013, p. 25). Blue ocean shift strategy shows us new way of value creation through rocket shooting, expanding boundary et al(Kim & Mauborgne, 2017). Through disruptive technologies, or reinventing business model in the value chain, business model can be enlarged or new business model created(Bower & Christensen, 1995; Johnson et al., 2008). If any liner supply chain structure is changed as a network of suppliers and customers, the change can be the way of enlarging of existing business model(Lyons, Mondragon, Piller, & Poler, 2012, p. 3).

## Research Framework

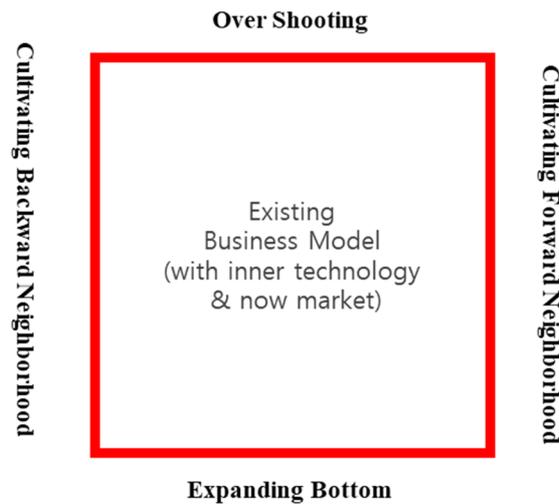


Figure 1. Rectangular Compass for business model design enlargement

We will develop and enlarge the business model design through rectangular compass which is a kind of architecture or concept model for the development of new business model. The rectangular compass comes from diverse literature reviews.

From this, we will develop 4 concrete rectangular compass concept models for customer, user, engineer, and social entrepreneurs.

### 1.1. Research scope and method.

First, this study did develop concept model of rectangular compass including rectangle compass at the open innovation knowledge funnel, and diverse rectangle compasses in business model components with open innovation according to customer, user, engineer, and social entrepreneurs. Rectangular compass concept model will be developed through literature reviews, and thinking experiment at the first step.

Second, we did social experiments which applied the rectangular compass to develop business model development by open innovation & business model research team between November 2014, and April 2018, and compared them with first social experiments which had been based on business model design compass between January 2011, and August 2014 like table 1

Table 1. Social experiment of rectangular compass, and business model of open innovation funnel

| First Social Experiment<br>(2011.01-2014.08) |   | Second Social Experiment<br>(2014.11- 2018.4) |   |
|--|---|---|---|
| BM of<br>OI funnel                           | Patent Title(Appling Number)                                      | Rectangular<br>Compass                        | Patent Title(Appling Number)  |
| Customer OI<br>based BM                      | Smart real-time concert system and<br>method thereof (10-1282743) | Overshooting<br>Rectangle                     | SMART LIBRARY MANAGEMENT<br>APPARATUS AND METHOD THEREOF<br>10-2015-0152005 |

|                                 |   |   |  |
|---------------------------------|---|---|--|
|                                 |   |   | Navigation Device and Method of Providing emotional drive route using the same (10-2018-0041560)                                   |
|                                 | Cleaning robot control method and apparatus based on autonomous learning (10-2014-0053594)              |   | System of sharing photo-based location and method thereof (10-2016-0123128)  |
| Social Entrepreneur OI based BM | Smart Weekend farm system (10-2011-0120524)   | Expanding Bottom Rectangle                  | SMART GUARD APPARATUS AND METHOD THEREOF (10-2015-0152007)   |
|                                 | Smart social library service (10-2012-0010317)  |   | System for improve smart social value (10-2016-0123353)  |
| User OI based BM                | Real estate development information intermediate method and system 10-2012-0012973                      | Cultivating Forward Neighborhood Rectangle  | Smart Meditation Apparatus For Improving Concentration and Operation Method Thereof (10-2014-0151358)                              |
|                                 | TIME AND LOCATION BASED SURVEY MARKETING SERVICE PROVIDING SERVER, AND METHOD THEREOF (10-2012-0010027) |   | Indoor Harmful gas emissions system (10-2014-0153686)  |
|                                 | ART MODULE APPARATUS FOR DRIVING AND CONTROLLING METHOD THEREOF (10-2014-0054960)                       |   | System for improve smart social value 10-2016-0123353  |
|                                 | System for preventing drowsy driving by one touch and method thereof (10-2014-0053593)                  |   | Store signboard-type smart display advertisement platform system and advertisement service method using the same (10-2019-0085833) |
| Engineer OI based BM            | APPARATUS AND METHOD FOR PUTTING POSE CORRECTING ON MOBILE TERMINAL THEREOF (10-2013-0036841)           | Cultivating Backward Neighborhood Rectangle | SYSTEM FOR ADVERTISEMENT USING SMART BENCH AND METHOD THEREOF (10-2015-0160388)  |
|                                 | Feedback public-relations server and method of manufacturing homepage using thereof 10-2013-0069705     |   | Smart Locking System Using User Terminal and Unlocking method thereof (10-2015-0172548)  |
|                                 | Bed system for the detection of sleep and sleep state detection method 10-2013-0144024                  |   | System for Electronic Car Charge Reservation and management method thereof (10-2018-0039146)                                       |
|                                 | Open business platform service method and apparatus Thereof 10-2013-0137001                             |   |  |
|                                 | Network System for Inter-vehicle and Method thereof 10-2014-0106828                                     |   |  |

### 3. Rectangular compass Concept model developing.

#### 3.1. Rectangle compass at the open innovation knowledge funnel

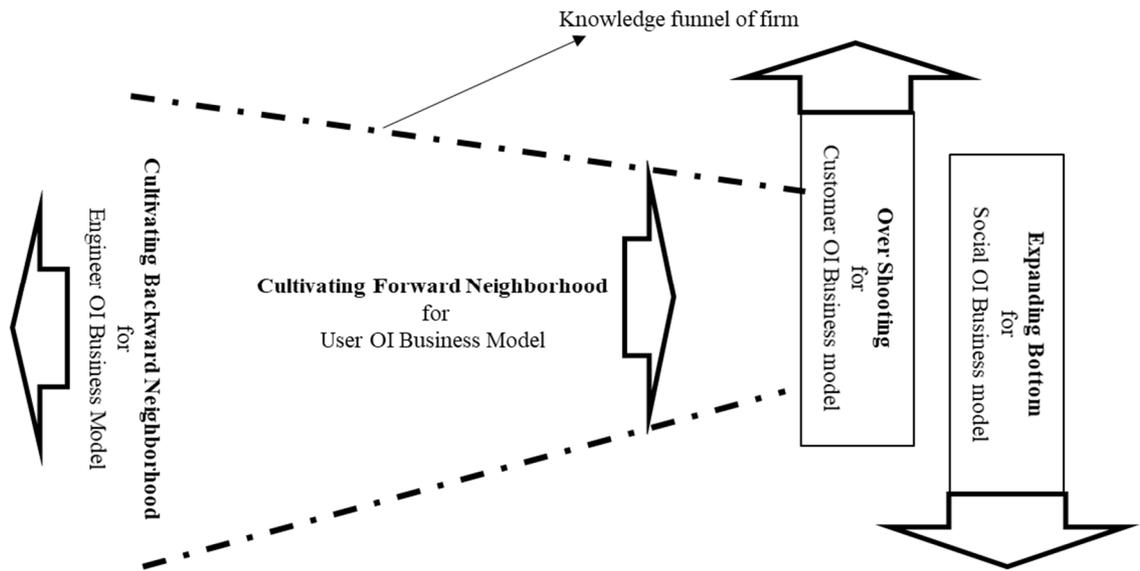
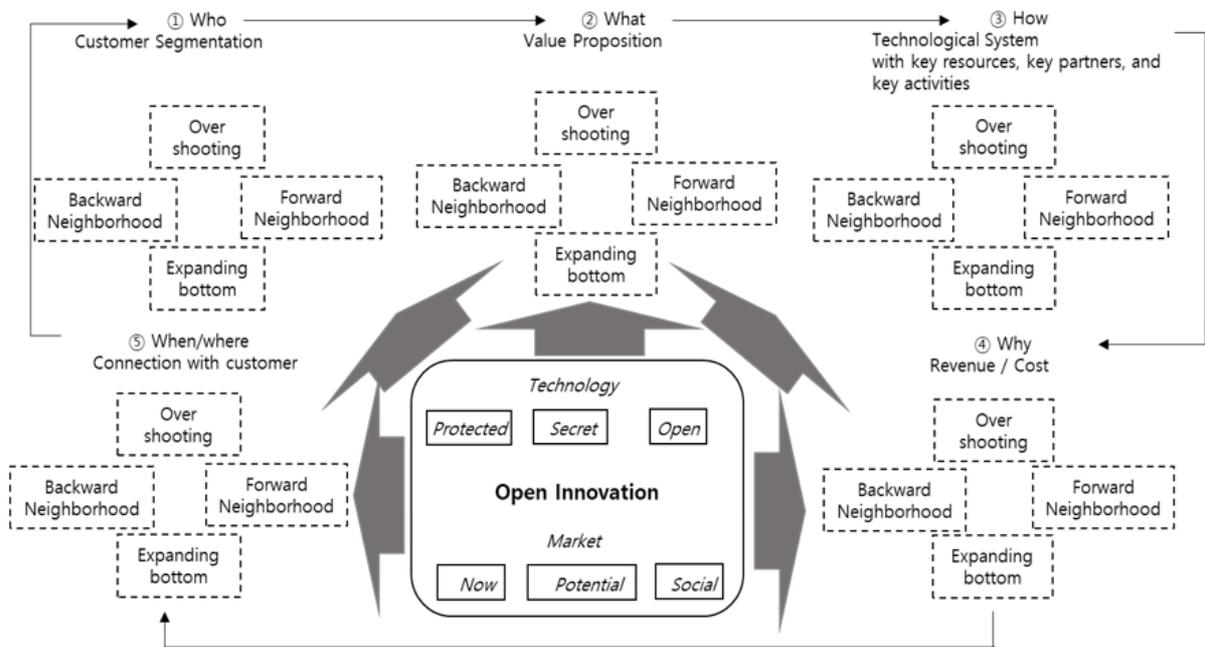


Figure 2. Rectangle compass at the open innovation knowledge funnel.

### 3.2. 4 Rectangle compasses in BM components with OI



### 3. Social experiment

- 3.1. Applying to customer open innovation business model with overshooting rectangle
- 3.2. Applying to social open innovation business model with expanding bottom rectangle
- 3.3. Applying to user open innovation business model with forward cultivating rectangle
- 3.4. Applying to engineer open innovation business model with backward cultivating rectangle

### 4. Discussion

## 5. Conclusion

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## 17.

### Getting the measure of open innovation by using of financial statements

JinHyo Joseph Yun (First and Corresponding author)

ByungTae Kim(DaeguGyung Research Institute)

jeongHan Baek (DongGuk University)

#### 1. Introduction; Research Question, and Research Scope & Method

##### 1.1. Research Question

There were a lot of studies to measure open innovation of firms objectively after open innovation depth and breadth being calculated through survey results which were done based on Frascati manual(Laursen & Salter, 2006). Until now, hot issues in open innovation include not only making open innovation work, but also measure open innovation objectively including catching up of profit from it (Davila, Epstein, & Shelton, 2012). After survey based measure, another representative method to measure open innovation was to calculate open innovation from the perspective of inter-organizational knowledge flows (Chiang & Hung, 2010). Representative example of this is to measure the open innovation of any firm by multiplying open innovation breadth, and depth which were measured from collaboration patent ratio, and average co-applicant number of the firm (Yun, Avvari, Jeong, & Lim, 2014). Measuring of open innovation through intellectual capital flow from the exogenous in-flows, and exogenous out-flows is another way to measure open innovation from patent(Michelino, Cammarano, Lamberti, & Caputo, 2014).

Even though patent-based measuring of open innovation is more objective than survey-based method, more market-oriented measuring of open innovation is being required because 1) patent based open innovation measure

cannot be applied to a lot of firms which do not apply so much patents; 2) patent is sometimes not close to market in firms.

In addition to these, this study started from the facts that financial statements provide important information that should be used to help guide decisions by owner of firm, or decision maker on open innovation strategy in firms(Carraher & Van Auken, 2013). We agree that open innovation measure is not just about open innovation activity, or process but also about open innovation culture or climate(Remneland-Wikhamn & Wikhamn, 2011). But, if any firm wants to measure open innovation to use open innovation strategy, the measure of open innovation activity will be needed.

Our research questions are as follows.

*Is it possible to measure the level and structure of open innovation of firms from financial statements?*

*How about the level and structure of open innovation of Samsung, Google, Apple, and MS?*

These research questions have focal points in open innovation activity measure from financial statements for firms to use easily at the modern market.

## 1.2. Research Scope and Method

First, we will build up model which could measure the open innovation level of a firm, or analyze the open innovation situation of a firm from literature reviews.

Second, we will apply this model in global IT firms such as Korean and US firms such as LG, Samsung, Kakao, Naver, Apple, Google, Facebook, Intel to compare firms in 2 countries, and validate the model by comparing the measure results of the model, and real open innovation of these firms in such as M&A numbers and M&A investment money.

Third, we will try to validate the forecasting ability of this model by measuring the open innovation of firms in 2017 by this model, and comparing the results with the open innovation reality of firms in 2018, and 2019.

## 2. Literature Review

Calculative practice trigger a process of mobilization of knowledge which become part of the innovation(Revellino & Mouritsen, 2015). In addition, adoption of management accounting can measure and motivate innovation through compatibility and perceived outcomes(Ax & Greve, 2017). According to any analysis, accounting in the development of a biotech innovation had shaped some particular linkages between scientific and economic ideas and different actors(Christner & Strömsten, 2015).

Financial statements data such as financial leverage, capital turnover, asset composition, and firm size are significant factors associated with fraudulent financial reporting(Persons, 1995). R&D expenditure in financial statements has a positive effect on firm value and profitability(Chen, Cheng, & Hwang, 2005). Financial performances such as ROA have an inverted U relationship with open innovation adoption(Michelino, Lamberti, Cammarano, & Caputo, 2015b). An accounting-based framework was suggested for defining open innovation adoption modalities through the analysis of annual reports about the cost, revenues, new investments and divestments in intangibles and knowledge assets related to open innovation(Michelino, Lamberti, Cammarano, & Caputo, 2015c). Another research on bio-pharmaceutical industry measured the pecuniary dimension of inbound and outbound open innovation processes through the analysis of annual reports(Michelino, Lamberti, Cammarano, & Caputo, 2015a).

Though the increase of profitability by focusing on cost reduction, and efficiency in operation were main issues in financials in closed innovation paradigm, at the era of open innovation paradigm, new issues such as the increase of profitability through new revenue streams, balancing risk and growth strategy, sustainable and profitable growth, or customer profitability are appearing as the main issue of financials (Fasnacht, 2009, pp. 153-172).

Like biodiversity is the sum total of all biotic variation from the level of genes to ecosystems, open innovation can exist from any department of a firm through firm to industry, regional innovation, sectoral innovation system, to national innovation system (Purvis & Hector, 2000; Yun, Won, Hwang, Kang, & Kim, 2015).

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## Knowledge creation by SMEs receiving government R&D support

He Soung Ahn (Corr.)

Assistant Professor, Department of Business Administration, Sejong University, Republic of Korea

### Abstract

**Purpose/ Research Question:** The purpose of this paper is to examine the role of government R&D support in the SMEs' exploration and exploitation in its innovation activities.

**Key Literature Reviews:** An important determinant of SMEs' innovation performance has been argued to be their explorative innovation activities (CITATION). While exploitation activities that allows SMEs to harvest exiting opportunities are valuable, such innovation activities is often argued to be insufficient to achieve long-term innovation performance (Kammerland, Burger, Fust, Fueglistaller, 2015). Instead, SMEs must pursue exploratory activities that requires them to be entrepreneurial and on the search for new business opportunities (Abebe & Angriawan, 2014). However, SMEs typically face severe resource constraints, which makes it difficult for them to engage in exploration.

At the same time, governments are actively supporting small and medium-sized enterprises (SMEs) in order enhance their innovation activities in hopes of improving their innovation performance in the long run (Hong, Feng, Wu, & Wang, 2016; Kim, Kim, Suh, & Zheng, 2016; Park & Shin, 2015; Radas, Anic, Tafro, & Wagner, 2015; Songling, Ishtiaq, Anwar, & Ahmed, 2018). The rationale is that government R&D support will allow SMEs to overcome their tendency to underinvest in innovation activities (Arrow, 1962; Becker, 2014; Nelson, 1959). What is more, government R&D support for SMEs will be deemed to be more effective if it renders SMEs to engage in exploration rather than sole on exploitation. Nevertheless, our understanding of whether government R&D support leads SMEs to engage in exploration or exploitation in its innovation activities remains lacking.

In this paper, we focus on the role of government R&D support for SMEs and explore whether such support is actually effective in enhancing SMEs' exploration initiatives in innovation. Specifically, we argue that government R&D support is positively associated with SMEs' exploration activities.

**Design/ Methodology/ Approach:** We will test the proposed research model using a sample of 284 SMEs that have participated in the South Korean government's technology development

support programs. A survey was collected from the managers of the R&D department.

**(Expected) Findings/Results:** We expect to find that government R&D support will be positively associated with SMEs' explorative innovation activities. In the final paper, we will identify moderating variables that will influence the positive relationship between government R&D support and SMEs' exploration.

**Research limitations/ Implications:** The finding that government R&D support will boost SMEs' exploration will imply that the government funding that aims to complement SMEs' innovation efforts are in fact effective. Allowing SMEs to engage in more experimentation and explore uncertain innovation attempts is a true policy goal that the government is interested in and benefits the broader society as a whole.

**Keywords:** SMEs, government R&D support, exploration, exploitation, innovation

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## 19.

### **Effects of hard and soft power on cross border M&As.**

Junghyun Kim

Ph.D Student, Myongji University, Korean

Jeonghwan Lee (Corr.)

Professor, Myongji University, Korean

#### Abstract

What would be the driving force of fostering national power or security? Can economic power overwhelm material power and become only sustainable factor for regimes in the 21st century? Or what leverages economic power on these days?

For the last centennial, the material power, so called hard power is the biggest power at all time in criterion of balance of power of the regime. Hard power is connoted breadth of military forces and population possessed by the regimes. Counter to this concept, soft power is newly implemented concept and began magnified with the beginning of the third wave . Soft power is free style influences. This could be represented through economy, media, cultural values, political influences, and foreign policies. It appeals and attracts others by influencing in less transparent channels and lobbying.

By implementing these concepts into brisk M&A market, which force could be more influential or to be penetrated effectively? If considering correlation or causality between hard power and soft power based economy, it can be aroused with question mark whether rich country with hard power or soft power can be in favorable position to conduct its cross-border M&A activity. To be precise, do stronger states with superb force highly effective on outward corporate activity, such in M&A at counter partner institution?

Recently, so called traditional M&A market eco system has changed. Market's leading powers, capital with brand power were mostly acquiring firms while start-ups and crumbling firms were the acquired firms in the market. This phenomenon has changed. The rises of Chinese firms

were backed up with complete support of their government random purchasing firms widely and externally.

Research on past & present phenomenon on cross border M&A cases and involved corporates' behavior would have differentiated. It is an era of strong intervention of states in the cross-border M&A market. In some extent, the states' political decision and role has become finishing blow on the M&A jungle. The paper will be targeting outcome whether hard and soft power influence on their corporates M&A activity on the foreign territory.

#### Research Idea

Up-to-date ground rule of international commerce have brought about both economic & political upheaval in world economic order. Generally outward M&A is accepted as tools for pioneering new markets, converging or diversifying firms' field of business, and pursuing for economies of scale & scope. It has evolved to accentuate knowledge and technology acquisition for perpendicular leapfrogging, especially from transitions in last-movers.

Until the financial crisis, the most of the M&A cases were achieved utterly under economic thinking. But post crisis, as political thinking, instrument of national power grew more widely and deeply. And today, there is a bigger hegemony struggle emerging on the horizon.

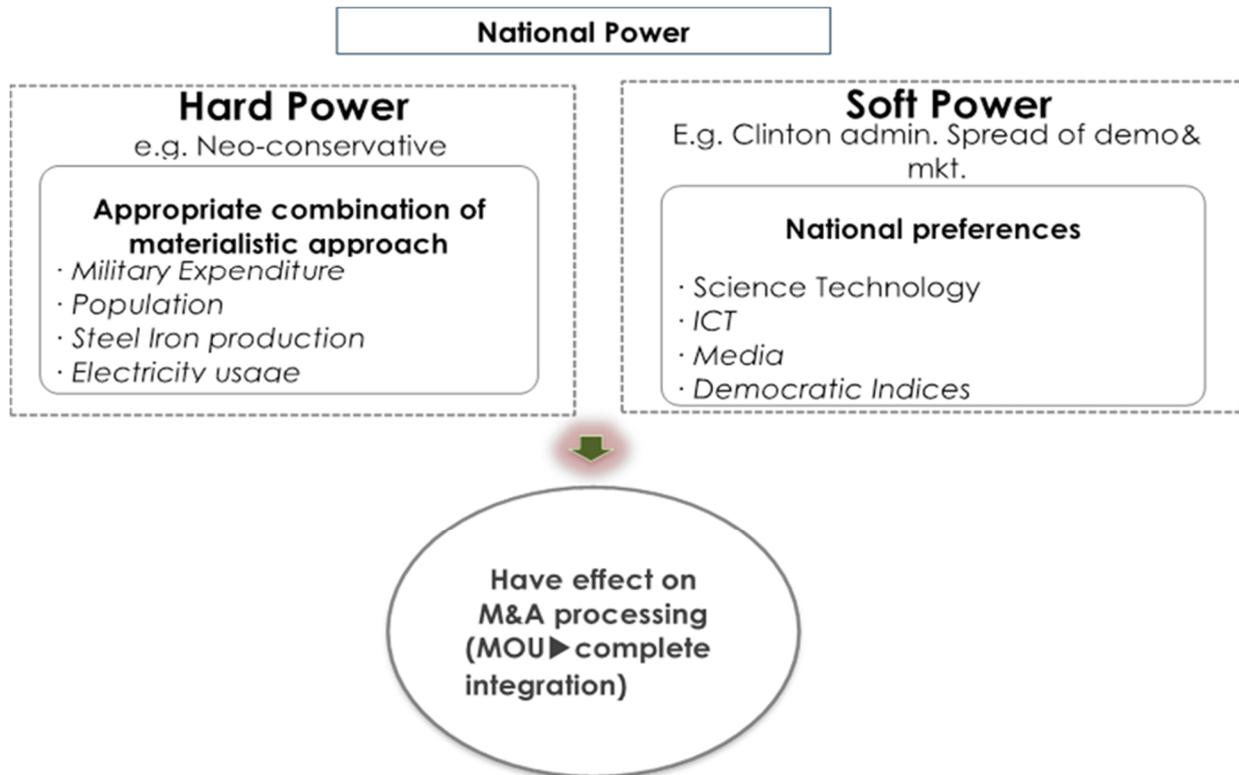
The dissertation would focus on these political tool's correlation with economic activity, its impact on outward M&A in the host country.

#### Purpose/ Research Question:

As mentioned above, the purpose of research is focusing how the states' power effects on cross border M&As. The power can be distinguished into hard and soft power. Beyond a passing glance, we are looking for both power's effects on cross border M&A from its announcement to the effective date.

Just by the look of it, the power might have affected in negotiation progress. Therefore, we would like to spotlight back onto real time progress from the M&A announcement to the complete integration

#### Design/ Methodology/ Approach



National power can be defined in two large categories, hard and soft power. Hard power is traditional material based indices based with coercion and military forces. On the other hand, soft power is newly brought ideas with rise of internet and globalization. It covers media, ICT, democracy, and etc.

#### (Expected) Findings/Results

In the view of hard power superiority, international regimes' hard power would contribute to their outward M&A performances. Hence, comparably advanced hard power related indices would be concluded with positive and higher outward M&A performances than others. Secondly, increasing and higher portion in hard power budget would show tendency on increments outward M&A cases and investment.

Assuming that the states with higher soft power might better perform in cross-border M&As. So the states with advanced soft power indices would be concluded with positive and higher outward M&A performances than others.

#### Research limitations

Sorting out big data on soft power is time consuming. It is also limited as the data has less public confidence.

#### Implications

Focusing whether states national power effects on corporates cross border M&A activity. The

power could be defined as materialistic and emotional approaches.

#### Keywords

Innovation, Hegemony, Hard and soft power, cross-border M&A

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## **The optimal diversification strategy for innovation management: balance-centered or hetero-centered?**

Eungdo Kim(Corr.)

Assistant Professor, Graduate School of Biomedical Convergence, College of Medicine, Chungbuk National University,  
Cheongju 28644, South Korea

### **Abstract**

Due to the importance of diversification effect, firm's diversification was discussed by different value chains of market, product, and technology. Previously, the diversification itself was adopted in a simple manner although its property contains different aspects and the results varies depending on the diversity property of selected index. In addition, the existing approach for measuring firm's product/market diversification using sales information distinguished by standard industry classification cannot provide direct implication as different strategies are made for market and product diversification. In this sense, this study takes firm-level diversification research to new level of analysis by considering firm-level diversification with clear separation between market and product and two diversification perspectives. To find out the effects of our framework on business and innovation performance, an empirical analysis for pharmaceutical firms are conducted. In the case of market diversification, less market heterogeneity causes a significant influence on business performance. For product (technology), a balanced and less heterogeneous (concentrated and heterogeneous) product (technology) diversification are turned out to promote the firm's performance.

Keywords: diversification framework; diversity property; market diversification; product diversification; technology diversification; panel regression

## **Do strategic alliances really benefit firms? A distinction between successful and failed alliances**

He Soung Ahn

Assistant Professor, Department of Business Administration, Sejong University, Republic of Korea

Eundgo Kim (Corr.)

Assistant professor, Department of biomedical convergence, College of Medicine, Chungbuk National University, Republic of Korea

### **Abstract**

**Purpose/ Research Question:** The purpose of this paper is twofold. First, we focus on the role of alliance portfolio management capability as a determinant of firms' overall likelihood of alliance success of its alliance portfolio. Second, we study whether higher likelihood of alliance portfolio success really do benefit firms by enhancing performance.

**Key Literature Reviews:** In the face of increasingly competitive environments, firms are actively adopting strategic alliances as a valuable strategic tool for enhancing firm competitiveness (Schilke & Goerzen, 2010). However, strategic alliances can enhance the competitive advantage of firms only when they are successful. As such, much of the prior research has focused on measuring the outcomes of individual strategic alliances (Christoffersen, Plenborg, & Robson, 2014). Other scholars have gone on to examine why some firms are able to achieve alliance success better than other competitors (Kale, Dyer, & Singh, 2002; Reuer & Ragozzino, 2006; Schilke & Goerzen, 2010).

At the same time, it is not uncommon for firms to have multiple strategic alliances operating simultaneously (Liang & Shao, 2019). As a result, firms must be able to achieve alliance success in its overall set of strategic alliances. In fact, alliance portfolio management capability is being recognized as a key capability that firms should possess in order to be successful in adopting interfirm cooperative strategies (Castro & Roldan, 2015; Han, Chen, & Deng, 2018; Hoffmann, 2007). Defined as a firm's capability to manage its entire set of alliances, the key idea behind alliance portfolio management capability is that a firm must be able to reach its final strategic goal by successfully managing its overall portfolio of alliances rather than focusing on the success or failure of its individual alliances (Hoffman, 2007).

Although the importance of alliance portfolio management capability has been recognized

in the existing literature (Castro & Roldan, 2015; Han, Chen, & Deng, 2018; Hoffmann, 2007), its role in enhancing the firms' overall success in its alliance portfolio and ultimately its performance has not yet been fully explored.

**Design/ Methodology/ Approach:** Alliance portfolio management capability will be measured using key network indices (e.g., density, brokerage) that are measured from the overall alliance network. Overall likelihood of alliance success will be measured at the level of firms' alliance portfolio. Although the specific measurement of firm performance is still under discussion, we plan to adopt several different measurements of performance in order to increase validity of our results.

**(Expected) Findings/Results:** We expect to find alliance portfolio management capability to increase the likelihood of alliance portfolio success and eventually lead to an increase in firm performance.

**Research limitations/ Implications:** By studying firms' strategic alliances at the portfolio level, we aim to go beyond a narrow focus on individual alliances implemented by firms. Instead, this paper explores firms' alliance portfolio in order to determine the key antecedent to alliance portfolio success (i.e., alliance portfolio management capability) and the effect of such alliance portfolio success on firm performance.

**Keywords:** Strategic alliance, alliance portfolio management capability, alliance success, firm performance

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22.

## **How do Cooperation between Large firms and SMEs Influence on Performance? – A Case of Korean Food Industry**

Harry Jeong

Ph.D. Student, Chungbuk National University, Korea

Kwangsoo Shin (Corr.)

Ph.D., Chungbuk National University, Korea

### **Abstract**

#### **Purpose/ Research Question:**

In the food industry of the catchup countries led by large firms, cooperation between large firms and SMEs (Small and Medium Enterprises) is crucial to improving firm's performance. Previously, cooperation between large firms and SMEs has been recognized as being carried out on the basis of duty or reciprocity of large firms. For large firms, working with SMEs is not a negative factor like taking part in losses. It is the point of improving the performance of large firms themselves. There have been some studies on the coexistence of large firms and SMEs in the developed countries, but the research on this field is little in the food industry of the catchup countries such as Korea. Hence, it is very necessary to study the effect of the cooperation of large firms and SMEs on the performance in these countries.

#### **Key Literature Reviews (About 3~5 papers):**

○ Radziwon, A.; Bogers, M. **Open innovation in SMEs: Exploring inter-organizational relationships in an ecosystem.** *Technological Forecasting and Social Change* 2019, 146, 573-587.

- They may not treat each other as a partner because large firms and SMEs appear to have different interests and give different values to common projects (Rothwell and Dodgson, 1991). However, Radziwon and Bogers (2019) found that large firms and SMEs can collaborate with each other

according to the condition of regulatory, market, customer, user, product or technology.

○ **Della Corte, V. Innovation through coepetition: Future directions and new challenges. *J. Open Innov. Technol, Mark, Complex.* 2018, 4(4), 47.**

- Brandeburger and Nalebuff (1996) proposed the concept of coepetition, in which the 'Value Net' model allows a firm's partners to compete and collaborate simultaneously. SMEs can benefit greatly from working with other firms, including competitors (Loebecke, C., Van Fanema, P.C., and Powell, P.). Della Corte (2018) says that the more balanced the competition and cooperation, the higher the innovative and competitive advantage.

○ **Lee, K.; Park, I.; Yoon, B. An approach for r&d partner selection in alliances between large companies, and small and medium enterprises (smes): Application of bayesian network and patent analysis. *Sustainability* 2016 8(2), 117.**

- SMEs with limited resources try to overcome them through cooperation with large firms. From a large firm's perspective, they choose to collaborate with SMEs that have the necessary resources, such as people, technology and equipment, as a way to innovate in the short term (Sawers, Pretorius, and Oerlemans, 2008). The experience of previous collaboration successes increases the likelihood of creating another partnership by reducing uncertainty (Anand, and Khanna, 2000). Many firms focus on collaboration rather than technology for R&D collaboration. (Nieto, and Santamaria, 2010) Lee, Park, and Yoon (2016) proposed the way of selecting the technology required for large firms. First, the technology roadmap (TRM) was prepared. Second, the technology needed for R&D collaboration with SMEs. Third, the candidate firms are listed up. Fourth, conditional probability table is constructed, and then the partners are evaluated and selected based on the Bayesian network model.

○ **Kim, C.; Lee, J. The Effect of Network Structure on Performance in South Korea SMEs: The Moderating Effects of Absorptive Capacity. *Sustainability* 2018, 10(9), 3174.**

- Kim and Lee (2018) confirmed that social capital is important in providing SMEs with resources that are critical to the success of a firm. However, recently some studies have shown that network activity has an inverted U-shape or negative effects due to the time and cost of setting up and maintaining members. (Gulati, Nohria, and Zaheer, 2000; Gilsing, Nooteboom, Vanhaverbeke, Duysters, and van den Oord, 2008; Koka, and Prescott, 2008)

#### **Design/ Methodology/ Approach:**

- We plan to use a case study method (Yin, 2003). We will investigate the cases of cooperation with SMEs and 22 large firms of Korean food industry with exceeding KRW 1 trillion (2018 year sales). The survey period is 10 years from 2009 to 2018, and we will investigate cases of MOU (joint

research, joint venture, M & A) with SMEs. The research method is to extract the case of developing new products through cooperation between large firms and SMEs by searching major daily newspaper Internet portals (15 media firms including Chosun ilbo, Dong-A ilbo, Hankook ilbo etc.). The data on the improvement of sales performance through cooperation will be based on the overall sales of the contents disclosed in the firm electronic disclosure (dart.fss.or.kr).

**(Expected) Findings/Results:**

- This study examines the achievements of large firms in collaboration with SMEs in the food industry. Through this, it is revealed that cooperation with SMEs is important to increase profits at large firms. And it is one of the efficient ways to achieve innovation.

**Research limitations/ Implications:**

- In addition to patents, the firm's innovation performance can be measured by (1) the number of new product developments and (2) the change in sales from new product developments. However, since firms do not disclose all information on new product development and new product sales. So we would search the Internet articles to check the new product development status, and measure the change in the total firm's sales, not the sales of only new products, in the firm's disclosure data. There is a limitation that it is not accurate data on the increase or decrease of sales due to the development.

- Through this study, firms can see how large firms have improved their performance through the cooperation with SMEs, and consider a viable model.

**Keywords:**

Cooperation; Food industry; Catchup country; Large firm and SME

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## **Strategies for Utilizing Public Health Big Data**

### **- A Case of South Korea medical Industry -**

Gyuyoung Kim

Ph.D. Student, Chungbuk National University, Korea

Kwangsoo Shin (Corr.)

Ph.D., Chungbuk National University, Korea

#### **Abstract**

##### **Purpose/ Research Question**

The use of public health data is important for healthcare innovation. Existing health and medical services will be developed in the future so that health care can be carried out through wearable devices or big data in everyday life, such as at home or at work, if they have been treated in person. This is because the paradigm of health and medical services is changing due to rapid development of information and communication technologies such as artificial intelligence and the Internet of Things. In addition, the use of big data in medical services is expected to be used for the health and benefits of the people, including the reduction of medical expenses and prevention of infectious diseases, which are considered important areas for the nation as well.

The use of public health and medical big data is important, but various problems have been raised. Big data on public health care are available under the current law, but due to lack of regulations or precedents on the main body and method of handling personal information, institutions holding personal information are reluctant to provide resident registration numbers. In addition, encrypted national resident registration numbers use the same encryption program, which can be identified several times. Despite data collected at public expense, it is difficult to utilize big data on public health care because data retention institutions operate data only when data is monopolized and data is provided through the institution. Therefore, this study seeks solutions by asking researchers a variety of questions to help utilize public health data.

It is necessary to conduct opinion surveys of health and medical researchers who are the main contributors to the use of data, and to utilize public health and medical big data such as public health and medical big data status, value recognition, and difficulties. In addition, public health care data amplifies its value when linked to various private data. Problems and improvements for the

linkage were investigated.

### **Key Literature Reviews (About 3~5 papers):**

○ Statistics Korea (2016). Current Status and Activation of Public and Private Big Data Link: Statistics of Newlyweds, Statistics Korea press release.

- The NSO found the implications of newlyweds' policy to cope with low birthrates through links to private big data (the National Statistical Office, 2016). This may result in valuable statistical information being obtained through links between data, which is difficult to obtain only by statistical investigation.

○ Lee S. M. (2011). Health technology assessment of prostate cancer screening test in the context of national cancer screening program. Seoul: National Evidence-based Healthcare Collaborating Agency, Ministry of Health and Welfare.

Lee (2011) conducted a study on prostate cancer by linking the sources of hospital examination data, health insurance claim data, central cancer registration data and Statistics Korea death data.

○ Pisani, E., & AbouZahr, C. (2010). Sharing health data: good intentions are not enough. *Bulletin of the World Health Organization*, 88(6), 462-466.

The benefits of sharing and linking data across public health and epidemiology are being emphasized worldwide, and the associated research funds and support is on the rise (Pisani & Abouzahr, 2010).

### **Design/ Methodology/ Approach**

The "Construction of Connection platform health care of Big Data project" was conducted in order to promote the use of public health and medical data. It is necessary to conduct opinion surveys of health and medical researchers who are responsible for data utilization in order to facilitate the utilization of health care data in public institutions and to recognize and solve problems related to data links. Therefore, the relevant data regarding the Interlocking between utilization and survey researchers performed.

The survey for this survey consisted largely of 1) questions about the status of use, value recognition, difficulties, and 2) problems and improvements for the connection of health care data to public institutions.

#### **1. Utilizing public health and medical data**

First, to find out the current status of public health data, 1) R&D tasks and academic papers were conducted using public health care data, and 2) the utilization value and data availability of each public health data were inquired. 3) In addition, researchers using health care data from public institutions were asked about the value of each data for 1 promotion of health and prevention of disease, 2 improvement of health care value, and 3 research on the development of the health care industry.

Second, to identify difficulties in utilizing public health care data, 1) the cost of purchasing data, 2)

the staff for analyzing data, 3) the lack of coding of data provided by public institutions, 4) the inability to analyze additional data linkages due to the progress of non-identification, 5) the lack of explanation variables provided by public institutions (such as variables) and 6) the agency's data sharing procedures are difficult enough to secure enough data.

Third, the criteria for calculating costs were asked by respondents who said they would pay for the payment in order to find out whether they would pay for the use of public health care data. The cost estimation criteria allowed us to select four criteria: 1) absolute volume of data, 2) number of variables provided, 3) labor costs injected to provide data, 4) fixed costs associated with data construction and maintenance, and labor costs (variable costs) to provide data (variable costs), and other comments were described in other matters.

## 2. Interlink public health and medical data

First, the need to link the health care data of public institutions and the ease of linkage was questioned. The types of data links were divided into 1) links between public health care data and 2) links between public health care data and private data. It was assumed that the private data included all medical institution data, non-medical institution data, and personal health records.

Second, to identify the biggest obstacle to the linkage of health care data of public institutions, 1) the existing laws and regulations such as the Personal Information Protection Act, the Medical Act, 2) the technical deficiencies (security-related), 3) and the lack of awareness and willingness of individual public institutions to link data, and other opinions were asked to be described in other matters.

Third, the need for a project to build a big data link platform for health care was questioned and the health care data of public institutions that should be mounted more on the linked platform.

### **(Expected) Findings/Results:**

Korea wants to develop the medical big data industry by utilizing medical data from public institutions, but has yet to make much difference except for a few studies. This is because it did not properly reflect the needs of the industry's consumers. Therefore, it is necessary to listen to the opinions of the demanders and seek out strategies for the development of the industry. Therefore, it is expected that this study will be conducted on demand and based on this survey, the main study results will be derived that reflect the needs of actual industry demanders.

### **Research limitations/ Implications:** Contents

### **Keywords:**

healthcare; bigdata; linkage; strategies

## **Reference**

Statistics Korea (2016). Current Status and Activation of Public and Private Big Data Link: Statistics of Newlyweds, Statistics Korea press release.

Lee S. M. (2011). Health technology assessment of prostate cancer screening test in the context of national cancer screening program. Seoul: National Evidence-based Healthcare Collaborating Agency, Ministry of Health and Welfare.

Pisani, E., & AbouZahr, C. (2010). Sharing health data: good intentions are not enough. *Bulletin of the World Health Organization*, 88(6), 462-466.

## **How innovation capacities affect firm performance in pharmaceutical industry: Focus on capability-based framework for open innovation**

Eung-do, Kim

Prof. Chungbuk National University, Republic of Korea

**Keywords:** Open innovation, pharmaceutical industry, knowledge-based view, knowledge management, technological innovation performance, financial performance

### 1. Introduction

Developing new products in the pharmaceutical industry requires astronomical investment and a multidisciplinary team of experts for periods exceeding a decade. In spite of these long-term and high-cost investments, the risk of successful commercialization of blockbuster products is limited to less than 10%. (Joseph, A.D. et al, 2016) Therefore, the pharmaceutical industry is characterized by (1) high-level of technology (2) high-costs and long-term R&D and (3) high-risk and high-returns. However, even though companies have made various efforts to increase efficiency by reducing investment cost and increasing profit, R&D efficiency in this industry is gradually declining recently. (Carter, P.H. et al, 2016) Because it is difficult for one company to sustain the cost and duration of developing a new product, several companies share the product development stage similarly to a relay race. Over the past two decades, large international pharmaceutical companies have been increasingly involved in the transition to an open innovation R&D system from the traditionally closed R&D, through trading and collaboration with external research institutes and companies. Firms pursue partnership

strategies such as M&A and Licensing to reduce the risk and expand the product pipeline. Small and medium-sized companies jointly develop through Partnership or have an Exit strategy through Licensing Out or M&A to resolve investment difficulties. These open innovation strategies allow firms to share risk with partners. (Sambandan, P. et al 2015) The success of this open innovation strategy depends on how well firms can absorb external technological knowledge. Main research question of this study is what the capacity of a firm has in order to lead to the firm's performances.

## 2. Capability-based framework for open innovation

The knowledge-based view in strategic management emphasizes knowledge as a resource and technological innovation by exploitation and exploration as a dynamic capability among various resources. (Martín-de Castro, G. et al, 2015) The combinative perspective of resource-based and dynamic capabilities in the knowledge-based view helps managers to understand and explain most of the complex business phenomena they encounter and to expand the firm's boundaries. In particular, in high-tech industries, firm's competitive advantage is directly related to continuous technological innovations. Thus, high-tech firms should build strongly on inter-organizational knowledge creation process through open innovation as well as internal knowledge creation process.

Lichtenthaler, U. et al (2009) represented a capability-based framework for open innovation processes, by complementing the concept of absorptive capacity. Firm's critical capabilities of managing internal and external knowledge in open innovation processes systematized in six knowledge capacities. Inventive capacity refers to firm's own knowledge management ability,

i.e. generate new knowledge inside the firm. Absorptive capacity, on the other hand, is related to exploring external knowledge. Firms having absorptive capacity acquire external knowledge and assimilate this knowledge by means of incorporating it into the firm’s knowledge base. Transformative capacity refers to a firm’s capability of internally retaining knowledge. Connective capacity comprises the process stages of maintaining knowledge in interorganizational relationships and subsequently reactivating this knowledge. Innovative capacity is associated with matching inventions with the context of their final market. Desorptive capacity comprises the process stages of identifying external knowledge exploitation opportunities and subsequently transferring the knowledge to the recipient.

Table 1. Definition of capability-based framework for open innovation

|          | Knowledge exploration | Knowledge retention     | Knowledge exploitation |
|----------|-----------------------|-------------------------|------------------------|
| Internal | Inventive Capacity    | Transformative capacity | Innovative capacity    |
| External | Absorptive capacity   | Connective capacity     | Desorptive capacity    |

### 3. Conceptual framework and hypotheses

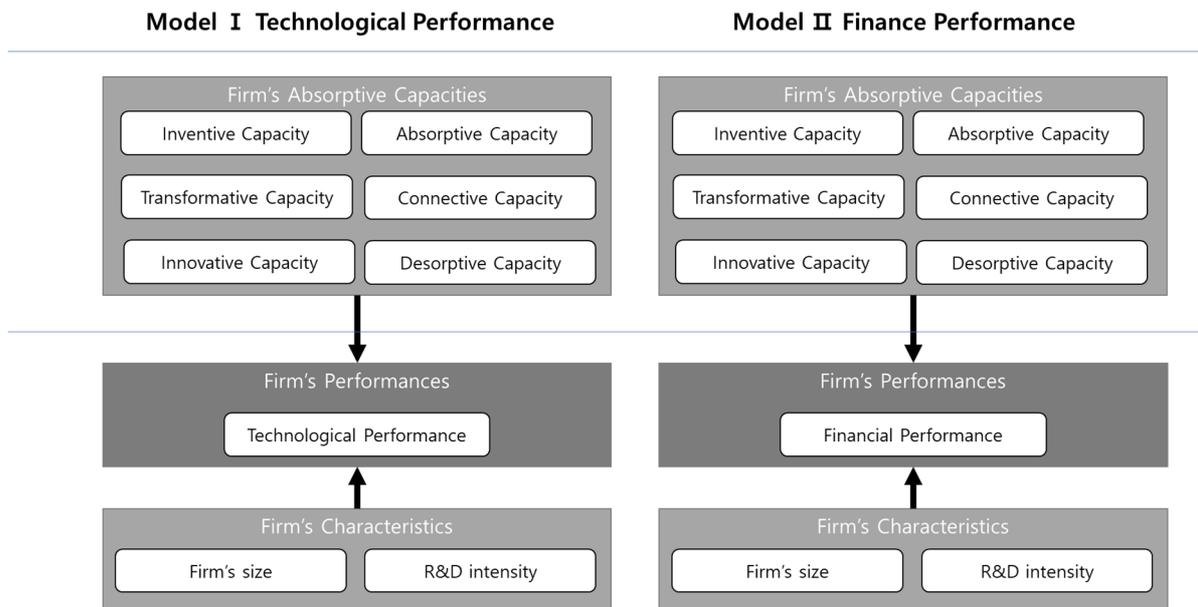
#### 3.1. Research conceptual framework

Research conceptual framework of this study are designed to analyze effect of firm’s innovation capacities to firm’s performances. Two research models are established considering effect of firm’s capacities on performances. Since Lichtenthaler et al (2009) defined innovative capacity and desorptive capacity as firm’s capacities of outward transferring in innovation process, we confirmed technological performance are affected by inventive capacity,

transformative capacity, absorptive capacity and connective capacity. And model of financial performance is related to all of capacities.

Firm's innovation capacities are based on capability-based framework for open innovation from Lichtenthaler et al (2009). And a framework of open innovation practices is incorporated. Firm's capacities for open innovation is distinguished into internal capacity and external capacity. And internal capacity is consist of Inventive capacity, Transformative capacity, Innovative capacity

Figure 1. Research conceptual framework



### 3.2. Firm's knowledge capacities and performance

Firm's knowledge capacities in open innovation environment is critical, sometime at personal level (Oganisjana, K., 2015; Dubickis, M., & Gaile-Sarkane, E. 2017) and even at national level (Jang, Y., et al. 2016). There has been a lot of studies about relation between firm's open innovation capacities and firm's performances. (Yun, J. et al, 2018 ; Roxas, B. et al, 2014).

Yusr, M. M. (2016). Find out innovation capability mediates the relationship between TQM practices and innovation performance. Shin, K., et al (2018) analysed the relationships among knowledge capacities and between knowledge capacities, technological innovation and financial performance at the firm level. It says the transformative, connective, inventive and absorptive capacities both directly and indirectly affects technological innovation performance; and innovative and desorptive capacities are the key factors connecting technological innovation to financial performance. In this study, we conduct analysis with formalized framework to define firm's capacities and distinguished firm's performances. Consequently, the hypotheses for firm's knowledge capacities and performance can be formulated as follows:

[Hypothesis I-1] Firm's Inventive capacity has a positive influence on technological innovation performance.

[Hypothesis I-2] Firm's Transformative capacity has a positive influence on technological innovation performance.

[Hypothesis I-3] Firm's Innovative capacity has a positive influence on technological innovation performance.

[Hypothesis I-4] Firm's Absorptive capacity has a positive influence on technological innovation performance.

[Hypothesis I-5] Firm's Connective capacity has a positive influence on technological innovation performance.

[Hypothesis I-6] Firm's Desorptive capacity has a positive influence on technological innovation performance.

[Hypothesis II-1] Firm's Inventive capacity has a positive influence on financial performance.

[Hypothesis II-2] Firm's Transformative capacity has a positive influence on financial performance.

[Hypothesis II-3] Firm's Innovative capacity has a positive influence on financial performance.

[Hypothesis II-4] Firm's Absorptive capacity has a positive influence on financial performance.

[Hypothesis II-5] Firm's Connective capacity has a positive influence on financial performance.

[Hypothesis II-6] Firm's Desorptive capacity has a positive influence on financial performance.

### 3.3.Firm's characteristics and performance

Large-scale firms might achieve a more competitive position in innovation activity using tangible and intangible resources, and small-scale firms might achieve the advantage in innovation activity by attracting external resources through a radical response to environmental change (Ettlie, Bridges, and O’Keefe 1984).

Bapuji et al. (2011) analysed the knowledge absorptive capacity of firm in terms of the effects on financial performance based on external knowledge exploitation level, considering R&D facilities, and found positive effects on firm sales if external knowledge is utilised when a firm has high knowledge absorptive capacity. Further, it was shown that new knowledge creation based on the absorptive capacity of external knowledge, measured by R&D investment, has positive influence on innovation performance (Cohen and Levinthal, 1990). Thus, R&D investment is used as a measurement corresponding to absorptive capacity for external knowledge.

#### 4. Data and Methodology

##### 4.1. Data

Sample data sources are MedTrack, PATSTAT and WDRS. Medtrack provides accounting and finance details, product, patents, deal-making information of pharmaceutical firms, produced by Informa. Detailed deal-making information will be used in this study. In addition, Since Medtrack includes partial financial and patent information for listed companies, we supplemented the missing information from the Wharton Research Data Services (WRDS) data and PATSTAT. The WRDS database supports information about accounting and finance of firms by collecting data from Capital IQ, NYSE, CRSP, and Thomson Reuters. The PATSTAT

database contains bibliographical and legal status patent data from leading industrialized and developing countries, extracted from the European Patent Office (EPO) databases. Definition of variables of this study shown as table 2.

#### 4.2. Dependent variables

We measure firm's performance in two concepts which are technological innovation performance and financial performance. In order to analyze financial performance, we set the time  $t$  as fiscal year, the average revenue between  $t+1$  and  $t+2$  calculated as a dependent variable. Technological innovation performance is measured as the number of patent applications from  $t+1$  to  $t+2$  year. Patent data has been used to measure firm's innovative behavior and performance. It appears to be used frequently in recent OI-related studies (Yun, J. et al ,2018; Grimaldi, M. et al, 2017).

#### 4.3. Independent variables

. Cumulative number of patent applications measure Inventive capacity. Patent is commonly accepted as achievement of R&D. And it is new knowledge generated inside the firm. We use cumulative number of patent self-citations as a proxy variable of Transformative capacity. Re-citation of a firm's patents is defined as 'self-citation', which indicates internally retaining knowledge. Innovative capacity is measured as cumulative number of new products. A proxy variable of innovative capacity should represent firm's ability to release product to their final market. We gathered information new product release by firms from databases.

We brought in a framework of open innovation practices to measure external capacities. Rangamiztousi, A., et al (2015) identified and categorized 36 open innovation practices in three core-process of open innovation paradigm by reviewing 286 publications. These three facets of open innovation processes include inbound or outside-in, outbound or inside-out and coupled. The outside-in process refers to the purposive inflows of knowledge and regards technology exploration and innovation activities to capture and benefit from external sources of knowledge. Inside-out is the process of establishing relationships with external partners with the purpose of bringing ideas to the market faster and commercially exploiting technological opportunities. Finally, in the coupled process companies combine the inbound (gaining external knowledge) with the outbound processes (bringing ideas to market). Moreover, the coupled process refers to co-innovation with complementary partners through structured cooperation such as alliances and joint ventures.

Table 2. Innovation practices in three core-process of open innovation

| Outside-in  | Coupled  | Inside-Out  |
|---|--|---|
| Purchasing, Acquisition of machinery, <b>Licensing-in</b> , Venture Capital, Customer Involvement, Lead User Involvement, <b>Employee Involvement</b> , Consulting, Crowd Sourcing, Crowdfunding, Out Sourcing, <b>Technology Sourcing</b> , Technology Scouting, Mass Customization, Learning Journeys, Online Portal for Inter Idea, <b>Merge &amp; Acquisition</b> , Sharing facilities, Revers engineering, Contract research | <b>Join research</b> , <b>Joint development</b> , Joint Purchasing, Joint procurement, Joint marketing, Joint Manufacturing, <b>External participations</b> , Personnel exchange | <b>Licensing-out</b> , <b>Spin-Off</b> , <b>Spin-Out</b> , Grant Back License, Open Source, Corporate Venture Capital |

We assume external capacities are matched to Outside-in, coupled, Inside-out concepts from open innovation. In this study, we are focusing on knowledge management and transfer by open innovation between firms. Therefore, OI types are re-classified as shown table 3.

Table 3. Innovation practices of external capacities

|  |  |                                    |
|--|--|------------------------------------|
| Absorptive capacity  | Connective capacity  | Desorptive capacity                |
| Licensing-in, Employee Involvement, Technology Sourcing, Merge & Acquisition | Join research, Joint development, J External participations, | Licensing-out, Spin-Off, Spin-Out, |

Table 4. Definition of Variables

|                       | Variables                 |                              | Descriptions   | Data Sources |
|-----------------------|---------------------------|------------------------------|--|--------------|
| Dependent Variables   | Technological Performance |                              | Number of patent applications from t+1 to t+3 years  | PATSTAT      |
|                       | Financial Performance     |                              | Average revenue from t+1 to t+3 years                | WRDS         |
| Independent Variables | Internal Capacity         | Inventive Capacity = IvC     | Cumulative number of patent applications in t year   | PATSTAT      |
|                       |                           | Transformative Capacity = TC | Cumulative number of patent self-citations in t year | PATSTAT      |
|                       |                           | Innovative Capacity = InC    | Cumulative number of new products in t year          | Medtrack     |
|                       | External Capacity         | Absorptive Capacity = AC     | Cumulative number of outside-in deals in t year      | Medtrack     |
|                       |                           | Connective Capacity = CC     | Cumulative number of coupled deals in t year         | Medtrack     |
|                       |                           | Desorptive Capacity = DC     | Cumulative number of inside-out deals in t year      | Medtrack     |
| Control Variables     | Resource                  | Firm's scale                 | Assets   | WRDS         |
|                       |                           |                              | Number of employees                                  | WRDS         |
|                       |                           | R&D investment               | R&D expenses   | WRDS         |

### 3.2 Methodology

We constructed a equation model based on the capability based framework for open innovation to verify the study hypotheses, which are the structural relationship and influence of six open innovation capacities on technological innovation and financial performance in biopharmaceutical firms.

Model(1) :

$$TP_{it+1 \text{ to } t+3} = \beta_0 + \beta_1 rnd_{it} + \beta_2 emp_{it} + \beta_3 AC_{it} + \beta_4 DC_{it} + \beta_5 CC_{it} + \beta_6 IVC_{it} + \beta_7 INC_{it} + \beta_8 TC_{it} + \varepsilon_{it}$$

Model(2) :

$$FP_{it+1 \text{ to } t+3} = \beta_0 + \beta_1 rnd_{it} + \beta_2 emp_{it} + \beta_3 AC_{it} + \beta_4 DC_{it} + \beta_5 CC_{it} + \beta_6 IVC_{it} + \beta_7 INC_{it} + \beta_8 TC_{it} + \varepsilon_{it}$$

## 5. Results

The estimated results of the equation model are shown in Table below. In Model 1, Firm's absorptive capacity, desorptive capacity, connective capacity, Inventive capacity, Innovative capacity has a positive influence on technological innovation performance. But Transformative capacity has a negative influence on technological innovation performance. In Model 2, Firm's desorptive capacity, Inventive capacity, has a positive influence on financial performance. But Transformative capacity has a negative influence on financial performance.

Table 5. Result

| VARIABLES | (1)<br>Model 1           | (2)<br>Model 2         |
|-----------|--------------------------|------------------------|
| RnD       | 0.00104***<br>(5.15e-05) | 5.126***<br>(0.180)    |
| Asset     | -1.49e-10<br>(3.45e-09)  | 1.65e-06<br>(1.21e-05) |
| Emp       | 0.00182                  | 14.09***               |

|                  |           |           |
|------------------|-----------|-----------|
|                  | (0.00127) | (4.453)   |
| AC               | 0.661***  | 322.2     |
|                  | (0.0892)  | (312.1)   |
| DC               | 0.695***  | 648.1***  |
|                  | (0.0422)  | (147.5)   |
| CC               | 0.320***  | 215.6     |
|                  | (0.0380)  | (133.0)   |
| IvC              | 0.463***  | 154.8***  |
|                  | (0.0121)  | (42.31)   |
| InC              | 0.123***  | -5.434    |
|                  | (0.0237)  | (82.89)   |
| TC               | -0.680*** | -189.4*** |
|                  | (0.0198)  | (69.21)   |
| Constant         | 0.251***  | 359.4***  |
|                  | (0.0132)  | (46.31)   |
| Observations     | 17,561    | 17,561    |
| R-squared        | 0.234     | 0.095     |
| Number of com_cd | 2,077     | 2,077     |

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 6. Research limitations/ Implications:

This study will have implication to biopharmaceutical companies to make decision about innovative strategies. They can adjust their R&D strategies to promote technological performance or financial performance. And 'empirical study using capability based framework for OI' is also one of contributions.

Limitations of this study is lack of varied proxies for the six capacities investigated, technological innovation, and financial performance. Comprehensive studies of the six capacities, as well as studies on proxy discovery that reveal capacities for open innovation need to be added.

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## **A Novel Approach on Constructing the Concordance Tables between IPC and KSIC using Vector Space and Probabilistic Models**

Chan-Ho Lee

Researcher, Department of Computer and Telecommunications Engineering, College of Science and Technology, Yonsei University, 1 Yonseidae-gil, Wonju 26493, Gangwon-do, Korea

Ji-Hye Choi

Researcher, Department of Computer and Telecommunications Engineering, College of Science and Technology, Yonsei University, 1 Yonseidae-gil, Wonju 26493, Gangwon-do, Korea

Min-Seung Kim

Researcher, Department of Computer and Telecommunications Engineering, College of Science and Technology, Yonsei University, 1 Yonseidae-gil, Wonju 26493, Gangwon-do, Korea

Tae-Eung Sung(Corr.).

Associate Professor, Department of Computer and Telecommunications Engineering, College of Science and Technology, Yonsei University, 1 Yonseidae-gil, Wonju 26493, Gangwon-do, Korea

### **Abstract**

#### **Purpose/ Research Question:**

The main purpose of this study are as follows:

1. Develop a new approach for measuring the similarity degree between the classification of patent and the related industry classification using vector space model.
2. To propose a novel "association and matching" method to produce the concordance table between IPC (Intellectual Property Classification) and KSIC (Korean Standard Industrial Classification) using ISIC (International Standard Industrial Classification).
3. What would be the difference of the link probability tables between a word-embedding method based on artificial intelligence and a traditional text analysis method of TF-IDF (Term Frequency-Inverse Document Frequency)?

This paper suggests the way to produce the concordance table between IPC and KSIC using text

analysis and discusses possible applications and extensions by using the evaluated similarity degree between IPC and KSIC based on text mapping.

### **Key Literature Reviews (About 3~5 papers):**

In order to analyze these economic levels, the similarity between economic activities and patents is an important link methodology if it is possible. This paper proposes a new algorithmic approach to establish the concordance between the international patent classification (IPC) system, which constitutes patents by technology, and the industrial classification system, which consists of indicators of economic activities such as standard international trade classification and international standard industrial classification (ISIC). This refers to comparing the keywords in the International Classification of Industries manual with the text within patent title and abstract for the IPC in question as a probabilistic framework. In addition, they compare the results of this "algorithmic links with probability (ALP)" concordance to the existing technology concordances. As a result, it presents new possibilities for empirical patent analysis (Travis J. Lybbert & Nikolas J. Zolas, 2014). Further analysis using ALP was conducted, which was applied directly to the economic activity data and Trademark (TM) data. This has been applied due to the economic importance of TM, and the groups that perform qualitative analyses, such as economic experts, have the limitation of analyzing and classifying the analysis between TM and its economic activities based on empirical aspects. Using text analysis, this paper proposes an efficient auxiliary means to remove the complexity between TM and economic data and then present a reasonable association so that it can launch the brand and provide various goods and services (Nikolas J. Zolas & Travis J. Lybbert & Bhattacharyya, 2016). In addition, similar analysis was conducted between the new patent classification structure system using ALP and the Cooperative Patent Classification (CPC). The resulting consensus between the USPC and CPC industries is that both US patents and world patents are divided into several vintages: North American Industrial Classification System (NAICS), International Standard Industrial Classification (ISIC), Harmonized System (HS), and Standard International Trade Classification (SITC). Next, they utilized crosswalks to highlight changes in the construction of industrial technologies over time. They reached to find the evidence that the link between technology and industry is strong over time. (Goldschlag & Lybbert & Zolas, 2016).

However, when analyzing the similarity between documents, it appears that the vector space model is more suitable than probabilistic model for measuring similarity. This has been demonstrated through comparative experimental results between various vector space models and probabilistic model (Masoud & Kim, 2014). The vector space model is an algebraic model of representing text documents as vectors where the examples are such as information retrieval, indexing, or association ranking of search engines. In other words, it is used to compare similarities between documents and has the following advantages : 1) Simple model based on linear algebra, 2) Document similar to the continuous value between the quality and calculation available, 3) It is possible to rank documents by association (Wenlei Mao, 2003)

Creating a technical classification for the comparison between countries is so important because a significant percentage of economic activity points to research and knowledge intensive goods and services where technology is a major driver of competitiveness. Technical skills are the foundation for working in specific product areas and sectors. Technology analysis is the first step in explaining and understanding the economic activity and performance of each country. The next step, not yet realized in this report, is to establish a match between technologies. Sector to show how technical competence translates into economic performance. The major purpose of this classification is to provide a basic tool for the analysis of country structures and international comparisons (Ulrich Schmoch, 2008)

With the advent of the Internet, the importance of intangible assets such as intellectual property has increased, and the significance of information continues to increase. This study proposed a method for classifying information based on either International Patent Classification (IPC) or Korean Standard Industrial Classification (KSIC) in order to provide information that would help companies make decisions on technology commercialization. A model that presents the most suitable KSIC by analyzing similarity between documents was established by organizing data sets with manuals and IPC definitions for KSIC. The relationship between patents and industry indicators can be explored, which can provide the necessary information in the course of an enterprise's technology commercialization and will serve as an aid to the empirical judgment of diverse experts (Lee & Jun & Yoo, 2018)

#### **Design/ Methodology/ Approach:**

First, carry out the approach for measuring similar degree to link patents and industrial activity using vector space model. Textual data on IPCs are quoted by KIPRIS, and 50 patent data for 645 subclasses of IPCs are selected and the documentation for the KSICs of 77 division criteria consists of data sets. Use TF-IDF methodology after pretreatment of digitized data in the form of data, data is weighted on accordingly modified. Next, measure the cosine similarity between each set of documents. Second, this paper will utilize the international classification criteria to upgrade the link between IPC-KSICs. For example, Trilogy, such as IPC-ISIC-KSIC, can be more reliable than if only text analysis was conducted independently and it can be utilized as a means for verifying the link table for IPC-KSIC.

#### **(Expected) Findings/Results:**

Using the vector space model, we propose to bridge patents and economic data, researchers can analyze important relationships between patents and a wide range of economic activities at an unprecedented level of disaggregation. The performance with a word-embedding technique is expected to be similar with one with a typical TF-IDF method in terms of its corresponding pair in link probability tables given a specific IPC or KSIC. In addition, Information that can help companies

make decisions on technology commercialization can be provided using an efficient and automated method called text analysis.

**Research limitations/ Implications:**

There is a limitation of text analysis and the disadvantage of not being able to consider the population when constructing training data.

**Keywords:** patent, economic activity, similarity, concordance, text analysis, IPC, KSIC, vector space model

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## **What does a top Chinese entrepreneur think about innovation and entrepreneurship: an archive data analysis of an open speech in Hupan University**

Zhenping Zhang

Ph.D. candidate, Department of Political Sciences and International Relations, University of Palermo, Italy; Chinese

Haiyan Yan (Corr.).

Associate professor, School of Management, Shanghai University of International Business and Economics, China; Chinese

Jiayin Qi

Professor, Institute of AI and Change Management, Shanghai University of International Business and Economics, China, Chinese

### **Abstract**

In the era of the knowledge economy, innovation and entrepreneurship become more and more important, which contribute to new products, creative services and improved processes, even the sustainability of the economy and society on the whole (Schumpeter and Opie, 1961; Deakins and Freel, 2009). Current research has emphasized the importance of individual personality and motivation for entrepreneur behaviors. A lot of entrepreneurship-oriented measures are taken, such as supportive public policies, shared facilities, and entrepreneurship education and training programs. However, to motivate innovation and entrepreneurship, it is also important to investigate what entrepreneurs think about innovation and entrepreneurship, i.e. their mental models of innovation and entrepreneurship. Based on the open speech of a top Chinese entrepreneur, archive data analysis is applied to elicit his opinions on the critical success factors and outcomes of innovation and entrepreneurship.

Guangchang Guo, a founder of Fosun, a top Chinese entrepreneur is selected as our research object. Fosun International Co., Ltd. founded in 1992, has cultivated three businesses of health, happiness, and prosperity to provide high-quality products and services to global family customers. In 2018, the total revenue reached RMB 109.4 billion (approximately USD 16.5 billion). As of June 30, 2019, the company's total assets amounted to RMB 681.51 billion (approximately US\$ 99.13 billion). Guo and the other six top entrepreneurs, and two management scholars jointly built a famous non-profit organization, called Hupan University, which provides trainings and support for young entrepreneurs in China. In Hupan University, based on their experiences and knowledge, the founders and the other invited top entrepreneurs will give lectures on mission and value, strategy, culture and institution, user experience and product, team building, and relationships. One of Guo's open speeches is selected for archive data analysis.

Mental model is a relatively enduring and accessible, but limited, internal conceptual representation of an external system (historical, existing, or projected) whose structure is analogous to the perceived structure of that system (Ford, 2018). Mental models represent the relationships and assumptions about

a system held in a person's mind (Groesser and Schaffernicht, 2012). In System Dynamics, mental model is represented by a causal loop diagram, which links variables with causal relationships.

A three-step coding scheme is applied, i.e. open codes, axial codes and selective codes (Corbin and Strauss, 2008). First, a few concepts are literally derived from the data based on open codes. Then based on the content, we classified the extracted words into different thematic categories according to axial codes. At last, following selective codes, the most relevant concepts are chosen to use for building the causal loop diagram.

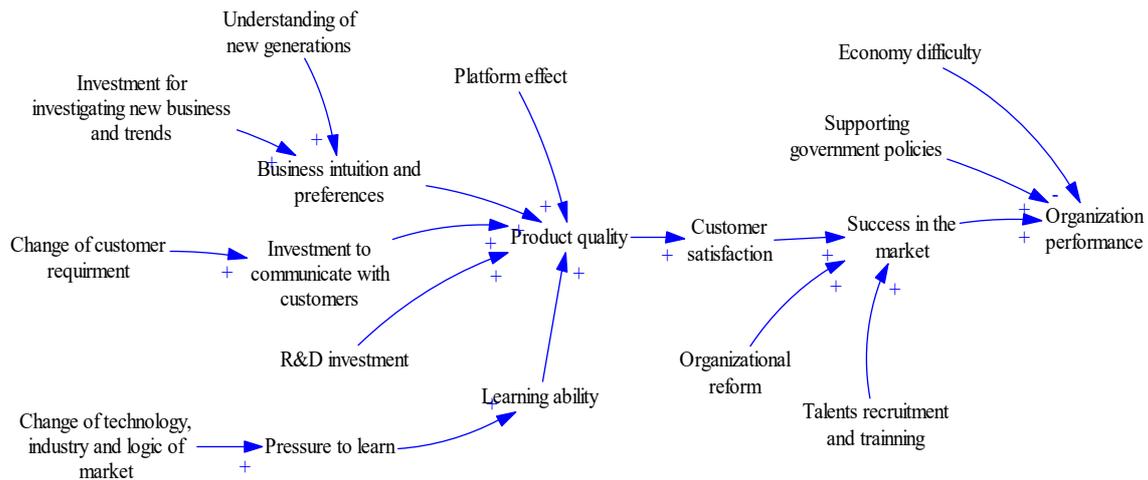


Figure 1. Coding result of Guo's open speech in Hupan University

**Purpose/ Research Question:** What are entrepreneurs' mental model of innovation and entrepreneurship?

**Key Literature Reviews:**

There are massive discussions of entrepreneur and entrepreneurship in the economic and management literature. According to Schumpeter and Opie (1961), an entrepreneur is a person who is willing and able to convert a new idea or invention into a successful innovation. Entrepreneurship employs what they called "the gale of creative destruction" to replace in whole or in part inferior innovations across markets and industries, simultaneously creating new products including new business models. Deakins and Freel (2009) define entrepreneurs as leaders who are willing to take a risk and exercise initiative, taking advantage of market opportunities by planning, organizing and deploying resources, often by innovating to create new or improving existing products or services. While entrepreneurship is often associated with new, small, for-profit start-ups, entrepreneurial behavior can be seen in small-, medium- and large-sized firms, new and established firms and in for-profit and not-for-profit organizations, including voluntary-sector groups, charitable organizations, and government. For-profit entrepreneurs typically measure performance using business metrics like profit, revenues, and increases in stock prices, but social entrepreneurs are either non-profits or blend for-profit goals with generating a positive "return to society" and therefore must use different metrics. Social entrepreneurship typically attempts to further broad social, cultural, and environmental goals often associated with the voluntary sector (Thompson, 2002).

A lot of research investigates the uncertainty of entrepreneurship and the personality of entrepreneurs. Entrepreneurship is often associated with true uncertainty, particularly when it involves the creation of a novel good or service, for a market that did not previously exist, rather than when a venture creates an incremental improvement to an existing product or service. Entrepreneurs are often overconfident, exhibit illusion of control, when they are opening/expanding business or new products/services (Zhang and Cueto, 2017). An entrepreneur typically has a mindset that seeks out potential opportunities during uncertain times (Hitt, Ireland, Sirmon and Trahms, 2011).

Entrepreneurs are supposed to acquire a high level of leadership, which is heavily shaped by the cultural context. The participative leadership style that is encouraged in the United States is considered disrespectful in many other parts of the world due to the differences in power distance (Hofstede, Hofstede, and Minkov, 2005). Many Asian and Middle Eastern countries do not have "open door" policies for subordinates and would never informally approach their managers/bosses. For countries like that, an authoritarian approach to management and leadership is more customary.

**Design/ Methodology/ Approach:** Grounded theory, Archive data analysis, Systems analysis

**(Expected) Findings/Results:** After coding, we found that the speech follows two logical sequences. First, it is backward modeling and goal-oriented, which begins from the outcomes and goals, and then trace back to the drivers and resources. Thus, innovation and entrepreneurship is treated as a tool to achieve expected goals. The second logic is from macro to micro and from outside to inside environmental analysis. The speech opens with an introduction of economic situation and market, then dig into the organizational reform and management. Besides, the speech is subject to open loop thinking, without considering the feedbacks of organization performance to resources and actions.

**Research limitations/ Implications:** Our research help to understand the mental image of entrepreneurs and can be used to facilitate the learning process of entrepreneur training. However, only one speech of one entrepreneur is investigated in this paper. Future research can aggregate different speeches of different entrepreneurs over time and compare the coding result with the theoretical studies in the literature.

**Keywords:** Entrepreneurship, Mental model, Entrepreneur, Causal Loop Diagram, Coding

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## **Enhancing the open innovation ecosystem of higher education: A system analysis and case study of Shanghai Zizhu International Education Park**

Linlin Wang

Ph.D., Department of Political Science and International Relationships, University of Palermo, 90100, Italy

Haiyan Yan (Corr.)

Associate Professor, School of Management, Shanghai University of International Business and Economics,  
Shanghai, 201620, China

Qiongbo Zhai

Postgraduate, School of Management, Shanghai University of International Business and Economics,  
Shanghai, 201620, China

Xinyue Yan

Undergraduate, School of Finance, Shanghai University of International Business and Economics,  
Shanghai, 201620, China

### **Abstract**

In an environment marked with phenomena such as globalization and creation, open innovation is critical for university to cooperate with the external resources in order to meet the requirement of the development of the era. However, even though many studies have been done on government-academia-industry relationship and open innovation, there's still the lack of a clear understanding of collaborative relationships between different stakeholders. The aim of this paper is to provide a new perspective to understand and enhance the open innovation ecosystem of higher education from a systems thinking approach based on the case study of Shanghai Zizhu International Education Park.

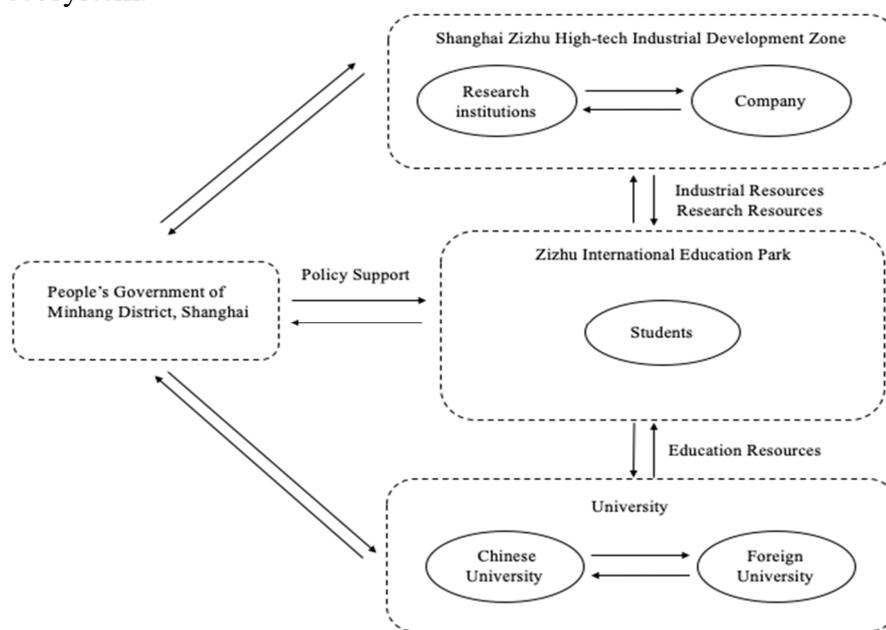
The open innovation system in government-academia-industry collaboration is bilateral interaction. On the one hand, it is an effective approach for firms to obtain external resources for their research and development activities (McAdam & Debackere, 2018; Perkmann & Walsh, 2006). Universities support knowledge-based processes for the entrepreneurial and innovation development capacities of both new ventures and existing companies by generating, transferring, brokering, codifying, and diffusing specialised knowledge and culture (Schiuma & Carlucci, 2018; Tani et al., 2018). On the other hand, it is also a critical approach for universities to obtain more social resources to support their sustainable development (Zhou et al., 2016). Many scholars have argued that university-industry-government linkages are extremely important mechanisms for shaping the growth and sustainable development of higher educations (Byun et al., 2018).

Despite the growing studies in the evolution of government-academia-industry, the current research has centered on the academic capacity to generate and exploit human resource transfer, informal interactions, commercialization of property rights and scientific publications (Inzelt,

2004; Jensen et al., 2007). There are a number of gaps in the understanding of dynamic collaborative relationships between different stakeholders within their environment.

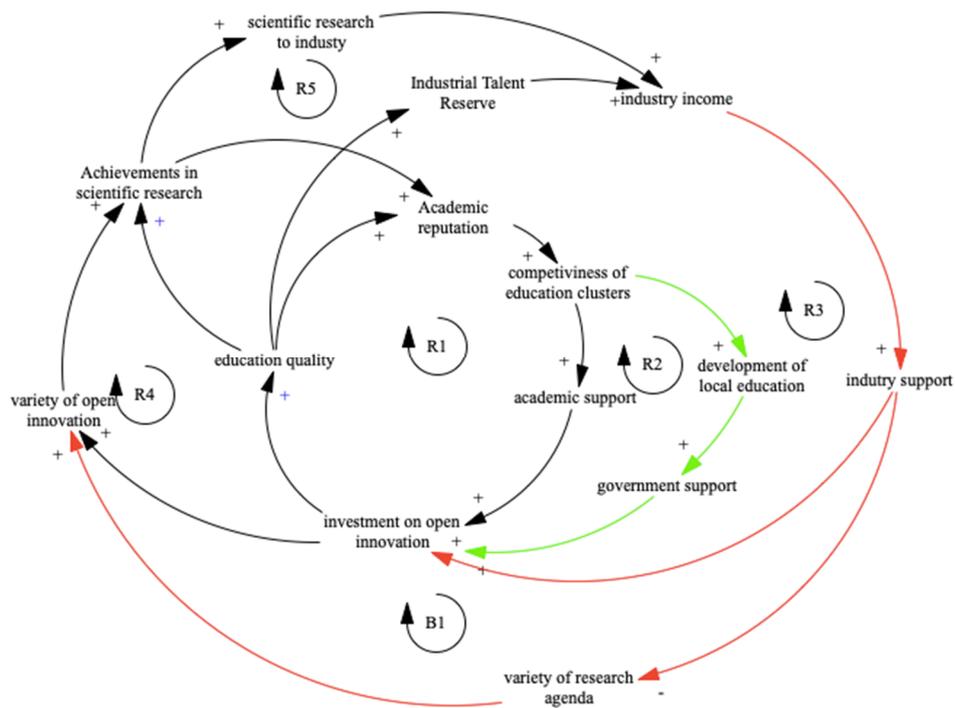
To investigate this gap, this research was performed in three steps. Firstly, a case study and secondary document analysis were conducted on the open innovation ecosystem of Shanghai Zizhu International Education Park (SZIEP). Secondly, interviews were held with multiple stakeholders (students, academic tutors, company supervisors) in the Asian Campus Semester programme of Emlyon Business School, which is one of five colleges in SZIEP. The interview findings were used to garner information on the collaborative dynamics between university and industry. Thirdly, systems thinking and causal loop analysis were adopted to improve our understanding of the collaborative ecosystem with education park policy.

Based on the information obtained, a conceptual model is given in Figure 1 to identify the key elements and internal relations of the university-industry-government collaborative open innovation ecosystem.



**Figure 1 The Core Elements and Relations of Open Innovation Ecosystem in Higher Education**

A casual loop diagram (CLD) for the open innovation ecosystem in higher education is given in Figure 2. The participation of government is shown in green color, while the participation of industry is shown in red color. As Figure 2 shows, there are five reinforcing feedback loops and one balancing feedback loop in open innovation ecosystem of higher education.



**Figure 2 A Casual Loop Diagram for the Open Innovation Ecosystem in Higher Education**

Loop R1 represents a feedback loop that reinforces the academic support from home support, such as the cooperation with other universities and research institutions. Academic support increases the investment on open innovation, and then will improve the education equality, such as the construction of teaching staff and the curriculum design. This will future increase the academic reputation. Then the increasement of academic reputation will improve the competitiveness of education clusters which will be helpful for getting more academic support eventually. Loop R2 represents a reinforcing feedback loop for open innovation support from government. The improvement of academic reputation will contribute to the development of local government, which can attract more policy and finance support from the government. Loop R3 demonstrates the positive impact of industry support on the sustainable development of the open innovation ecosystem in higher education. Enhanced education quality drives more industrial talent reserves, which will future increase the industry income. Then more industry income will bring more industry support and better investment that create a reinforcing feedback to investment on open innovation in the education parks. Loop R4 illustrates the reinforcing effect of variety of open innovation on the whole open innovation ecosystem. More investment on open innovation will increase the capacity of education institution to develop more open innovation projects, which will increase the achievements of scientific research and then obtain more support from academic institutions. Loop R5 focuses on the positive interactive relationship between education quality and achievements scientific research.

Loop B1 demonstrates the negative impacts of the collaborative relationships between university and industry. This inhibition effect of industry support is mainly embodied in two aspects. Hall et al. (2012) has found that intellectual property issues could be an insurmountable barrier to university participation. Bowie (1994) suggested that university becomes "caught between two of its compelling interests" because of its relationship with corporate sponsors. In

a sense, the decision makers in education institution will pay more attention the open innovation projects that have more monetary value other than academic value.

This paper empirically investigates the open innovation ecosystem of higher education. The concepts of government-academia-industry collaboration and policies to open innovation ecosystem are introduced from a systems perspective. The findings illustrate that government policy and industry support facilitate positive effects on education quality, achievements in scientific research, academic reputation, industry income. Knowledge transfer, knowledge sharing and knowledge creating must be specifically identified with reinforcing feedback loops in the ecosystem. However, the findings also show that a big challenge for the open innovation ecosystem of higher education is how to achieve the balance in university-industry connections without forgetting its mission for training talents, producing knowledge and serving the society. The government should play a leading role in the development of open innovation ecosystem in higher education. By studying and judging the progress of university-industry cooperation in a timely manner, the government implements policies to improve the service level of universities.

The main limitation of this research is lacking a quantitative analysis of the added economic and social value of the open innovation ecosystem from a long-range perspective. In future study, second round interviews (taking the role of government into consideration) and more research will be conducted to refine the framework and address the measures and performance of innovation in the education park.

**Keywords:** Open innovation, Ecosystem, Higher education, International education park

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**A Comparative Analysis on the Corporate R&D Capability and Innovation :  
Focused on Manufacturing and Service Industry in Korea**

Jae-seong, Kim

Doctorate, Korea University, Republic of Korea

Sang-ok, Choi(Corr.)

Professor, Korea University, Republic of Korea

**Abstract**

**Purpose/ Research Question**

In this study, the relationship between R&D capabilities (planning, developing, manufacturing, and commercializing) and corporate performance of the manufacturing/service industry is established. This study focuses on the relationship between each factor and performance, taking into account the lower dimensions that make up the R&D capability, and looking at dynamic characteristics such as changes in the relative importance of manufacturing/service industries.

**Key Literature Reviews (About 3~5 papers)**

While studies on the impact of R&D on corporate performance vary, there is also the need to re-illuminate R&D capabilities with a new perspective, with different results for different researchers.

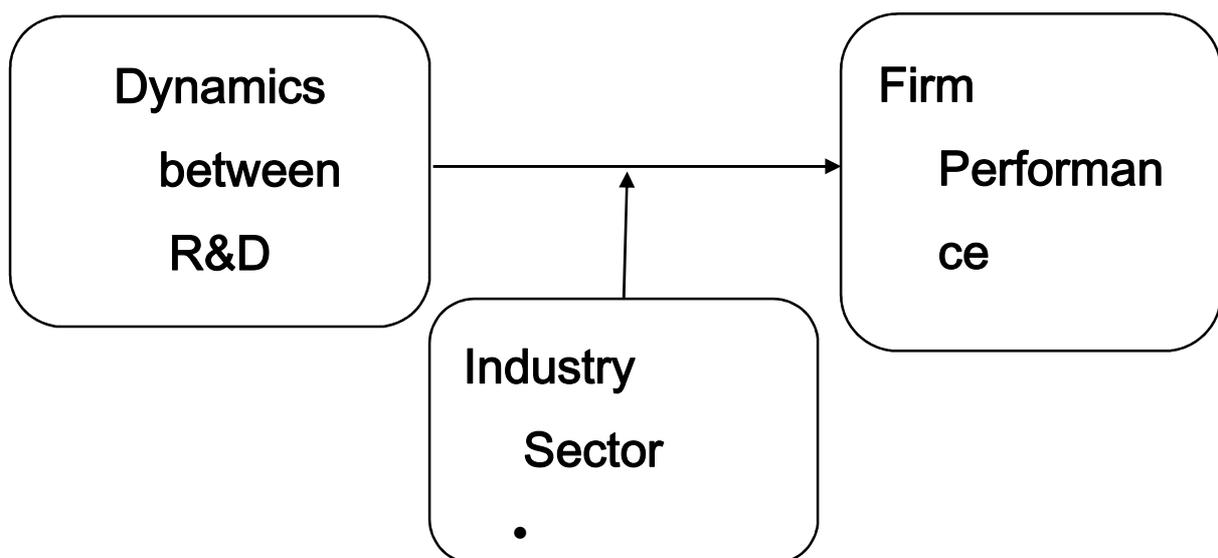
Many of the existing studies did not fully take into account the differences in industry characteristics in the form of generalizing the research of manufacturing targets to the entire industry. In addition, existing studies recognized R&D capabilities as a single dimension or a concept of competence and focused on the relationship between planned capabilities, which are specific factors of R&D capabilities, and the external performance of business capabilities.

Prior research on R&D capabilities in manufacturing focuses on R&D intensity and manpower. Souitaris (2002) argued that R&D capabilities are an important source of innovation as well as the most important corporate activity associated with innovation, and that R&D capabilities contribute positively to business performance and improvement. And what was important was not the absolute R&D amount, but the degree of relative efforts such as the ratio of R&D investment and the number of technical personnel compared to employees, or the degree of R&D input. Continued investment in order to improve R&D capabilities is important (Cohen and Levinthal,1989), and the overall R&D capability of the enterprise must be sufficiently secured to link R&D investment to performance.

Yam et al., (2004) identified the causal relationship between technological innovation capabilities and business performance in 213 innovative manufacturers in Beijing, China. R&D affected all types of businesses (large, medium and small). The R&D capability of a corporate is defined as the ability of the corporate to integrate its R&D strategy, project execution, project portfolio management, and R&D expenditure, and the role of internal competence, which means enterprise resources, was emphasized.

A prior study of R&D capabilities in the service sector shows that the service sector is relatively less R&D in the enterprise than in the manufacturing sector (Dreger, 2004; Tether, 2005), more dependent on external R&D sources such as suppliers, customers, demand companies, research institutes, etc. (Tether, 2005; Vega-Jurad et al., 2008). Also, since the service industry does not produce regular products unlike manufacturing industries, external factors such as government policies are believed to affect R&D activities.

#### **Design/ Methodology/ Approach**



Using the structural equation model, the relationship between dynamics in R&D capability and performance is derived and the path coefficients for manufacturing/service industry are compared.

#### **(Expected) Findings/Results**

Planning and development capabilities in the manufacturing sector will have a stronger impact on firm performance than in the service sector. And Producing and commercialization capabilities in the service sector will have a stronger impact on firm performance than in the manufacturing sector.

### **Research limitations/ Implications**

In this study, it is meaningful to further develop research on R&D performance factors, which were both linear and manufacturing-oriented, and to provide a theoretical basis for R&D support policies of service companies. It is also expected that the relationship between each R&D detail capability component and performance can be measured and demonstrated in detail.

### **Keywords**

R&D Capability, Performance, Dynamics

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## The Effect of Human Resources Development on Innovation

Jae-seong, Kim

Doctorate, Korea University, Republic of Korea

Sang-ok, Choi(Corr.)

Professor, Korea University, Republic of Korea

### Abstract

#### Purpose/ Research Question

This study presupposes that rather than directly linking investment in T&D(training and development) to performance, other institutional factors such as the HRD system, as well as psychological factors such as organizational commitment, will influence corporate innovation. And such investments will improve workers' performance and eventually enhance the performance of the enterprise.

#### Key Literature Reviews (About 3~5 papers)

The view is that the key factor in determining a company's competitive advantage is the productivity of knowledge workers, and that investment in workers' knowledge that can increase the productivity of knowledge workers is a real investment.

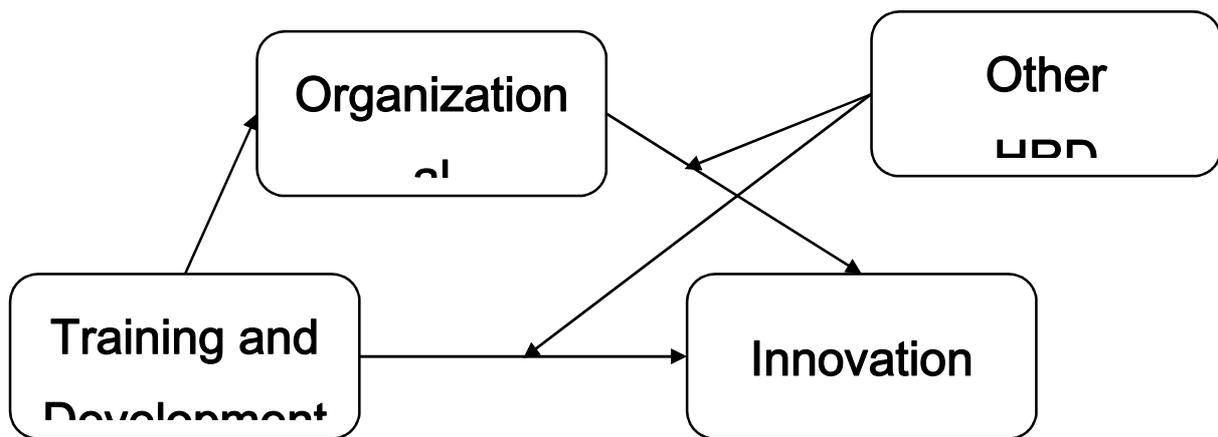
In a knowledge society, because innovation and creative spirit are essential activities to sustain the life of an organization, economy, and society, without creativity and innovation, organizations are bound to fall behind. In this sense, a super-rich enterprise is to find its competitiveness in the person, the members who are the main players of creativity and innovation.

Kim Ki-tae et al.,(2008) said in their study on human resource development and organizational commitment, job satisfaction, turnover, turnover and per capita sales, that the more positive the members have toward the organization, the lower the turnover rate and the increase in sales per capita. Some studies show that T&D have little impact on, but it is important to understand that the effect of investment in T&D will be realized in the long run (Pfeffer, 1994). On the other hand, studies show that the more companies invest in education and training, the more they become more involved in their duties, and that such commitment has a static impact on corporate performance. Philips(1998) calculated the return on investment in T&D programs for companies around the world, which often show a high ROI of more than 500%. While it is not easy to generalize these results, many domestic companies are making various attempts to measure ROI, but rarely

have satisfactory results. In particular, not many have studied the impact of education, training and investment on corporate performance for individual companies. Nevertheless, many companies' investment in training and development is based on experience or vague confidence that investment in T&D has a positive impact on the performance of a company.

Therefore, it is very important to continue to prove that investment in human resources affects corporate performance through research on many domestic companies.

### Design/ Methodology/ Approach



Using the hierarchical multiple regression analysis, we want to identify the role of organizational commitment, which is being addressed as an important factor in the successful operation of an organization within the relationship between training and innovation of the enterprise. In addition, we intend to verify the mediated adjustment effects of training and development by the HRD system, which comprehensively strengthens the indirect effects on innovation through organizational commitment.

### (Expected) Findings/Results

Planning and development capabilities in the manufacturing sector will have a stronger impact on firm performance than in the service sector. And Producing and commercialization capabilities in the service sector will have a stronger impact on firm performance than in the manufacturing sector.

### Research limitations/ Implications

This study can show the degree to which the institutional factors of T&D and other HRD systems and the psychological factors of organizational commitment affect innovation. The results of this study are believed to help companies establish strategies for action within the human resources sector.

**Keywords**

T&D, organizational commitment, innovation, HRD

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30.

**Potential legal and ethical risk of AI technology:**

**A face recognition smartphone application in China**

Runzhe ZHANG

Master student, HUST, Sino European Inst Intellectual Property, China

Ben ZHANG(Corr.)

Post-doctoral, HUST, Sino European Inst Intellectual Property, China

**Abstract**

The gradual application of artificial intelligence (AI) has exerted more and more profound influence on the development of society. The existing AI technology has been gradually replacing humans for repetitive labor. This paper takes a Chinese smartphone application based on DeepFakes technology, a face recognition algorithm as an example, and discusses about the potential legal risk of such AI as well as the works produced by such AI programs from the perspectives of the copyright and ethic. Meanwhile, the business model of the involved smartphone application, commercial value, ethical risk and the countermeasures has also been discussed.

**Purpose/ Research Question:** The risk of copyrights and personality rights brought by DeepFakes, an AI technology to change one's face into others in video clips

**Key Literature Reviews (About 3~5 papers):**

Over three quarters of a century has passed since the concept of artificial intelligence was firstly introduced into our world. Marvin Minsky, John McCarthy, Claude Shannon et al., these pioneers had made significant contributions because of their achievements. As time went by, Expert system and natural language processing was the first attempts that we human tried to use AI technology for the convenience. However, due to the complexity

of 'Knowledge', it seemed that their attempts were not so satisfied. Then it came to the 1990s, when the internet and the concept of machine learning came out of laboratory and into the public view, the AI technology had the chance to develop further. At that time, the advanced version chess AI Deep Blue developed by IBM firstly won the human world champion Garry Kasparov in 1997. In the next 20 years there were several rounds of competition between human players and AI, until Google published their super AI AlphaGo.

AI is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. (Nils J. Nilsson, 2010) The combination between AI and robotics in the industries has been diffusing because of their lower resource intensity. (MinHwa Lee et al., 2018) Governments are extremely responsive to AI. 'Industry 4.0' by Germany, the 'Made in China 2025' plan by China as well as 'Society 5.0' by Japan all put AI in a spotlight. (Fumio Kodama, 2018) As the high application speed of AI technology in our daily life, people tend to focus on the ethic guideline for the technology. Yun JJ et al. (2016) pointed out that direct learning and autonomous learning should be considered while developing an AI algorithm. Cath, C et al. (2018) suggested that clear guide policy and pivotal concept of human dignity are essential for a 'good AI society'. In April 2018, the General Data Protection Regulation became effective as well as brought an example or standard for the whole world of data Protection. China as one of the big countries of AI technology, however, is still working on the legislation of AI or personal data protection.

**Design/ Methodology/ Approach:** case analysis, comparative legal analysis

**(Expected) Findings/Results:** Policy suggestions

**Research limitations/ Implications:**

**Keywords:** At least more than three keywords are kindly requested.

Deepfakes, face recognition, Copyright, ethic, GDPR, artificial intelligence

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## **Collaborative Innovation Network Structure Driven by Similar Technology Domains: Evidence from Blockchain Patent Information**

Ben Zhang (Corr.)

Ph.D., School of Management, Huazhong University of Science and Technology, P. R. China

### **Abstract**

**Purpose/ Research Question:** The construction of collaborative innovation mechanism has always been a hot research topic. To explore the collaborative innovation structure and evolution drivers under the internal organization framework of industry clusters, this paper carried out corresponding empirical research based on the technology coupling relationship network for the blockchain industry clusters.

### **Key Literature Reviews (About 3~5 papers):**

For most of the prior research, knowledge transfer of multi-national enterprise (MNE) is usually the focus of attention (Patra et al., 2015). The network is based on the complex innovation system framework with local triple helix (Laitinen et al., 2016). Knowledge sharing system and strategic guidance for knowledge learning are the important factors that have a positive effect on the learning transfer (Sung et al., 2016).

**Design/ Methodology/ Approach:** By collecting patent data from the blockchain industry clusters worldwide, this study applied the multiple quadratic assignment procedures (QAP) regression method to investigate the mechanism that the local structure has influence on the overall structure in the technology coupling relationship network.

**(Expected) Findings/Results:** The research results show that three characteristics shown by the local technology coupling relationship, tendency, hierarchical convergence and hierarchical heterogeneity, have significant influence on the overall technology coupling relationship. These three characteristics play an important role in the collaborative innovation structure, and establish the foundation of sustainable technological innovation for the industry clusters. Furthermore, the management implications indicate that the majority technology coupling relationships distributed to the innovation entities that are at middle-level of enterprise group can promote stability and sustainability of the collaborative innovation structure.

**Research limitations/ Implications:** There are also some limitations that need to be considered in further studies. In this paper, it is not enough to discuss the periodical characteristic in the collaborative innovation structure. The research questions proposed determine that the empirical analysis focuses more on the mechanism which local structures have influence on the whole structure rather than the time-based evolution trend of collaborative innovation network. The understanding on the driving effect of technology coupling relationship will be much more profound if the periodical characteristic can be clearly identified.

Keywords: Collaborative Innovation, Technology Coupling, Innovation Network Structure, QAP

### Reference:

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# **Open Innovation and Performance of Tech-based Companies: Entrepreneurial Business Process Management Based on RPA(Robotics Process Automation)**

Sanghyun Sung

Research Assistant Professor, POSTECH Entrepreneurship Center  
Pohang University of Science and Technology (POSTECH), Republic of Korea

Sehwan Yoo

Researcher, Entrepreneurship Center  
Yeungnam University, Republic of Korea

Junghyun Yoon (Corr)

Assistant Professor, School of Business  
Yeungnam University, Republic of Korea

## **Abstract**

### **Purpose/ Research Question**

Recently, companies are looking for a new technological approach called Robotic Process Automation (RPA) using machine learning to maximize corporate operational efficiency and reduce costs. In particular, they can automate routine, rule-based business processes and spend more time on valuable tasks by combining traditional business process methodologies with the concept of RPA. In this study, we propose an entrepreneurial business process management methodology applying the machine learning-based RPA from a startup perspective.

### **Key Literature Reviews (About 3~5 papers)**

Most studies on entrepreneurship have asserted that many start-up companies have failed due to the lack of resources and networks with external stakeholders. Systematic resource management can be achieved by business process management (BPM). Nevertheless, there would be no study to explain how BPM apply to them. This study would like to suggest that startups should have a unique model regarding BPM, and would like to designate it entrepreneurial business process (EBP). EBP explains the unique phenomenon of startups, from a variety of viewpoints of Know-Why, Know-

What, Know-Who, and Know-How. Based on the EBP, this study would like to propose an entrepreneurial business process notation (EBPN) to define the procedure or the process to secure and use resources, extending existing business process modelling notations. The proposed methodology and notation will contribute to make the more effective entrepreneurial business process and to manage the factors affecting the growth of startups [1].

Systematic business process management is required to maximize the efficiency of business operations [2,3]. However, the existing entrepreneurial process research has limitations that it is difficult to intuitively and dynamically provide the necessary information for start-up operation, and it is necessary to define necessary information (resources, stakeholders, activities). A BP Model Repository should support a series of basic functions to effectively manipulate the processes that it stores. We identify storage functions, retrieval functions and integration functions. Advanced management functions can be subdivided into functions that are provided by general repositories and functions that are provided only by BP Model Repositories [4]. "Start-up Process Repository System" can overcome limitations of existing entrepreneurial process research. The architecture for the Start-up Process Repository System provides five layers and enables each layer to interact four interfaces between each layer. This system improves start-ups' accessibility to the start-up business process repository created from the existing repository architecture and increases the utility derived from it by providing methodologies for components that offer useful start-up knowledge [5].

Robotic Process Automation (RPA) is a simple, repetitive, human-doing task that transforms a computer into a patterned task. The purpose of the RPA is to automate the work of human beings, allowing them to focus on high value-added and creative work [6,7]. Because of these advantages, many companies are applying RPA throughout the value chain to improve productivity. In this paper, we propose a process methodology that combines the concept of RPA so that the process can be automatically handled by the expansion of existing entrepreneurial business process research.

### **Design/ Methodology/ Approach**

This study analyzes previous studies on the application of automation to improve work productivity in the business process field and presents various cases. Based on this, we will define the types of machine learning that can be applied to various business process documents from the start-up perspectives, and look into the applicable scope of automation and specific in-house development plan. Finally, we will study how much the productivity can be improved through the simulation of each application. Specifically, automated robots are developed in C # language based on the .Net Framework based on MS Office (PowerPoint /word), document creation tools that defines the existing business process specification. This paper conducts simulation analysis using BCL (Base Class Library) and PowerPoint/Word API to develop Robot for improving process modeling analysis efficiency in business process documents.

### **(Expected) Findings/Results**

In this study, we analyze the types of process automation that can be analyzed based on business processes. This allows you to distinguish between types of documents that typically have a pattern and similar pattern, depending on their type. In order to select the automation area of a business document in which a business process is generally defined, a simple repetitive task based on a certain pattern may be an object of automation rather than a human cognitive judgment. Through the simulation results, the results of observing the humans performing the actual process analysis are compared with the execution time of the robot progressed through the machine learning. Compare productivity with automated analysis indicators.

### **Research limitations/ Implications**

Start-up is not enough to establish internal processes, and management is not specified and causes confusion in business. This is one of the reasons for typical start-up failures, and business processes are considered necessary for long-term business management, but in reality, the majority of entrepreneurs have limitations in identifying them or acquiring relevant knowledge. In this study, we propose a methodology to automate and analyze startup processes and implement them through RPA using machine learning. In this way, it is possible to increase productivity and efficiency by separating the formal and atypical domains and collecting the processes in the actual implementation of existing entrepreneurial business processes.

**Keywords:** Business Process, Entrepreneurial Business Process Management, Machine Learning, Robotic Process Automation

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### 33.

## **The Effect of Customer Discovery Program on the Entrepreneurial Education**

Choonghyun, Kim

Assistant Prof., School Of General Education, Yeungnam University, South Korea

Jaehoon, Rhee

Prof., School of Business, Yeungnam University, South Korea

Junghyun, Yoon(Corr.)

Assistant Prof., School of Business, Yeungnam University, South Korea

### **Abstract**

#### **Purpose/ Research Question**

This study aims to conduct research on young people who participated in “KDB entrepreneurship education program and i-core program” for diagnosis and consulting of prospective young entrepreneurs. Identify the difficulties experienced in the process of starting a business through the change of perception of the young entrepreneurs, the recognition after the start-up training, and the customer discovery technique. By providing implications for youth start-up support.

#### **Key Literature Reviews**

The economic environment is changing fast. Increasing uncertainties in the global economic environment, high technological developments and high labor productivity make it difficult to

increase employment in the current economic ecosystem and environment. Accordingly, the founding is attracting attention as a solution.

Entrepreneurship has become a hot topic in the Korean economy in recent years and many policy studies are underway. Entrepreneurship not only suggests new solutions to the job market, but also serves as a catalyst for economic development and competitiveness in the country by accelerating structural changes in the economy through innovation. In addition, the importance of entrepreneurship is emphasized as a means to create future values by entering the fourth revolutionary era in 2018.

Compared with existing companies, young entrepreneurs lack the capital, human resources, technology, and various start-ups, and a successful and successful business model is needed for success. Most of the existing start-up methods of preliminary entrepreneurs were prepared by preparing business plans without thorough verification of market items, and preparing, selling and commercializing manpower and funds. However, this method has a different customer response to the product than the founder's idea, so most of the prospective founders face difficulties.

## 1. Lean Startup

Eric Ries (2011), the author of *Lean Startups*, defined startups as "organizations that create new products or services in extreme uncertainty." Unlike large companies with relatively stable environmental conditions in terms of size of customers, products and resources, startups are more likely to fail because startups create new products or services under uncertainty. Lean Startup is a business operation methodology that is more suitable for early start-ups in such a situation. It is useful to many startup founders by minimizing the impact of failure and increasing the chance of success (Blank, 2013; Maurya, 2012).

Lean was originally used to borrow from the concept of lean manufacturing, a Japanese Toyota production system (TPS) that minimizes waste (Womack. & Jones, 1991). Lean production is a philosophy that emphasizes continuous problem solving and learning / coordination to minimize waste of corporate resources. Lean startup is a combination of 'Lean' which means efficient company operation and 'Startup' which means start-up company

The concept of lean start-up is developed under the influence of Customer Development, presented by Steve Blank, a serial entrepreneur in the United States and professor of Berkeley, along with the basic philosophy of lean production.

Blank (2003) pointed out that the reason why founders fail is not because they can make a product, but because they can't create a customer. He emphasized the importance of the 'customer development' process of finding customers and repeatedly verifying and revising business ideas. He must constantly test customers with various hypotheses about their ideas until the startup finds a business model that works for the customer, and then establishes the company in earnest after

finding a business model that works in the real market(Blank, 2003).

Since then, Ries (2011) combines his own ideas with Toyota's Lean Manufacturing Method and Blank's (Customer Development Theory) to focus on the Build-Measure-Learn Feedback Loop. Announced the Lean Startup methodology as a model and contributed to popularization. Lean startups are now recognized for their effectiveness and importance by many venture entrepreneurs, and academically related concepts and techniques are actively discussed.

Accordingly, companies that are growing by actively utilizing Lean startup methodology are emerging in Korea one after another (Lim & Kim, 2015). Unfortunately, there is still insufficient accumulation of theories and case studies on lean start-ups in Korea.

In particular, as lean start-up is a methodology proposed in the United States, related cases are mainly focused on the United States, which is different from the reality of Korea in various aspects such as the level of human resources, target market, and the amount of funds supported. It can be said that there is a gap. The purpose of this study is to find a representative customer discovery method and application examples of lean start-ups in Korea, and to lay the groundwork for discussions on the use of lean start-ups to foster young entrepreneurs.

## 2. Customer Discovery Theory

Blank (2003) shows that the traditional new business promotion process, which is based on a large company that is easy to grasp the functions required for customers and products, has a clear market, and is relatively easy to find a differentiation plan, is applied to the start-up company. Pointed out that it is not very effective, and it is impossible and useless for a start-up company with much greater uncertainty about products and customers to make a complete decision about products / services early in business operations.

The process of business operation suggested in the previous business administration collects the requirements for new products, develops products based on them, conducts alpha / beta tests to customers, reflects test opinions, Proceed with correcting technical errors that are found.

As pointed out by Blank (2003, 2012), the existing business promotion process (Alpha / Beta) test releases the product, but the test is a step for iterative and persistent verification and improvement of the product's plan itself. Rather, it is the process of correcting technical errors in products developed on the basis of an initially determined plan.

The error-corrected product will be introduced to the public for the first time upon launch. After the product is released, marketing and sales departments will take over the promotion and sales of the product and sell it to customers in earnest.

It should be noted that in the existing process, the company initially plans the product, decides the concept / detail specification of a specific product, and starts to develop the product. During the long process, systematic and iterative hypothesis verification of the product through

communication with the most important customers is not possible.

In fact, in many cases, it is very difficult for customers to judge the purchase without seeing the actual product. If a company's product is an existing product category and it is relatively easy to understand and recall detailed features, it is relatively easy for a customer to find his or her specific requirements.

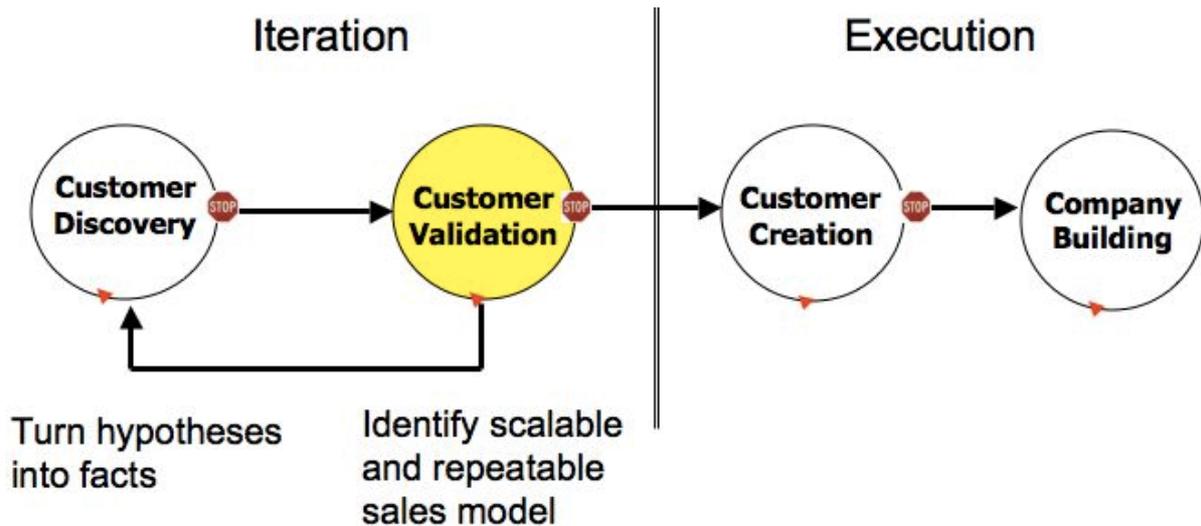
However, most customers don't even know what they want without seeing the actual product, or even if the product is made and released as they wish, they are motivated to buy it when they encounter it. There is no possibility. Indeed, the failed startups realized that only a few customers were in the real market to buy the developed product after the increase in customer contact, but after the launch, they changed the product without spending a lot of time and resources again. It is argued that it was actually difficult.

Blank (2012) reiterates the importance of recognizing that no business plan is working at the moment of meeting with the customer, and waiting for the result after the product is released according to the existing process is like 'shooting, preparing, launching' It was like doing 'preparation and aiming'.

Based on this perspective, Blank (2003) emphasized the need for customer development to 'discover and verify the existence of customers' for the products / services provided by the company before the company's full-scale establishment and expansion.

The stages of customer development are:

- 1) Customer Discovery : It is the stage of capturing the entrepreneur's vision, turning a series of business models into hypotheses, testing customer responses, and making a hypothesis true.
- 2) Customer Validation : Verify that the derived business model is repeatable and extensible, and if not, shift the hypothesis back to customer discovery.
- 3) Customer Creation : At the stage of execution, it gathers customers, focuses them on sales channels, and understands the size of the business.
- 4) Company Building : It is a step that scales up the organization to focus on the implementation of the validated model.



<figure 1. Customer Discovery Process>

The difference between the model developed by the business administration as a product development process and the theory of customer development is that the budget expenditure is limited as much as possible until the firm's hypothesis about the business model is verified and convinced that it is extensible(Blank, 2003; 2012).

In the customer development model, the initial start-up company keeps its cash until it finds a repeatable and scalable business model, and then finds the right business model to speed up and execute a large budget to expand its business. Therefore, as shown in <Figure 1>, the initial stage of customer development focuses on 'exploration', and when the scalability is verified, the team that focuses on exploration is replaced with a team that focuses on 'execution'.

As such, customer development theory begins with the recognition that the methodology presented in the existing business administration is not suitable for the situation of early start-up companies. Focusing.

Steve Blank's customer development theory, which has been experienced and observed as an entrepreneur and investor in the startup ecosystem, has since been further developed by Eric Reese and popularized as a lean startup concept.

### **Design/ Methodology/ Approach**

This study thoroughly examines their items from the customer's point of view, focusing on the case of prospective young entrepreneurs who participated in the youth entrepreneurship education program. Based on the analysis, we want to provide a solution. This study will proceed as a case-based qualitative study due to the limited sample.

### **(Expected) Findings/Results**

This study is aimed at young small business owners who want a new way to analyze their current projects and conduct management diagnosis. We suggest what Lean startups are and how to use them for young entrepreneurs by applying and utilizing customer discovery methodology and Lean Canvas in the process of securing customers and verifying their business items.

In the process, it is also possible to verify the business model of the preliminary young entrepreneur as to whether the idea is realistically feasible and to reduce the failure rate of the entrepreneur diagnosis model and the founders in the early stages of business. Present strategic suggestions.

This study is meaningful as a comprehensive review of the overall process so that it can be an effective framework for not only the strategies of entrepreneurs, but also for professionals who provide mentoring for entrepreneurs and start-ups.

### **Research limitations/ Implications:** Contents

At present, the domestic research is very limited because the research related to start-up based on customer development and lean start-up is in the early stage. In particular, since most of the research and projects that apply lean start-ups have been conducted around technology startups, the application of lean start-ups for young entrepreneurs is only at an early stage, and the number of participants is limited. Therefore, quantitative research is required to promote the generalization of research results by expanding the number of cases and samples based on this study in the future.

**Keywords:** At least more than three keywords are kindly requested.

Customer Development theory, Lean startup, Entrepreneurship, Startup, MVP

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## Trend Analysis of Social Entrepreneurship Research Using Network

Seunghoon Lee

Ph.D. Student, Department of Industrial and Management Engineering,  
Pohang University of Science and Technology (POSTECH), Republic of Korea

Junghyun Yoon

Assistant Professor, School of Business  
Yeungnam University, Republic of Korea

Sanghyun Sung (Corr)

Research Assistant Professor, POSTECH Entrepreneurship Center  
Pohang University of Science and Technology (POSTECH), Republic of Korea

### Abstract

#### Purpose/ Research Question

Social entrepreneurship, unlike traditional businesses and entrepreneurs whose sole purpose is to pursue corporate profits, refers to the business pursuing profits as well as social / cultural / environmental creation. In particular, in the situation where poverty / education / disease / environment problems are so severe and the polarization of society is increasing all over the world as it is now, it is difficult to solve this by the welfare policies of individual countries. It is necessary to use social enterprise and social entrepreneurship to solve the problems facing the world. However, many studies still believe that social entrepreneurship is not yet mature enough and points out that it is difficult to be recognized as an independent field of research [1,2,3]. Therefore, this study collected and analyzed author keywords of all research findings in the social entrepreneurship field from 1999 to 2018 to grasp how the research trend in the field is changing compared to the past. Through this, we analyze from various perspectives whether the field is growing not only in quantitative growth but also in quality.

#### Key Literature Reviews (About 3~5 papers)

The bibliometric method, which is used extensively to measure scientific progress in various research areas in science and engineering, is a general research method for systemic analysis[4]. Since the

concept of evaluative bibliometric was proposed, many researchers have used publication outputs, subject categories, and citations in books and papers published by governments, research institutions, and journals to evaluate research trends in related fields[5,6,7,8]. Traditional bibliometric methods such as co-citation analysis are based on analysis of the author and journal citations contained in research papers. While this type of analysis leads to interesting results, it does not provide practical research topics for researchers. On the other hand, co-word analysis, which counts and analyzes the co-occurrences of keywords in the papers on a given subject, has the potential to overcome the limitations of co-citation analysis[9]. Researchers have recently started extracting words from bibliographic information: e.g., article title, abstract[10], "author keywords" given by authors, and "keywords plus" suggested by journals. These words are used in their analyses of research trends. Article title and "author keywords", in particular, represent the key research topics of related literature and are thus useful tools for analyzing emerging research topics.

A social network represents the social structure of people, organizations, or countries (referred to as "nodes" or "actors") that interact with each other. Given a social network, these relations can be analyzed for any structural patterns that might be present among the nodes. Thus, an analyst of social networks looks beyond the attributes of individuals to also examine how nodes are positioned within a network and how relations are structured into overall network patterns. The aim of social network analysis (SNA) is to detect and interpret the patterns of social ties among nodes using statistics and visualization, and the methods of SNA are useful in assessing R&D trends. In general, these social networks are expressed by dots (actors or nodes) and lines (links or arcs).

### **Design/ Methodology/ Approach**

Prior to collecting the data, various literatures in the field of social entrepreneurship were searched to select a search term that could be considered to represent the relevant field. As a result, we have selected the following three search terms that are considered to represent the relevant field inclusively. Unlike other search terms, social enterprises sometimes include studies in the field of enterprise social systems, and the data includes research results that include "social enterprise" correctly. At least one of the three search terms presented collected 14,358 citations, all of SCOPUS's findings in the abstract / keyword / title. The author keyword of research results is a key word in which the research contribution of each result is concentrated, and it is a standardized and standardized data, which can be viewed as a kind of research unit. Therefore, if you analyze frequency and keyword co-occurrence trends in various perspectives (by year, type, and country), you can identify various trends in the field.

Also, in order to effectively deal with 'similarity', which can be understood by considering not only forms but also hidden meanings, compared to 'morphological similarity', which is relatively easy to convert, I have a neural embedding architecture that converts the text doc2vec into a numerical

vector. Was used. Each course consists of three steps:

- 1) Training: Learning using the abstract of each work,
- 2) Prediction: Predict the numeric vector of each keyword,
- 3) Calculate Similarity: measure the similarity by calculating cosine similarity between keywords

In this analysis step, basic analysis is performed by using the frequency (Term-Frequency) of the keyword. Frequency analysis is an analysis method that can quickly identify the general research trend in the field in a relatively simple way. In particular, when keyword standardization is conducted in an objective and excellent manner as in this study, a simple analysis such as frequency analysis can yield meaningful results. To do this, we first derive the top 20 keywords analyzed with the highest frequency from 2008 to 2017, and then analyze how the frequency ranking of the top 20 keywords has changed in the last 10 years. Second, we analyze keywords whose frequency-based rankings have increased or decreased dramatically in 2017 compared to 2008.

### **(Expected) Findings/Results**

We analyzed how the ranking has changed over the next 20 years for the top 20 keywords in 1999, and how the ranking has changed over the past 20 years for the top 20 keywords in 2018. In order to understand in detail the research areas of social entrepreneurship, community detection was conducted on the keyword co-occurrence network. This study analyzed the research results from 1999 to 2017 in the field of social entrepreneurship, which is growing actively, and systematically derives research trends in the field. In particular, while other studies used the citation network to analyze the relevant research field, this study analyzed the research trend by constructing a co-emergence network based on the co-appearance of keywords. This has the advantage of providing practical help to researchers who are currently studying the field. In order to overcome the limitation of existing keyword data that is not standardized, semantic similarity of keywords is effectively processed. In addition, natural language processing techniques were used, which resulted in very accurate results compared to other studies.

### **Research limitations/ Implications**

As a result of analysis of this study, it was found that social entrepreneurship is growing as independent research field. The number of papers is increasing rapidly, and in a slight way, we found that the mediation centered on a specific keyword decreased and the mediation center of other keywords gradually increased. We also derived keywords that are rising and keywords that are declining. Cluster analysis has identified 11 major areas of social entrepreneurship. This is expected to be of practical help to many researchers in planning future research.

**Keywords:** social entrepreneurship; entrepreneurship; network analysis; keyword analysis;

bibliometric study

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## University Entrepreneurship Ecosystem In Daedeok, Korea: Triple Helix perspective

Jong In Choi

Professor, Ph.D., Hanbat National University, Korea

### Abstract

#### **Purpose/ Research Question:**

University's role has been changed, from education, research, collaboration between industry-university, to the entrepreneurship development. Entrepreneurship education focuses on the development of skills or attributes that enable the realization of opportunity. For instance the Ewing Marion Kauffman Foundation launched the Kauffman Campuses Initiative (KCI) since December 2003, to encourage new, interdisciplinary entrepreneurship education programs throughout American colleges and universities. The Foundation sought to make entrepreneurship a campus-wide experience, to help schools become more entrepreneurial, and to ensure that thousands of students on diverse campuses would begin to see their own knowledge and resources from a more entrepreneurial perspective.(Torrance, 2013).

Korean government introduced the entrepreneurship concept to the university, graduate level since 2003, initiated by Department of Small & Medium Enterprise. Current Entrepreneurship education od undergraduate level is introduced by "The planning of university entrepreneurship education for 5 years(2013-2017)" from the three government organization, Department of Education, Department of Small & Medium, Venture, and Department of Science and Technology.

This article examines entrepreneurial education in a unique setting positioned to prepare people for entrepreneurship. The Daedeok Innopolis has a rich tradition of company and university cooperation. The Daedeok Innopolis is one of the largest science and technology parks in the world with a long track record of success. The Korean government created a research park in the middle of the Korean peninsula, to facilitate the interaction between corporations and government research institutes(GRIs) The universities recognize their role to prepare students for companies while at the same time being focused on innovation and entrepreneurship.

Each university has a diverse program of entrepreneurship education supported by the government, local government and university itself. But entrepreneurship education is not the major subject in the campus and is not enough as a Campus wide Entrepreneurship Edcation(CWEE). Therefore this

article looking for the way how can make CWEE, using the related programs and organizations like an entrepreneurial education center, incubator, angel investor and garage, competition and curriculum and extra-curriculum of department to be coordinated and integrated by the university, industry and government.

**Key Literature Reviews:**

Entrepreneurship education—the teaching skills and cultivation of talents that students need to start businesses ideas, find customer’s needs and opportunities, manage capabilities and risks, and innovate in the course of their careers—is now a staple of world higher education(Kauffman, 2013; Choi and Markham, 2018). Entrepreneurship training and education use the traditional small business management approach as well as a more recent new technology based firm’ creation approach(Rideout and Gray, 2013). Choi and Markham(2019) shows that university must establish their own vision, reward faculty for involvement, create a student focus, and promote community engagement from the perspective of open innovation. Therefore, to be successful Campus-wide Entrepreneurship Education (CWEE) must include 1) entrepreneurial leadership; 2) faculty champions; 3) student-focused policies; 4) engagement with the community; and 5) a decentralized, autonomous structure of entrepreneurship programs (see Table 1).

**Table 1.** Key aspects or success components of entrepreneurial education.

| Key Aspects                                   | Interview Contents  |
|---|---|
| 1) Entrepreneurial leadership in universities | Vision of industry-university collaboration for corporate entrepreneurship. Entrepreneurship vision tied to the university vision/mission. Administrative support to start and sustain funding strategies. This can come from tenured faculty, administrators, or non-tenure track specialists.           |
| 2) Faculty champion                           | Although leadership can come from anywhere, a strong program will have a faculty champion, ideally with a strong STEM background, academic and industry experience, and entrepreneurial experience. These are exceptional faculties so faculty and program development in multiple colleges is necessary. |
| 3) Focus on student                           | Student friendly policies and engaging content and programs need to be focused on involving a wide variety of students. Connect students with a community, teamwork, competitions and co-working accessibility, process, and hands-on program.  |
| 4) Community engagement                       | Industry–university collaboration culture, identify key stakeholders and partners, corporate participation, angel and investor networks, industry sponsors, mentor in residence, and internship opportunity.  |
| 5) Decentralized/ coordinated                 | Diverse autonomous discipline-based program. Each academic unit may sponsor their own program to meet specific industry needs associated with each discipline. Nevertheless, there is also the necessity for coordinated and collaborated structures.   |

Source : Choi and Markham(2019)

**Design/ Methodology/ Approach:**

|                            | <b>Recommendations for Ecosystem Members</b>   |   |  |
|----------------------------|--|---|--|
| <b>5 Success Factors</b>   | <b>University</b>  | <b>Industry</b>   | <b>Government</b>  |
| Entrepreneurial Leadership | <ul style="list-style-type: none"> <li>• Create a culture for industry involvement.</li> <li>• Administration support for cooperative programs.</li> <li>• Faculty engagement in programs, course creation.</li> <li>• Thought leadership and skills training.</li> </ul>  | <ul style="list-style-type: none"> <li>• Champion proposals for university engagement with in company.</li> <li>• Initiate the creation of corporate entrepreneurship programs at universities.</li> <li>• Connect leading corporate entrepreneurs with university programs, faculty and students</li> </ul>  | <ul style="list-style-type: none"> <li>• Commission research and economic development studies.</li> <li>• Policy Champions for tax and regulatory issues.</li> <li>• Initiate and fund technical and business programs in emerging areas of strength and opportunity</li> </ul>  |
| Student First              | <ul style="list-style-type: none"> <li>• Offer corporate entrepreneurship education opportunities (courses, curriculum, majors, minors, certificates)</li> <li>• Extracurricular activities – games, visits, competitions</li> <li>• Career vision and development programs</li> <li>• Establish student clubs and activities to increase corporate entrepreneurship confidence</li> </ul> | <ul style="list-style-type: none"> <li>• Collaborate to create corporate entrepreneurship programs</li> <li>• Host visits by university students</li> <li>• Establish hiring and promotion criteria for corporate entrepreneurship.</li> <li>• Develop job descriptions for corporate entrepreneurs so students can see the opportunities.</li> </ul> | <ul style="list-style-type: none"> <li>• Expand internship programs with government agencies (<a href="#">Innopolis, TP</a>) to include corporate entrepreneurship opportunities.</li> <li>• Create education-funding programs (<a href="#">Korean I-Corps, STEM training programs</a>).</li> <li>• Craft policy to include women and minorities.</li> </ul> |

**Findings/Results:**

Collaboration among the university, industry and government can contribute the university entrepreneurial ecosystem using the key aspects or success components of entrepreneurial education. University has to take an entrepreneurial leadership(EL) for the entrepreneurial

|                                 |  |  |  |
|---------------------------------|--|--|--|
| <p>Faculty<br/>Champions</p>    | <ul style="list-style-type: none"> <li>① Identify and support corporate entrepreneurship faculty.</li> <li>① Time and Leave policies to participate with industry.</li> <li>① Entrepreneurially friendly evaluation criteria.</li> <li>① Course development support.</li> <li>① Provide faculty corporate entrepreneurship funding.</li> </ul> | <ul style="list-style-type: none"> <li>① Participate in course development</li> <li>① Assign mentors to courses and projects.</li> <li>① Provide access to company projects for courses.</li> <li>① Provide faculty internships at companies.</li> <li>① Create professorships in corporate entrepreneurship</li> </ul>  | <ul style="list-style-type: none"> <li>① Sponsor economic development studies.</li> <li>① Provide funding for positions to hire and retain high profile faculty.</li> <li>① Support centers and institutes for university/industry cooperation.</li> <li>① Integrate economic development infrastructure between universities and industry.</li> </ul>                                 |
| <p>Community<br/>Engagement</p> | <ul style="list-style-type: none"> <li>① Create joint programs such as speakers, games and competitions.</li> <li>① University extension service for corporate entrepreneurship.</li> <li>① Contribute to regional economic development.</li> <li>① Establish entrepreneurship clinics, project space</li> </ul>                               | <ul style="list-style-type: none"> <li>① Sponsor and enable joint program such as: speakers, competitions and visits to companies.</li> </ul> <p>Convene technical and business user groups</p> <ul style="list-style-type: none"> <li>① Job creation programs integrated with university training in corporate entrepreneurship</li> <li>① Support community entrepreneurship programs</li> </ul> | <ul style="list-style-type: none"> <li>① Create and sustain business relationship agencies and include universities.</li> <li>① Support places for faculty, students and industry to meet (TBC).</li> <li>① Pass tax policy to encourage industry and university involvement.</li> <li>① Create SBIR, Co-investment funds, etc.</li> <li>① Recruit companies to the region.</li> </ul> |

ecosystems as follows method; Create a culture for industry involvement and administration support for cooperative programs, faculty engagement in programs, course creation, thought leadership and skills training.

Industry also make an EL through the Champion proposals for university engagement with in company., Initiate the creation of corporate entrepreneurship programs at universities and connect leading corporate entrepreneurs with university programs, faculty and students.

Government contribute the EL by the Commission research and economic development studies. Policy Champions for tax and regulatory issues, Initiate and fund technical and business programs in emerging areas of strength and opportunity.

|                          |   |  |   |
|--------------------------|---|--|---|
| De/Centralized Structure | <ul style="list-style-type: none"> <li>⌚ Establish central support for decentralized programs for sustainability.</li> <li>⌚ Encourage corporate entrepreneurship programs across the entire university.</li> <li>⌚ Provide corporate entrepreneurship portal for communications between university and industry collaborators</li> </ul> | <ul style="list-style-type: none"> <li>⌚ Create a university involvement office,</li> <li>⌚ Create and sponsor corporate entrepreneurship centers and programs in different departments around campus.</li> <li>⌚ Emphasize involvement from a diverse major and population base.</li> </ul> | <ul style="list-style-type: none"> <li>⌚ Support structure for university involvement in government economic development projects.</li> <li>⌚ Create grants for entrepreneurship structures at universities.</li> <li>⌚ Provide training programs for university faculty, students and administrators for industry cooperation</li> </ul> |
|--------------------------|---|--|---|

Research limitations/ Implications:

Campus-wide entrepreneurship education is new concept and need more concrete in-depth studies. The CWEE recommendations are the collaboration between the regional ecosystem and university's diverse entrepreneurial programs. The interviews from the Daedeok Innopolis and universities identified program policies and activities at universities that support entrepreneurship needs of companies. The successful "Campus Wide Entrepreneurship Education" (CWEE) which is defined at the university level, several departments and organizations are interconnected and diverse student teams consist and directed by professors and mentors, is important for the diverse corporate needs of entrepreneurial thinking. CWEE must include the five factors, entrepreneurial leadership, faculty champions, student-first policies, tight engagement with the community and a decentralized, autonomous structure of entrepreneurship programs. Especially CWEE has to close relationship with the understanding of industry, university, and central and local government.

Keywords: Entrepreneurship, Entrepreneurial Leadership, Ecosystem, Professor Champion

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36.

## **A Study on the Factors of Entrepreneurial Orientation:**

### **Focus on Undergraduate Students and Entrepreneurs**

Ki Hwan Kwon

Adjunct Professor, Ph.D., Hanbat National University

Jong In Choi(Corr)

Professor, Ph.D., Hanbat National University

## Abstract

**Purpose/ Research Question:** The world is pay attention to entrepreneurship which is key to solve the economic crisis, sustain economic growth, create jobs, and to improve quality of life. Therefore, each and every country has recognized the importance of initiating entrepreneurship in order to overcome the above problems (Dvouletý, 2019) and various efforts have been made to revitalize entrepreneurial mindsets.

In order to measure entrepreneurship in every country, the "Global Entrepreneurship Monitor" measures the performance of each country's environment and individual characteristics for entrepreneurship. Hence, the measurement of entrepreneurship is very important to understand the current situation of any country. Therefore, the current study attempts to explore the measurement of individual psychological characteristics.

In general, in the prior literature, many indicators have been used to measure entrepreneurship at the individual or organizational level which are primarily based on organizational level researches (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller, 1983). Specifically, the cited studies have used organizational level researches for the individual level researches.

However, in measuring the entrepreneurial orientation at the individual level, the use of the organizational Entrepreneurial orientation has been generally used. The reason for this is, because the organizational entrepreneurial orientation questionnaire has been used without considering its shortcoming for individual entrepreneurial orientation (Sung, 2016).

Therefore, this study attempts to re-examine the sub-factors of individual level entrepreneurial orientation based on the researches of the individual characteristics of entrepreneurs.

**Key Literature Reviews:** In the existing previous studies on entrepreneurship, the following factors are considered as the characteristics of entrepreneurship. For example, Kim et al. (2009) reported need for achievement, self-control ability, Risk taking, creativity, Self-efficacy as sub-factors of entrepreneurship at the individual level.

<figure> Kim et al. (2009) Individual Level Entrepreneurship

| Dimension            | Sub Dimension   |
|----------------------|---|
| Need for Achievement | Goal Orientation, Future Orientation, Active, Innovative Activities |
| Self-control ability | Positive thinking, self belief, self control                        |
| Risk taking          | Challenge, determination, a sense of purpose                        |
| creativity           | Innovative thinking, novelty, Proactiveness                         |
| Self-efficacy        | Self-confidence, self-esteem, social networking                     |

Similarly, Lee et al. (2014) reported challenge spirit, creativity/innovation, leadership and value

orientation as sub-factors of entrepreneurship at the individual level.

<figure> Lee et al. (2014) Individual Level Entrepreneurship

| Dimension             | Sub Dimension   |
|-----------------------|---|
| challenge spirit      | Risk-taking propensity, patience with ambiguity, aggressiveness, future orientation   |
| Creativity/innovation | Pursuit of newness (change preference), flexibility (converged thinking), problem solving ability / will, external acceptability (open innovation), technology emphasis |
| Leadership            | Autonomy, extrovert/social networking, self-efficiency  |
| value orientation     | Need for Achievement, Goal-Oriented, Social Contribution to Achievement   |

Han et al. (2014) argued value and philosophy, entrepreneurial characteristics, and entrepreneurial abilities as constituents of entrepreneurship.

<figure> Han et al. (2014) Individual Level Entrepreneurship

| Dimension                       | Sub Dimension  |
|---------------------------------|--|
| Value and Philosophy            | Perception and attitude, motivation and purpose, values, social purpose  |
| entrepreneurial characteristics | Innovativeness, Risk seeking tendencies, Proactiveness / Driver, Autonomy / Locus of Control, Need for Achievement |
| entrepreneurial abilities       | communication skills, technical skills, management skills, relationship management skills, economic abilities      |

Finally, Yoo & Kim. (2019) organized entrepreneurial orientation into innovation, progressive and risk-sensitive, with the following sub-factors.

<figure> Yoo & Kim(2019) Entrepreneurial Orientation of Top Manager

| Dimension        | Content Analysis Keywords   |
|------------------|---|
| Innovation       | Discovery, Dream, Think out, Predict, Visible, Envision, Shape, Occurrence, Find out, Come up with, Creative, Imagine, Draw, Impromptu, Originality, Creativity, Proactiveness, founder, innovation, Inspiration, Encourage, Excellence, Invent, Originative, Creator, Temperament, Construct, Change, Transformation, Slick, Smart, Change, Creation, New, Novelty, Originate, Derive, Start |
| Proactiveness    | Predict, look ahead, Expect, Exploration, Research, Prediction, Discovery, Predict, Think, Foresee, Prophesy, Progressive, Inquire, Research, Search, Investigation, Lead, Study, Carefully, Inspection   |
| Risk Sensitivity | Adventurous, Progressive, Bold, Confident, Courage, Possibility, Opportunity, Uncertain, Dangerous, Brave, Danger, Challenge, Strong, Rash, Bold, Indomitable, Equivocal, Enterprise, Brash, Reckless, Slump, Instability, Indiscreet, Risk factor, Interest, Unidentified  |

Source: Yoo & Kim. (2019)

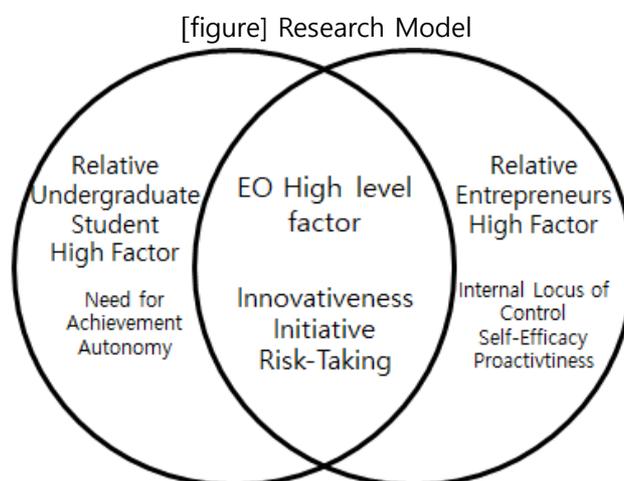
Based on our analysis we found common factors from the above main studies to develop individual-level entrepreneurship and entrepreneurial orientation. These are innovativeness,

initiative, risk-taking, need for achievement, autonomy, internal locus of control, self-efficacy, proactiveness

The deduced factors were considered as possible characteristics for individual level entrepreneurial orientation. In addition, considering the situation of undergraduate students and entrepreneurs, it was expected that the intensity of the factors would be different for undergraduate and entrepreneurs

**Design/ Methodology/ Approach:** The purpose of this study was to derive the following research model to identify the differences in the entrepreneurial orientation components of undergraduate students and entrepreneurs.

Data for the study were collected from undergraduate students and entrepreneurs. Specifically, 287 of undergraduate students and 211 of entrepreneurs were participated for the study.



**Hypothesis 1: For both university students and entrepreneurs, the influence of the factors presented in the existing entrepreneurial orientation studies will be higher than the influence of the entrepreneur's personal characteristics.**

Hypothesis 1-1: For both undergraduate students and entrepreneurs, the effect of innovativeness in existing entrepreneurial orientation studies will be higher than that of entrepreneurs' personal characteristics.

Hypothesis 1-2: For both undergraduate students and entrepreneurs, the effect of initiative in existing entrepreneurial orientation studies will be higher than the influence of the entrepreneur's personal characteristics.

Hypothesis 1-3: For both undergraduate students and entrepreneurs, the effect of risk-taking in existing entrepreneurial orientation studies will be higher than the influence of the entrepreneur's personal characteristics.

**Hypothesis 2: The effect of some entrepreneurial characteristics of undergraduate students**

**will be higher than entrepreneurs.**

Hypothesis 2-1: The effect of Undergraduate students' need for achievement will be higher than entrepreneurs.

Hypothesis 2-2: The effect Undergraduate students' Autonomy will be higher than entrepreneurs.

**Hypothesis 3: The influence of some entrepreneurial characteristics of entrepreneurs will be higher than undergraduate students.**

Hypothesis 3-1: The effect of entrepreneurs' internal locus of control will be higher than undergraduate students.

Hypothesis 3-2: The effect of entrepreneurs' self-efficacy will be higher than undergraduate students.

Hypothesis 3-3: The effect of entrepreneurs' proactiveness will be higher than undergraduate students.

Reliability analysis was performed by using Cronbach's  $\alpha$  coefficient to evaluate the model using SPSS 21 to verify the model. The oblimin method was directly used among the square rotation methods without independence. Secondly, confirmatory factor analysis was conducted using Amos 21 for validity analysis.

**(Expected) Findings/Results:** As a result of reliability analysis, Cronbach's  $\alpha$  coefficient ranged from .71 to .91 for both undergraduate students and entrepreneurs.

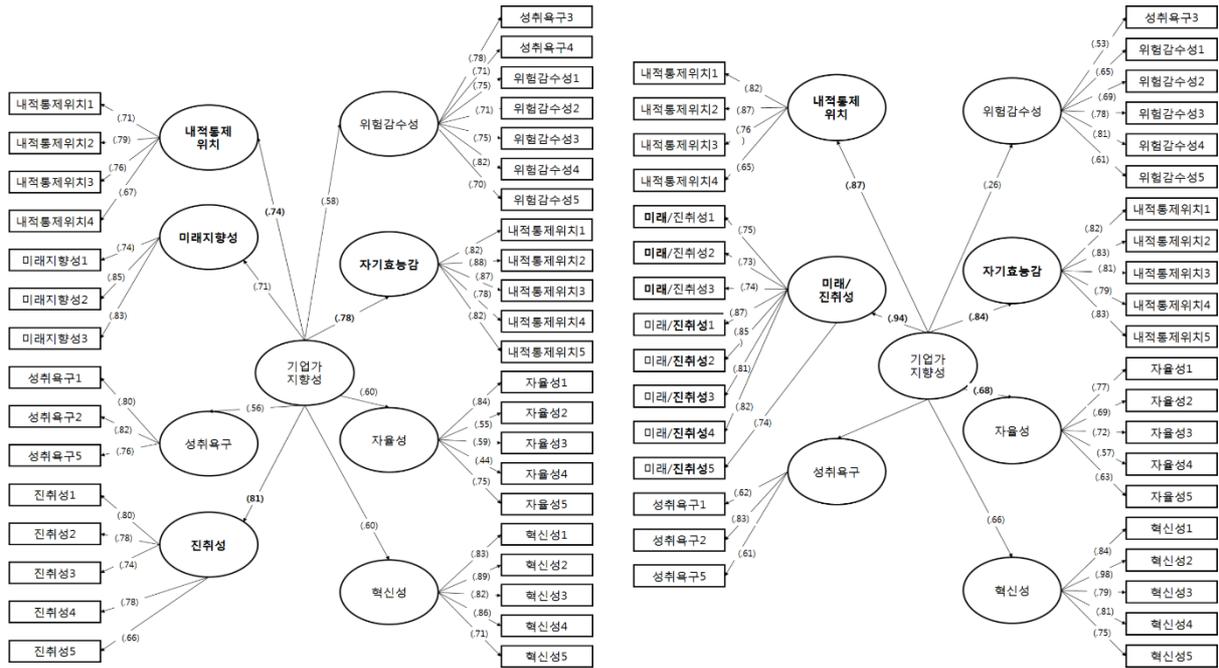
As a result of the validity analysis, in the exploratory factor analysis (EFA) for undergraduate students were identified as eight factors: Initiative, self-efficacy, internal locus of control, proactiveness, autonomy, innovativeness, risk-taking, need for achievement

However, for entrepreneurs the EFA identified seven factors: Proactiveness/Initiative, internal locus of control, self-efficacy, autonomy, innovativeness, risk-taking, need for achievement

As a result of the high-order confirmatory factor analysis, the undergraduate students had statistically significant path coefficients in all eight factors, but in case of entrepreneurs only six factors out of seven factors except need for achievement are statistically significant.

[figure] 8 Factor Higher-order Confirmatory  
Factor Analysis: Undergraduate Students

[figure] 7 Factor Higher-order Confirmatory  
Factor Analysis: Entrepreneurs



$\chi^2=1197.28$ , d.f.=622 ,p=.00, 표준  $\chi^2=1.93$ , NFI=.83,  $\chi^2=1084.78$ , d.f.=587 ,p=.00, 표준  $\chi^2=1.85$ , TLI= .90, CFI=.91, GFI=.82, AGFI=.79, RMSEA= .06 NFI=.80, TLI= .89, CFI=.89, GFI=.78, AGFI=.75, RMSEA= .06

\* n = 287, 211 () means standardized path coefficient, and all path coefficients in () are significant at p <.001 level.

<figure> 8 Factor higher-order Confirmatory Factor Analysis Result

|                        | 1                          | 2                         | 3                         | 4             | 5        | 6              | 7           | 8                    |
|------------------------|----------------------------|---------------------------|---------------------------|---------------|----------|----------------|-------------|----------------------|
| Undergraduate Students | Initiative                 | Self-Efficacy             | Internal Locus of Control | Proactiveness | Autonomy | Innovativeness | Risk-Taking | Need for Achievement |
|                        | .81                        | .78                       | .74,                      | .71           | .60      | .60            | .58,        | .56                  |
| Entrepreneurs          | Proactiveness / Initiative | Internal Locus of Control | Self-Efficacy             |               | Autonomy | Innovativeness | Risk-Taking | Need for Achievement |
|                        | .94                        | .87,                      | .84                       |               | .68,     | .66            | .26         | -                    |

As a result, Hypothesis 1-2 of Hypothesis 1 was accepted, but Hypotheses 1-1 and 1-3 were rejected. Hypothesis 2 2-1 was accepted, but Hypothesis 2-2 was rejected. Hypothesis 3, Hypothesis 3, 3-1, 3-2, and 3-3 were accepted.

**Research limitations/ Implications:** Based on the findings of study there following several academic and practical implications.

First, it is meaningful that the factors of entrepreneurial orientation at the individual level are derived from the characteristics of entrepreneurs, suggesting the possibility of research differentiated from the organizational level.

Second, it is meaningful that it reflects reality by deriving individual level factors of entrepreneurial orientation through empirical study not based only on previous studies.

Third, it is meaningful that unlike the previous studies in the current study we have examined individual level entrepreneurial orientation and empirically validated the entrepreneurial orientation in a simple way.

Fourth, in entrepreneurship education, this study suggested there is a need of student-friendly education such as community, teamwork, competition, and public works to enable students to gain self-confidence (Choi & Markham, 2019).

While the results of this study have these implications, they have theoretical and empirical limitations. First, this study relies only on previous studies in deriving the components of entrepreneurial orientation in the individual level, but further research needs to find additional factors for entrepreneurial orientation through subject-specific interviews.

Second, this study used the items of entrepreneurial orientation from the field of business and psychology because of the lack of item in the literature of entrepreneurship. Therefore, for the generalizability of the entrepreneurial orientation further studies are needed in the area of entrepreneurship.

Third, this study collected data with the same questionnaire for undergraduate students and entrepreneurs, but identified the problem that it was difficult to compare by subjects because the response criteria were different for each subject. In future research, it is necessary to develop a measure of entrepreneurial orientation for each target and clearly specify the criteria for survey responses.

**Keywords:** Entrepreneurship, Entrepreneurial Orientation, Individual Level

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37.

## **An Empirical Study on the Local Informatization using Semantic Network Analysis**

Hanbyul Choi

Ph.D. Student, Seoul National University, South Korea

Kil Pyo Hong (Corr.)

Professor., Baekseok University, South Korea

### **Abstract**

**Purpose/ Research Question:**

The purpose of this study is to identify the level of activation of local informatization in Korea through Semantic Network Analysis, a big data analysis method. This study will examine the level of activation of local informatization through the ordinances related to informatization of local government. This study analyzes the regulations of metropolitan municipalities such as metropolitan cities and provinces. Since "Framework Act on National Informatization" was enacted in January 1996, various local governments ordinances have been enacted in various local governments from 1997 to 2010. As a result, the regulations on informatization have been established in all 17 metropolitan municipalities in Korea.

However, the local ordinances related to local informatization of each local government are quite different in scope and depth. For example, in the case of the quantity of words, there are many differences of quantity from 5,748 words to 11,899 words. There is also a variety of responses to change, from initial enactment to three revisions to 24 revisions. The local government's ordinances on informatization can cover various scopes such as personal information protection, administrative use, service provision, promotion system, and administrative use. However, there are differences between local governments. In this study, the citation relationship of the regulations related to informatization will be organized into networks, and the network will be interpreted to measure the level of local informatization activation. This measures the policy targets, policy scope, and major technologies that appear in the ordinances related to information.

#### **Key Literature Reviews (About 3~5 papers):**

Song, et al (2014) analyzed the language network of the International Conference Industry Promotion Act. This study aimed to overview the legal contents of International Conference Industry Promotion Act, analyze the law statistically rather than in a juridical perspective and thereby provide basis for relevant law as well as concerned industry law. This study attempted to analyze the International Conference Industry Promotion Act in a statistical approach and the results of the study may be actively used in exhibition, incentive tour industry as well.

Ryu & Namkung (2013) tried to induce the problems of disaster related laws in Korea through the comparative review with disaster management advanced countries and to propose how to arrange legal system in the future. The legal system of Korea's disaster-related laws has been implemented at the national level. However, the network was analyzed based on the problem that it is inferior to the advanced countries in foreign disaster management.

Kim & Ha (2015) is to analyze logrolling in the legislation process of regulation bills initiated by members of National Assembly (members, hereafter) through the Network Analysis. The regulation bills are classified into three types (political party, terms of office and constituency) and an individual network of members.

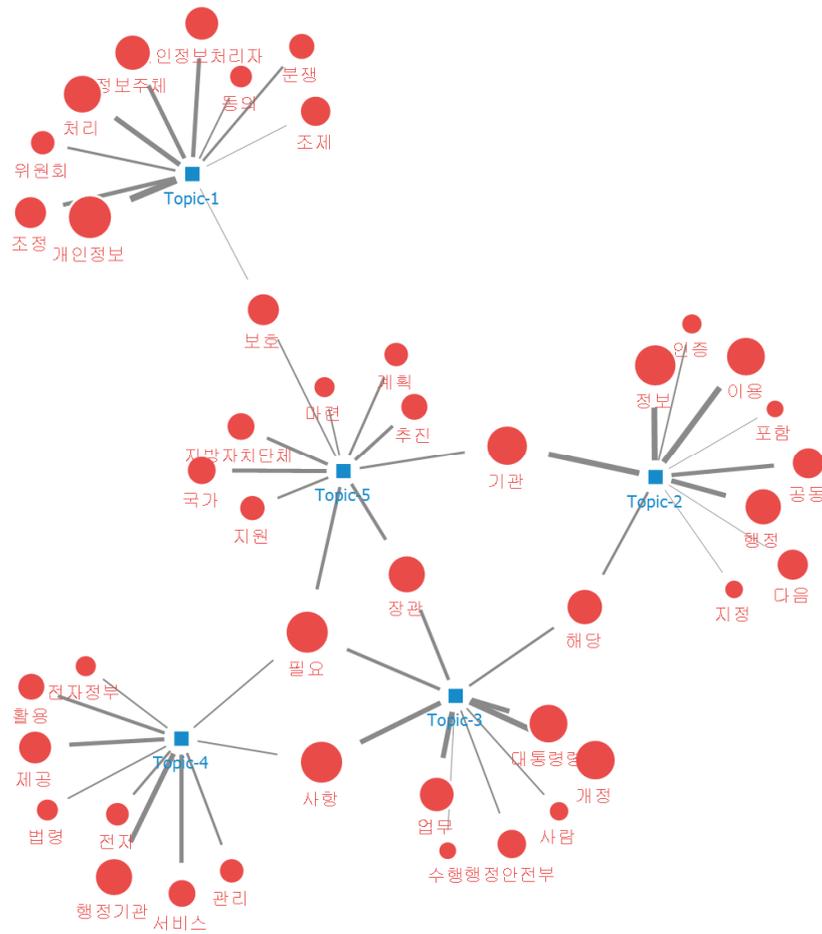
#### **Design/ Methodology/ Approach:**

This study aims to draw implications by comparing and analyzing the ordinance system related to informatization of metropolitan municipalities such as metropolitan cities and provinces in Korea. For this purpose, the semantic network methodology, which is a kind of content analysis, will be used for the ordinances of each local government, and the central keyword analysis will be conducted.

In general, content analysis involves the researcher reading, coding, and analyzing the document. However, the content analysis in this way is dependent on the analysis items arbitrarily made by the researcher, the labor cost is high, and the external validity is limited.

The purpose of this study is to derive key keywords of the ordinances related to informatization of 17 local governments in Korea and analyze them through the linkage relationship between keywords. The most important element of word-to-word network analysis is the semantic association between the cores. When key words are combined in a specific form, they have a specific meaning, and the frequency with which key words occur simultaneously becomes a relationship in network analysis. In this regard, this study intends to analyze the key keyword analysis and the linkage between keywords in the ordinance related to information.

**(Expected) Findings/Results:**



Before analyzing the local government's information ordinance, the results of topical modeling of “Framework Act on National Informatization” are shown. The first topic is about privacy. The second topic is the topic of utilization in administration. Third is the promotion plan and related topics. Fourth is the topic of service provision. Fifth is the topic related to the promotion system.

In this way, the local government's ordinances can be used to understand the scope and depth of the contents of each ordinance. In this way, it is possible to identify which municipalities are considering various scopes for various policy targets.

**Research limitations/ Implications:**

In semantic network analysis, attention must be paid to the interpretation of the meaning of each word and connection in that a particular word has a meaning when showing a particular connection.

This study is meaningful to empirically analyze the differences in the depth and scope of the ordinances regarding regional information of each local government. As the intelligence information era arrives, it is important to respond at each local government level. The basis for local government

policy enforcement comes from the ordinances. By analyzing the ordinances related to the informatization of local governments, it will be a chance to reflect on the role of local governments in preparation for the era of intelligent information.

**Keywords:** Informatization of Local Government, Information Ordinance. Semantic Network Analysis, Content Analysis

### **Reference**

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38.

**The Determinants of Local Government Informatization Budget**  
**- Focusing on the Digital Innovation Capability of Local Government -**

First Author Y. Min Cho

Ph.D Student, GSPA Seoul National University, Republic of Korea

Second Author Kim, Dongwook

Professor GSPA Seoul National University, Republic of Korea

Corresponding Author Shin, Seungyoon

Ph.D Candidate, GSPA Seoul National University, Republic of Korea

Abstract

Purpose/ Research Question:

- This study aims to find out the determinants of local government informatization budget.
- Developed Information and communication technology(ICT) caused economical and cultural innovation and reformation and this kind of phenomena is called informatization(Lim, 2002), In other words Informatization is defined as "converting the main goods and energy of a social economy to information through the revolution of high data communication technology and utilizing information produced by gathering, processing and distributing data within the vast fields of the society" (National Computerization Agency(NCA), 1997).
- The applied(or analyzed) level of informatization at the local government level is informatization of local government.
- Major research question(RQ) is that what is the determine the local government informatization budget?
- In addition, If local governments own more digital innovation capability they will get increased amount of informatization expenditure. This is hypothesized as follows: Does the digital innovation capability of local government made difference of increase in expenditure?

## Key Literature Reviews:

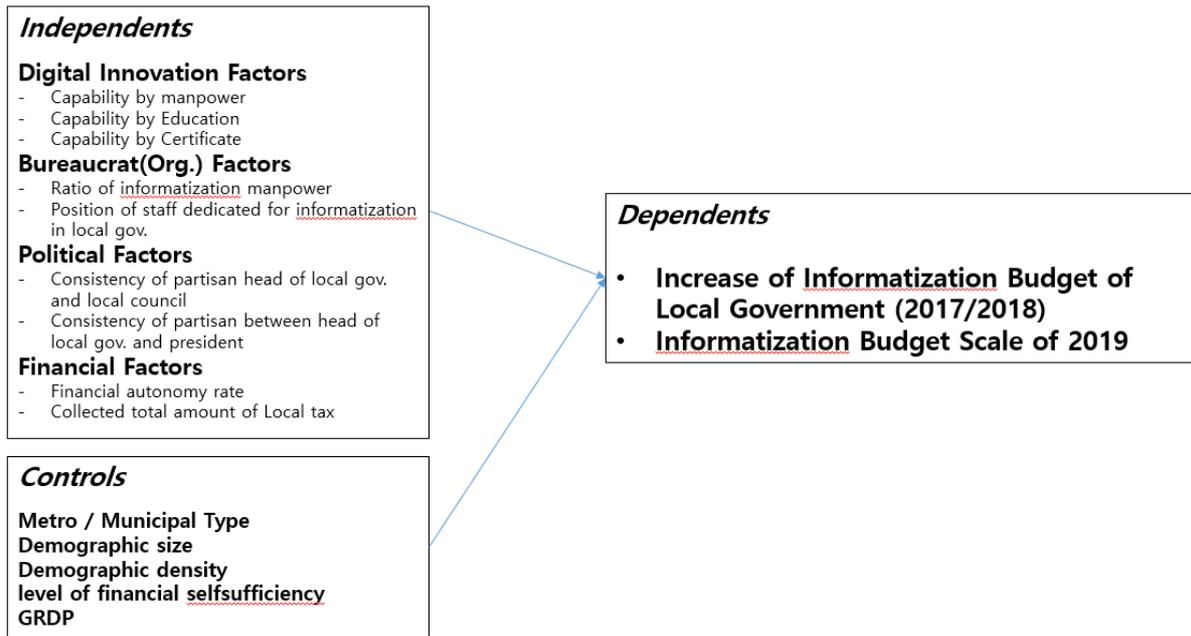
Hudson(1999) adopted political science perspectives: the policy networks approach, rational choice and the new institutionalism to explain informatization and its effect which was expected to change public services by using UK's three policy sector(social security, health care, and social care). He emphasize that in order to understand applying informatization in public sector, political factors must be considered in terms of its incremental nature of change.

Choi(2001) tried to find out the determinants of informatization expenditure of local government using data of 16 metro local governments(1997-2001) by OLS, error correction model and Parks model which include socio-economic factor, political-administrative factor, financial factor and incrementalism factor. The main results of this study showed that ordinary determinant factors of expenditure also affect the informatization expenditure.

Kim(2011) compared the information society organization and information society budget of 16 metro local government of 2010. One of the key findings of the study is that Local government's informatization budget have less association rate with population and number of households and public officials of local government.

**Empirical study about the determinants of informatization expenditure is hard to find and even seldom in the levels of local governments accompanying both type of metro and municipal governments.**

## Research Design



#### Methodology/ Approach:

Local government's budget is generally supposed to be determined by Incrementalism, public choice theory, policy determinants theory etc.

Basically, We tried to apply combined model which includes social factors, economic factors, political factors, environmental factors, etc. Moreover, We consider digital innovation capability factors as one of main factors which bring increase of informatization budget of local government.

The unit of analysis is total 245 Korean local governments(Metro 17, Municipal 226) and their 2017, 2018 and 2019 informatization expenditure.

All data we used to test our hypothesis is collected from the Survey of Level of Local Informatization and KOSIS

In order to analyze the determinants of informatization budget of local government, descriptive statistics, correlation analysis and ANOVA will be applied for describing basic status and levels of informatization of each local governments.

Multiple regression model will be applied to the verification of our hypothesis.

All of our analysis will be conducted by statistical analysis program, SAS 9.4.

#### (Expected) Findings/Results:

The factors affecting the level of informatization budget increase could be examined empirically.

If the level of digital innovation capability of local governments affects the increase of its budget, it implies local governments with higher digital innovation will increase the amount of budget which is the material resources needed to promote digital innovation for its local region(society).

If other factors(bureaucrats, political, financial) are verified statistically significant for the increase, the following findings could be obtained:

The determinants traditionally known to affect the budget of other sectors(welfare, R&D, education..) could be verified to have same tendency on the information sector either.

It might be concluded that digital innovation capability of local government has no influence on the increase of informatization budget, which is the material base of local government, rather have affected other outputs such as innovation case on its region and ICT service levels.

Keywords: Digital Innovation Capability, Local Government, Informatization Budget.

Research limitations/ Implications:

The expected findings of this study which explore the factors affecting the increase of informatization budget of local governments in South Korea could contribute on academic foundation for local informatization budget which are relatively lacked in research.

The data we utilized in this study is meaningful in that it actually measured the digital innovation capabilities of local government officials of the whole country.

It might be proved that the digital innovation capability level, the key factor in this study, has influence on the increase of budget which is a material resource needed for actual promotion of new ICT service, and if the key factor is verified significant, academic contribution could be suggested by presenting it as a new factor affecting the informatization budget of local government.

The limitations of this study include the following points:

Since the data utilized was not panel data, it is difficult to fully control endogeneity problems that the model may have.

Part of the measurement of digital innovation capability factors is based on the public official's perception data.

The limitations of this study will be overcome by further study.

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## **Do listed companies pay to be green? Evidence from Chinese green bond market**

Lujun Qi

Post-doc., Postdoctoral Station, Orient Securities Company Limited, Shanghai, China  
Economy School, Fudan University, Shanghai, China

Lixiang Wang (Corr.)

Ph.D. candidate, China Academy of Corporate Governance, Nankai University, Tianjin, China

Weian Li

Prof., China Academy of Corporate Governance, Nankai University, Tianjin, China  
China Academy of Corporate Governance, Tianjin University of Finance and Economics, Tianjin, China

### **Abstract**

**Purpose/ Research Question:** Green bond issuance has significantly surged in Chinese capital market since 2016. However, whether green bond issuance could bring positive premiums for a listed company is still unexplored. What if green bond failed to bring positive premiums for the listed company, the underlying incentives of these listed companies needs to be examined. Our study could make contributions on making efforts to call on establishing green governance structure in the capital market and on clarifying corporate greenwashing mechanisms through green bond financing.

**Key Literature Reviews (About 3~5 papers):** Tang and Zhang (2018) find that stock prices positively respond to green bond issuance. But they do not find a consistently significant premium for green bonds, suggesting that the positive stock returns around green bond announcements are not fully driven by the lower cost of debt. Necessary institutional framework needs to be embedded in the capital market, the proper governance structure design and governance mechanism arrangement can effectively coordinate the relationship between human and nature (Li, Xu and Zheng, 2018). Without the proper governance basis, this may cause a severe risk in the capital market. Kim, Li and Li (2014) find that there is a relationship between CSR performance and stock crash risk. The effect of CSR on crash risk is more pronounced with less effective governance.

**Design/ Methodology/ Approach:** Using a green bond issuance dataset from 2016 to 2018 to examine stock market reaction of green bond announcement through CAPM model. We estimate the beta of each firm using estimation windows starting from 300 trading days to 50 trading days before the announcement date. To alleviate the concern that bond issuance has some information

linkage, we follow Krüger (2015) to conduct 10- and 21-day event windows. The sample data is from CSMAR database which includes various Chinese listed companies' data. Our basic empirical results show that green bond announcement has a strong negative relation with stock price which is significant in the case window [-5, 5], [-3, 3] and [-1, 1]. So, we further explore whether these companies try to hide risk to become greenwashing using PSM-DID method. The measurement of stock crash risk is based on Chen, Hong and Stein (2001).

**(Expected) Findings/Results:** Through market reaction model, we find that green bond announcements fail to bring the listed companies' positive premiums, but significantly negative. The result is robust in the Fama-French's three factors model and five factors model. In order to explore the underlying mechanism of negative premiums of green bond issuance, we try to examine the relationship between green bond issuance and stock crash risk. The expected result is that green bond initial issuance is significantly positive with stock crash risk, which may show that issuing green bond is just a symbolic action of Chinese listed companies.

**Research limitations/ Implications:** According to our empirical results, we find that there is still a basic lack of institutional framework for green finance although bundles of laws and documents have been implemented in Chinese green capital market. The governance basis of green finance is still delicate. Regulators should build an entire green governance framework for green finance. *Global Green Governance Principles* which was published by Green Governance research group from Nankai University could provide a good reference for establishing the green governance framework in the capital market. Of course, our study still has some limitations. For instance, we do not include unlisted companies' green bond data in the sample because of data availability.

**Keywords:** Green bonds; Chinese companies; Corporate sustainability; Green premiums; Green Governance.

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## Socially responsible funds, corporate greenwashing and disclosure quality

Weian Li

Professor, Business School, Nankai University, China Academy of Corporate Governance, Tianjin, China

Yupei Liu (Corr.).

Ph.D, Business School, Nankai University, China Academy of Corporate Governance, Tianjin, China

### Abstract

**Purpose/ Research Question:** This paper tests whether and how socially responsible funds improve corporate social responsibility (CSR) disclosure quality of listed companies in China. Socially responsible funds can guide social capital to flow to responsible enterprises. Besides, they can play an active role of shareholders in social responsibility issues and promote social responsibility performance. But when shareholding ratio is low, socially responsible funds may only have a short-term impact on the enterprise and its negotiation ability to influence the decision-making is not strong enough. Furthermore, social responsibility disclosure may also become a greenwashing tool. From the aspect of institutional environment, the current environmental regulation has a large operating space, and the regulatory effect also has a high uncertainty, which is the key reason for enterprises to greenwashing. From the individual level of decision-makers, the narrow decision-making framework, which refers to managers are headstrong or short-sighted, finally leads to decisions of greenwashing. As a result, we examine whether companies engage in greenwashing activities and discretionary disclosure in CSR reports to be consistent with legitimacy or to cover up the "disguise" of managers' immoral behaviors.

**Key Literature Reviews (About 3~5 papers):** There are different conclusions about the influence of institutional investors on corporate social responsibility. Dyck et al. (2019) assesses whether shareholders drive the environmental and social (E&S) performance of firms worldwide and find that institutional ownership is positively associated with E&S performance. In contrast, Dam and Scholtens(2012) find that the ownership of firms by institutional investors is neutral with respect to the firms' range of CSR involvement. And the reason may be that these investors thoroughly assess costs and benefits of CSR and the two will compensate under market equilibrium. However, social responsibility information can also be used as a greenwashing tool. Prior(2008) find a positive impact of earnings management practices on CSR, which demonstrates that CSR can be used to garner support from stakeholders and provides an opportunity for entrenchment to those managers that manipulate earnings. Rupley et al. (2012) find that the main effects of both short-horizon and long-horizon investment are not associated with voluntary environmental disclosure, but there is a positive association when interacted with negative media. It shows that when there is negative environmental publicity, institutional investors exerting influence over managerial decisions on environmental reporting.

**Design/ Methodology/ Approach:** According to the Decennial Report on the Responsible Investment in China jointly issued by SynTao Green Finance (STGF) and Xingquan Fund, as of August 31, 2017, there are 62 socially responsible investment funds in China's market. This study intends to take the investment objects of these 62 socially responsible investment funds in 2009-2018 as research objects, and empirically tests the socially responsible funds and corporate greenwashing motivations in relation to the disclosure quality of CSR reports. Firstly, the paper tests the shareholdings of socially responsible investment funds and the disclosure quality of CSR reports. On this basis, we further examine the influence of enterprises' greenwashing motivations, which can be examined from two aspects, managers' behaviors and the institutional environment. So the paper assesses the moderating effect of agency costs and legal system environment to figure out whether greenwashing activities exists in corporate social responsibility issues. In the model, we use the results of Rankins CSR Ratings (RKS) to measure disclosure quality of CSR reports. Besides, we use firm size, leverage, return on assets, Tobin's q, ratio of independent director, state-owned shareholding rate, equity concentration, and some other corporate governance factors as firm-level

control variables.

**(Expected) Findings/Results:** We expect that there will be a significant U-shaped relationship between the shareholdings of socially responsible funds and the disclosure quality of CSR reports. That means when the shareholding ratio of socially responsible fund is low, there is a significant negative correlation between it and CSR disclosure quality. And when the shareholding ratio is high, there is a significant positive correlation between it and the CSR disclosure quality. Furthermore, we also expect that the two proxy variables of greenwashing motivations, the agency costs and the legal system environment will have a significant effect on the relationship between shareholdings of socially responsible investment funds and CSR disclosure quality. That means companies use greenwashing as a discretionary disclosure strategy to be consistent with legitimacy or to cover up the "disguise" of manager's immoral behaviors.

**Research limitations/ Implications:** The possible contribution of this paper lies in that it explains the external reason for enterprises to fulfill their social responsibilities, especially from the perspective of socially responsible investors to explore why enterprises choose to be benevolent. The paper also provides empirical evidence for companies' greenwashing motivations and discretionary disclosure strategies. It demonstrates whether the listed companies issue social responsibility reports to convey the signal of fulfilling social responsibility, or to achieve legitimacy and cover up the "disguise" of managers' immoral behaviors. The research limitations mainly includes two points, firstly, the measurement of CSR disclosure quality is aimed at social responsibility reports issued by enterprises. So the paper may miss some information without considering sources including annual reports, official websites or other platforms. Secondly, at present, China's socially responsible investment is still in its infancy and has not become the mainstream. Compared with the developed capital market, the role of institutional investors in China is still weak and has not become the main force of improving corporate governance. As a result, the role of socially responsible investment in guiding listed companies to improve governance level and strengthen social responsibility may not be in line with our expectations, which needs to be further examined in future research.

**Keywords:** Socially responsible investment, Corporate social responsibility, Greenwashing motivation, Disclosure quality

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41.

**How blockchain influence organization governance: A literature review and multi-case study**

Runhui Lin (Corr.).

School of Business, Nankai University, People's Republic of China

School of Business & China Academy of Corporate Governance, Nankai University, People's Republic of China

Lun Wang

School of Business, Nankai University, People's Republic of China

Biting Li

School of Business, Nankai University, People's Republic of China

Yanhong Lu

School of Business, Nankai University, People's Republic of China

Zhiqiang Qi

School of Business, Nankai University, People's Republic of China

Linyu Xie

School of Business, Nankai University, People's Republic of China

Abstract

Blockchain is a technical solution integrating distributed storage, encryption algorithm, consensus mechanism and other technologies. Decentrality, immutability, traceability, smart contract and other functions of the blockchain can provide technical solutions for solving

(social, institutional) trust problems in existing organizational governance issues. Blockchain technology has been and will be widely applied in many fields. However, current researches are mainly on technical level and related research on organizational governance is still scant. This paper takes blockchain as the trigger point to solve problems of traditional organizational governance and organizational trust. This study argues that: (1) Blockchain technology can improve the information security of organizations (inter-organization), promote trust among entities, and ultimately achieve organizational innovation through collaboration; (2) Blockchain technology can promote subjective consensus and trust, and reduce organizational conflicts; (3) It can re-examine organizational rule formulation, implementation, reward and punishment mechanisms, and explore new organizational governance model in the technological era.

This paper includes literature review, multi-case analysis of organizational blockchain application practices, isomorphism analysis of blockchain and organizational governance, influence mechanism of blockchain on organizational governance, upgrade mode of blockchain and organizational governance, challenges of embedded organizational governance of blockchain and further research directions, conclusions and prospects.

The BC&OS (blockchain and organizational governance) framework captures the following ideas that emerged from our review: (1) analyzing the structural consistency and internal relationship between blockchain and organizational governance, especially network governance, from the perspective of blockchain connotation (distribution, decentralization, consensus mechanism) and general governance (Pluralism, independence, self-organization; Li W., 2005); (2) analyzing of its mechanism isomorphism and goal consistency, from the perspective of blockchain system functional structure (consensus mechanism, trust mechanism, smart contract) and governance process (Rules, compliance, accountability; Li W., 1999); (3) comparative analyzing of theoretical and practical advantages and disadvantages of computing trust based on blockchain architecture and institution-based trust in traditional organizational governance, and discussion of the relationship between technical trust solutions and institution-based trust solutions (support, complementarity or substitution); (4) discussing the matching relationship between the public chain, private chain and alliance chain in the blockchain and the real organizational governance model, and study the constraints of blockchain influencing the organizational governance model, such as redundant storage cost, access efficiency, communication cost and the reliability of pre-chain information; (5) exploring the boundary setting and interface design of "people and blockchain", "chain and chain", "chain and organization system". This paper discusses the model of promoting organizational governance upgrade based on blockchain, and puts forward further research directions.

Purpose/ Research Question:

In this study, we will investigate the following research questions:

1. What is the theoretical evolution and application progress of blockchain in organization

governance?

2. What are the structural similarities between blockchain and organization governance?

3. What is new in organization governance mechanism model based on blockchain?

4. What is general mode of blockchain and organization governance upgrading?

Key Literature Reviews (About 3~5 papers):

With the application of blockchain technology, the traditional organization governance model has also changed. Recently, some articles have reviewed blockchain and application (Casino, Dasaklis, Patsakis, 2019; Tama, Kweka, 2017; Brandao, Manede, 2018), from business model innovation, corporate governance, network governance, government governance, social governance.

### 1. Blockchain and Business Model Innovation

The development of blockchain technology provides new technical support for business model innovation (Zhu, 2019). Blockchain influences business models in three ways: authenticating traded goods, facilitating disintermediation and improving operational efficiency (Nowinski, 2017). Zhu (2019) verified theoretical model of blockchain driven business model innovation through the case study of DIPNET. Blockchain technology driven business model innovation, built a multi-party equal business ecosystem including partners and customers, matched with the strategic intention of the corporate, and reconstructed the value network of stakeholders. Song et al. (2019) proposed that the integration path of "blockchain +" business model innovation is from blockchain technology configuration to specific business model optimization innovation, and then to business model concept, forming a dynamic change of the three cycles. Nowinski and Kozma (2017) summarized how different elements of business model are affected by blockchain, and concluded that blockchain technology can affect business models by certifying commodity, improving operational efficiency and decentralization. In the traditional energy field, the integration of blockchain and Internet of things can build a point-to-point network. On this platform, users can automatically buy and sell energy according to their own defined standards. For example, TransActive Gridis has experimented with a renewable energy trading network near Brooklyn, NY. Solar panels record energy surplus on the blockchain, and then sell it to other users through smart contracts (Christidis et al., 2016).

### 2. Blockchain and Corporate Governance

The application of blockchain technology has also optimized corporate governance mechanisms. (1) It can bring lower transaction costs, shorter transaction times, and more accurate transaction records for enterprises. As a result, institutional investors can purchase stocks at a lower cost, and they cannot cover up the transaction. This reduces the opportunity for fund managers to profit from insider trading, and makes shareholder voting more reliable and lower cost. (2) It can reduce the moral risk of the game between executives and shareholders, and executives do not have to maintain a high degree of honesty. Through the

use of smart contracts, shareholders will be able to monitor the commitments made by executives and to clarify the differences between results and goals. Institutional investors will be able to create their own credit dashboards (Tapscott, 2017). The blockchain can reduce moral hazard of the game between executives and shareholders. Through the smart contract under the blockchain, shareholders will be able to monitor the commitments made by executives and clarify the differences between the results and objectives. Institutional investors will be able to create their own credit dashboards based on facts rather than relying on rating agencies (Tapscott, A., 2017).

In corporate operation, the application of blockchain technology can optimize human resources, financial accounting, market, law and financing. In terms of human resources, blockchain technology will enable organizations to obtain more correct and unchangeable information about potential contractors and partners. In terms of financial accounting, in addition to horizontal and vertical search of company's financial information, block chain technology can be used to search what happened to the company in the past few minutes, and to expose hidden accounts. In the selling market, blockchain technology enables companies to reach their target audiences and their credit records with higher accuracy. In terms of law, blockchain technology can promote the establishment of long-term contracts and make it more challenging to change transaction terms (or attempt to manipulate transactions). In terms of financing, blockchain will also change the financing process, and may damage the way global financial system operates (Tapscott, D., Tapscott, A., 2017)

### 3. Blockchain and Network Governance

Block chain and network governance including two meanings. On the one hand, block chain as a network, governance of block chain itself, and on the other the influence of blockchain on enterprise network organization as underlying supporting technology of network governance.

#### (1) Governance of Blockchain Network

The blocks on the blockchain are interconnected to form a chain network. The blockchain transaction can continuously verify and store value on this chain network. If you want to steal the value of the blockchain, a thief needs to rewrite the history of the entire blockchain network. Collective self-interest ensures the security and reliability of blockchain network (Tapscott et al., 2017; Song et al., 2019). Meanwhile, as a decentralized platform (Zyskind et al., 2015), blockchain network has its own scalability limits (Vukolic, 2015). Blockchain relies on digital signature, which is easily attacked by quantum computer. Kiktenko et al. (2018) proposed a quantum secure blockchain platform, and carried out theoretical experiments on information security authentication of urban optical fiber network with quantum key distribution on the platform. These results address important issues of implement ability and scalability of quantum secure blockchains for commercial and government applications (Kiktenko et al., 2018).

#### (2) Network Governance by Blockchain

Blockchain will reshape organizational structure and redefine the trust relationship between organizations. Using cryptography, smart contract and other technologies, blockchain can build

a network based on technology trust, in which network members can trade without the trust of both parties (Christidis et al.,2016; Casino et al., 2019; Nowinski, 2017). Williamson believes that trust can reduce transaction costs. Applying the blockchain to supply chain can enable all participants to obtain information about invoices, latest status and payment in a more transparent way in a timely manner. Participants can continuously monitor products and transactions in real time (Helo, P., Hao, 2019).

#### 4. Blockchain and Government Governance

The USA, UK, China, Estonia and other countries have successively carried out the exploration of blockchain government construction. In internet environment, blockchain technology also provides possibility for innovation of government governance model. In government governance, there are four applications: deepening customer-oriented thinking, building a multi-center governance structure, building a sharing and co-construction platform, and creating an intelligent governance model, which will develop towards the direction of precision, service, personalization and customization. Using blockchain technology to optimize the sharing of government information resources can be divided into the following steps: generating smart contracts, creating shared services, creating shared forms, sharing form feedback, and sharing total form backup. The application of blockchain improves the credit, security, transparency and expandability of government information sharing. On the one hand, blockchain technology can promote the transformation of government role and function, promote the flattening of government organizational structure, transparency of governance and service process, improve the performance of government innovation, improve the security of government data, and build an intelligent and trustworthy government. On the other hand, blockchain technology will also bring a series of challenges to the traditional functions, management mechanisms and legal systems of the government, so as to maintain the adaptability of the government's organizational structure, management mechanisms, laws and regulations with the development of blockchain technology, and strengthen the supervision of the application of this emerging technology.

#### 5. Blockchain and Social Governance

The essence of blockchain technology driven social governance innovation lies in the realization of "individual" centered public service intelligence, and the exploration of many changes and impacts brought by it will reshape the credit system, highlight individual value, build a simple governance mechanism and gather social governance consensus (Zhu, 2019). In terms of network social governance, the decentralized feature of blockchain technology has changed the relationship of governance subjects and shaped a more democratic network society; the de-trust feature has evolved the information internet into a value Internet and shaped a more valuable network society; the open and transparent feature can curb the anomie behavior on the Internet and shape a more orderly network society.

#### 6. Multi-case study ( Reports and Enterprise cases )

Blockchain is becoming more common in business nearly 1,000 (33%) senior executives said they are considering or have actively participated in blockchain (IBM,2017).

| Applications  | company name                             | Data sources   |
|---|--|--|
| Sharing ledger, Smart contract, Sharing economy, Confirmation right, Digital asset    | Tencent                                  | Tencent block chain scheme white paper , 2017  |
| Aviation accident insurance   | Sunshine Insurance                       | Sunshine insurance, citic construction investment securities research and development department |
| Food traceability   | Wal-mart and IBM and Tsinghua university | Citic construction investment securities research and development department                     |
| Cross-border payment  | RippleLabs                               | Everbright securities research report,2018   |
| Media source authentication: Mijin  | Tech Bureau                              | Everbright securities research report,2018   |
| Crpyto Kitties  | Axiom Zen                                | Everbright securities research report,2018   |
| Huawei's cloud blockchain service   | Huawei                                   | Huawei blockchain white paper, 2018  |
| Alleviate inefficiencies in global financial and IT supply chains                     | IBM                                      | Goldman sachs, from theory to practice, 2016   |
| Enhance security, efficiency and customer service for corporate customers             | Accenture                                | Goldman sachs, from theory to practice, 2016   |
| To improve and record transactions of Private securities on the NASDAQ Private market | NASDAQ                                   | Goldman sachs, from theory to practice, 2016   |

### Design/ Methodology/ Approach:

1. *This paper reviews the research progress of block chain in business model innovation, corporate governance, network governance, social governance, government governance and other organizational governance fields through literature research.*

2. *The multi-case study method tracks the blockchain application scenarios of existing enterprises.*

3. *The theoretical analysis method constructs the theoretical model of trust mechanism, consensus mechanism, cooperation mechanism and security mechanism of the organization governance based on the blockchain.*

### **(Expected) Findings/Results:**

This study takes blockchain as the breakthrough point of traditional organizational governance, systematically reviews the research progress and relevant enterprise practice of blockchain in the fields of business model innovation, corporate governance, network governance, social governance, government governance, etc., and constructs the theoretical model of trust mechanism, consensus mechanism, collaboration mechanism and security mechanism of organizational governance based on block chain.

The blockchain and organizational governance framework captures the following ideas that emerged from our review: (1) analyzing the structural consistency and internal relationship between blockchain and organizational governance (Pluralism, independence, self-organization; Li W., 2005); (2) analyzing of its mechanism isomorphism and goal consistency, from the perspective of blockchain system functional structure (consensus mechanism, trust mechanism, smart contract) and governance process (Rules, compliance, accountability; Li W., 1999); (3) comparative analysis of theoretical and practical advantages and disadvantages of digital trust based on blockchain architecture and institution-based trust in traditional organizational governance, then discussing the relationship between technical trust solutions and institution-based trust solutions (support, complementarity and substitution); (4) discussing the matching relationship between the public chain, private chain and alliance chain in the blockchain and the real organizational governance model; (5) exploring the boundary setting and interface design of "people and blockchain", "chain and chain", "chain and organization system". This paper discusses the model of promoting organizational governance upgrade based on blockchain, and puts forward further research directions.

### Research limitations/ Implications:

First, the application of block chain technology in the field of organizational governance changed the organizational governance ecology, improve liquidity and reduce costs and enhance transparency of blockchain technology as organizational governance technology solutions, and in the affirmation of its development and application potential at the same time, should also be aware of its transparency in scalability open standardized reliability and safety and so on some basic issues, there are many problems to be solved.

Secondly, the management of blockchain and governance rules of the blockchain are the keys to

ensuring its effective implementation. As blockchain technology is more widely used, if there is no supporting governance guarantee, blockchain technology may be at risk of being abused. This paper combines a functional structure of blockchain with governance process to analyze its mechanism isomorphism and target consistency, providing a theoretical basis for blockchain's organizational governance practice. In the future, it is necessary to further explore the relationship (support, complementarity, substitution) between technical trust solutions and institution-based trust solutions from the perspective of comparative analysis of theory and practice, as well as limiting factors that affect organizational governance model of blockchain. Organization governance upgrade proposes further research directions.

Keywords: blockchain; organizational governance; digital trust; institution-based trust; governance upgrading

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## **What factors influence on determinants of entrepreneurial career choice?**

Joo Y. Park

Discipline of Information Technology, Mathematics and Statistics,  
Murdoch University, Western Australia

### **Purpose/ Research Question:**

Recently unemployment among young people has been a major problem showing the highest unemployment rate of 10.9% in Korea. Having this situation, college graduates are suffering a hard time to get a job and this becomes major concern in both academia and societies. In resolving the youth unemployment rate, universities and government try to expand entrepreneurial opportunities and encourage entrepreneurial career choice after graduation. Government and industry provide various accelerator and incubator programs to foster entrepreneurship and universities proliferate courses related to entrepreneurship education initiatives including mentorship components. Increasing the number of enrollment in entrepreneurship programs is not a goal in itself. The ultimate goal is to enhance the overall youth entrepreneurship in workforce. Students taking entrepreneurship courses and with a great intention in entrepreneurship do not always mean to pursuit entrepreneurship as a career. To enforce the overall entrepreneurship as a career in workforce, it needs to consider students' choice of entrepreneurial career and the motivational factors that enable students to persist beyond school.

Many entrepreneurial researchers have examined motivational factors affecting students' entrepreneurial intention and mechanisms increasing entrepreneurship (Rosha and Lace, 2016). However, most research focuses on students' entrepreneurship intention within academia, with less attention to mentorship in entrepreneurship and antecedents influence entrepreneurial career choice after graduation. Mentoring has been studied for years in the context of organizations and identified positive benefits. Recently, universities have been using the mentoring program for students in motivating and encouraging potential entrepreneurs. Mentorship programs play an important role in fostering expectations and interests to become an entrepreneurs after graduation and have a positive influence on the rate of entrepreneurship. Although mentorship is important part of entrepreneurship education and career choice, the effects of mentorship on entrepreneurship are still not well understood and little work has examined the impact of mentorship type.

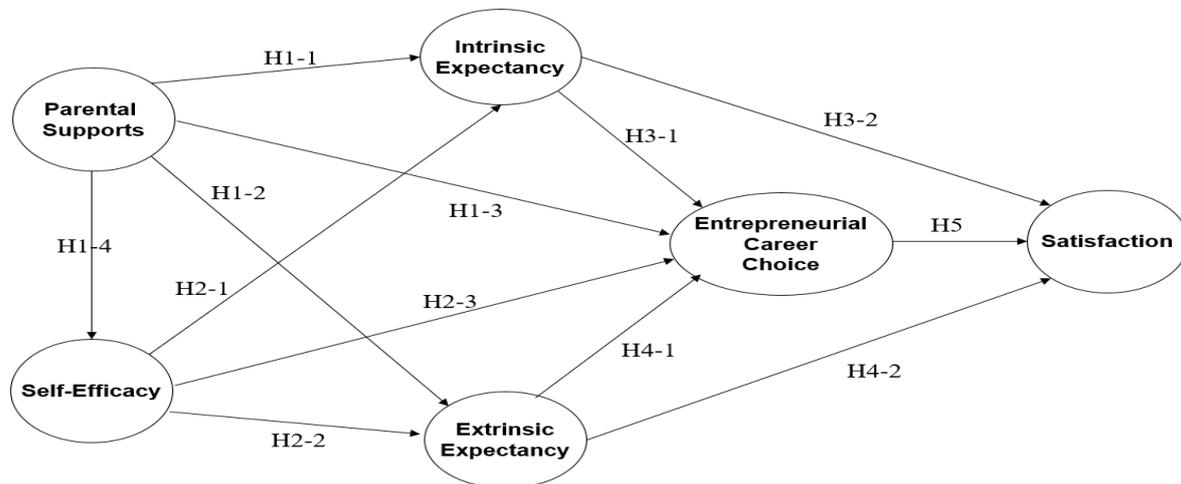
Therefore, we examined the effect of entrepreneurial career mentorship on social cognitive determinants and entrepreneurial career choice adapting social cognitive career theory. We specifically focused on mentorship for entrepreneurial career choice in order to find out what mentoring role facilitates self-efficacy and intrinsic and extrinsic expectation that lead to entrepreneurial career choice. Using this social cognitive career framework, the aim of this study is to explore mentoring supports influence on entrepreneurial career choice considering interrelationship of self-efficacy, intrinsic and extrinsic outcome expectations. The result of this study would provide insights to educators regarding to entrepreneurial career choice.

## Key Literature Reviews

A literature on mentorship has been explored mostly in psychology and management studies focusing the importance of mentorship in career opportunities and leader development (Scandura, 1992; Johnson & Anderson, 2010). Mentoring provides a positive career intention in entrepreneurship by assisting business plan and aspiring interests. Although the effectiveness and optimal program of mentorship still in debate in mentorship literature, most of studies have revealed that mentorship has a positive association with self-efficacy, leadership within organization (Lester et al. 2011) and career outcome (Srivastava, 2013; Oganisjana, 2015).

Mentorship generally provides two types of functions, career development and psychosocial advancement (Kram, 1985). According to Kram's mentor role theory, mentors can improve mentees' professional development and personal growth by career supports and psychological interaction. Along with two dimensional mentorship functions, the role model is also an important feature that mentorship can provide. The role model represents an example to be learned and inspired for building motivation. Entrepreneurial role models influence on entrepreneurship intention in the startup phase of a new venture (Bosma, et al. 2012). Having such different types of mentoring role, little work has revealed whether the type of mentoring function provides different result.

## Proposed research model.



## Research limitations/ Implications:

The results indicate that we need to consider factors enable students to choose entrepreneurial career but also motivational factors that enable students to persist and satisfy beyond school to enhance the entrepreneurs in workforce.

This study has limitations in examining mentorship and entrepreneurial career choice since it use cross-sectional survey data. It is difficult to identify which mentoring function related to students' characteristics. A longitudinal, experimental approach can provide evidence of in-depth relationships between mentors and students well beyond the classroom.

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## **The Effect of Team Competence on Team Performance in Startup activities**

### **- The Mediating Effect of Team Efficacy and Team Immersion -**

Yun Jeong, Kim

Graduate School of Technology Entrepreneurship,  
Dogguk University, Seoul, Korea

Chang Soo Sung (Corr.)

Graduate School of Technology Entrepreneurship,  
Dogguk University, Seoul, Korea

#### **Abstract**

##### **Purpose/ Research Question:**

The purpose of this study is to understand the impact of team competency on team performance in students who are engaged in start-up activities through team efficacy and team immersion through medial effect. Therefore, this study validates the importance of team competency in team performance in start-up clubs through empirical analysis and further identifies which of the three sub-factors (team knowledge, team skills, and team attitude) that can be presented by Cannon-Bowers et al., (1995) have the greatest influence. Further, we conducted an empirical analysis of how team efficacy and team immersion mediated the two relationships.

##### **Literature Review and Hypothesis**

(H1) The Team competence (Team knowledge, Team skills, Team attitude) of startup clubs will have a positive impact on Team performance.

(H1-1) The team knowledge of startup clubs will have a positive impact on Team performance.

(H1-2) The team skills of startup clubs will have a positive impact on Team performance.

(H1-3) The team attitude of startup clubs will have a positive impact on Team performance.

(H2) The Team competence Team knowledge, Team skills, Team attitude) of startup clubs will have a positive impact on Team efficacy.

(H2-1) The team knowledge of startup clubs will have a positive impact on Team efficacy.

(H2-2) The team skills of startup clubs will have a positive impact on Team efficacy.

(H2-3) The team attitude of startup clubs will have a positive impact on Team efficacy.

(H3) The Team competence (Team knowledge, Team skills, Team attitude) of startup clubs will have a positive impact on Team Commitment.

(H3-1) The team knowledge of startup clubs will have a positive impact on Team Commitment.

(H3-2) The team skills of startup clubs will have a positive impact on Team Commitment.

(H3-3) The team attitude of startup clubs will have a positive impact on Team Commitment.

(H4) The Team efficacy of startup clubs will have a positive impact on Team Performance

(H5) The Team Commitment of startup clubs will have a positive impact on Team Performance

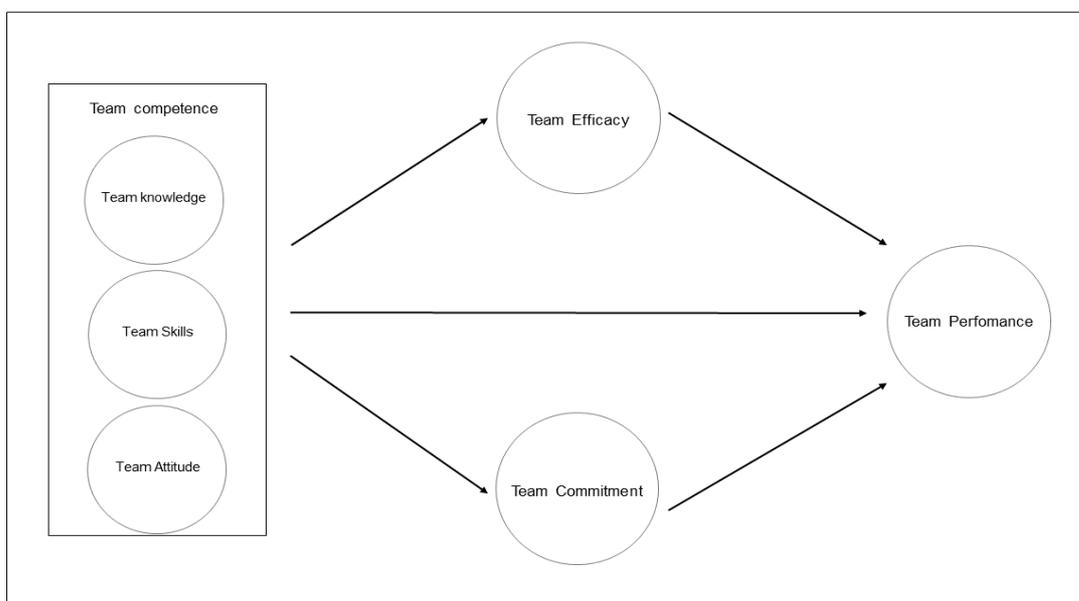
(H6) Team efficacy of startup clubs will mediate the impact of team competency on team performance.

(H7) Team Commitment of startup clubs will mediate the impact of team competency on team performance.

### Design/ Methodology/ Approach:

This study presented the following research hypotheses, as shown in [Figure 1], and derived the study theory to verify the relationship between the variables through empirical analysis. In this study, we would like to conduct an empirical analysis of how team efficacy and team immersion affect team performance. Accordingly, each sub-level (team knowledge, team skill, team attitude) of the team heat wave was identified to affect team performance, and team effectiveness and team immersion were mediated between the two characters.

### Proposed research model



H1. Entrepreneurial alertness will have a positive impact on opportunity recognition.

(H1-1) Exploring and searching of Entrepreneurial alertness will have a positive impact on opportunity recognition.

(H1-2) The linkage and linkage of Entrepreneurial alertness will have a positive impact on opportunity recognition.

(H1-3) The judgement and evaluation of Entrepreneurial alertness will have a positive impact on opportunity recognition.

**H2. Regulatory focus will control the relationship between Entrepreneurial alertness and opportunity recognition.**

(H2-1) Regulatory focus will control the relationship between scanning and search of Entrepreneurial alertness and opportunity recognition.

(H2-2) Regulatory focus will regulate the association and connection of Entrepreneurial alertness and the relationship of opportunity recognition.

(H2-3) Regulatory focus will control the relationship between the judgment and evaluation of Entrepreneurial alertness and opportunity recognition.

**(Expected) Findings/Results:**

The main findings of the empirical analysis can be summarized in two ways. First, the three sub-dimensions of team competency were shown to affect team competency, and among the three sub-factors, team attitudes were found to have the greatest impact on team performance. Therefore, when building a team building or conducting team training, it is judged that providing education that can have a shared team attitude will have a positive effect on the performance of the club.

Second, after verifying the medial effects of team efficacy and team immersion, it was found that team efficacy has a positive effect on team performance, and team immersion also has a positive effect on team performance. Since this study was conducted on members of a group of start-ups at some universities in the Seoul metropolitan area, future research will require empirical research to be conducted on members of a group of start-ups operating in various regions. In addition, although this study considered team competency as a factor affecting team performance, future studies should consider a variety of leading variables on team performance.

**Research limitations/ Implications:** Contents

**Keywords:** Team competence, team efficacy, team commitment, team performance

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44.

## **The effect of user innovation activities and absorptive capacity on the relationship between owner manager's ownership rate and innovation performance**

Eunhwa Lee

Ph.D student, College of Business Administration, Konkuk University, Seoul, Korea

Jae Wook Yoo (Corresponding Author)

Professor, College of Business Administration, Konkuk University, Seoul, Korea

### **Abstract**

#### **Purpose/ Research Question**

The first purpose of this study is to analyze the relationship between owner manager ownership and innovation performance. According to the agent theory, the higher the ownership ration of managers, the stronger the propensity to settle down in reality, resulting in a decrease in the company's innovation performance (Fama & Jesnse, 1983, Jensen, 2001). Previous research on manufacturing firm in Korea also strongly suggested the side of the hypothesis based on the agent theory (Jung-Uk Kwon, Dong-Wook Kim & Byoung-Gon Kim. 2012; Min-Shik Shin & Soo-Eun Kim, 2010). However, ownership managers in Korean manufacturing firms have a high ownership ratio, so shareholder tendencies exist at the same time (Kyung Suh Park, 2017). The purpose of this study is to analyze whether, despite the uncertainty in the current environment, the relationship between owner manager ownership and the company's innovation performance is based on agent theory.

The second study purpose to analyze the impact of user innovation activities(Letl, 2007) on innovation performance. Korean manufacturing firm are engaged in a variety of open innovation activities to improve their innovation performance and have a high proportion of innovation activities through cooperation with user. The purpose of this study is to analyze whether user involvement in providing market-oriented knowledge has a significant impact on innovation activity and outcomes.

Lastly, when the owner manager involve user in the innovation process to improve their innovation performance, analyzed which factors in the organization have significant influence on the improvement

of the innovation performance as absorptive capacity (Murovec & Prodan, 2009)

As a result, the number of professionals in the entire organization had a statistically significant positive influence on innovation performance as an absorptive capacity. On the other hand, per capita R & D costs did not have a significant impact on user innovation activities and innovation performance.

### **Key Literature Reviews:**

(1) *Ownership Structure & Innovation Performance*: Innovation is essential for a company to survive in today's uncertainty (Teece, Pisano & Shuen, 1997). Corporate innovation is important, but risk aversion of managers is a factor that undermines innovation (Fama & Jensen, 1983).

Many scholars have argued that the characteristics of a company's ownership structure have a significant impact on the company's strategy and performance. In particular, the share of managers is a factor influencing the innovation activities of companies such as R&D (Hillman & Dalziel, 2003; Lynall, Golden & Hillman, 2003; Pearce & Zahra, 1991). However, research on the effect of ownership structure on the innovative performance of ownership managers in Korean manufacturing industry is mixed (Kim, Kyung-Mook, 2003; Hyunseob Kim, & Jaeyong Song, 2011).

(2) *User Innovation Activity and Absorptive Capacity*: It is mentioned that absorptive capacity is essential to achieve innovative performance through open innovation (Von Hippel, 2005; Hoyer, Chandy, Dorotic, Krafft & Singh, 2010; Lettl, 2007; Zahra, & George, 2002). Especially in user innovation activities targeting customers, the information they provide is characterized by a wide range and high heterogeneity and tacitness (Cui & Wu, 2016). Therefore, the understanding of the user to cooperate with should be preceded, and the absorptive capacity should include not only R&D related factors, but also several other factors (Von Hippel, 2005; Lavie & Rosenfopf, 2006).

### **Design/ Methodology/ Approach**

Of the 445 companies that responded to user innovation activity in the National Innovation Survey, we sampled 168 companies that could verify ownership structure and obtain financial data.

about sample

- 1) Analyzing the relationship between owner manager ownership rate and innovation performance
- 2) After analyzing the interaction effect of user innovation activities on the relationship between owner manager ownership rate and innovation performance

3) Absorptive capacity is divided into R&D aspects and the overall expertise of the organization, and analyzed the impact of three-way interaction on user innovation activities.

Multiple regression analysis using SPSS and Process Macro 2.0 to analyze the 3-way interaction effects of user innovation activity and absorptive capacity on the relationship between owner manager ownership rate and innovation performance.

## **Findings/Results**

As a result, there was a significant positive relationship between the ownership rate of the owner manager and the innovation performance of patent application, and the user innovation activity resulted in a positive effect on the innovation performance.

And a high level of human resources exist as a company's resources, the organization's absorptive capacity has been enhance the positive interaction between ownership interests and user-innovation activities. On the other hand, the R&D cost, defined as the absorptive capacity showed a negative direction but was not statistically significant. As a result, incentives based on the ownership structure of corporate owner managers can reinforce the propensity to innovate, and when consumer engagement is used as a strategy, it is necessary to build a high level human resources of awareness of environmental changes and for internal acceptance of external knowledge. On the other hand, R&D costs have made minor progress in its type itself. High internal R&D costs have a strong propensity for closed innovation, so NIH(Not Invested Here) syndrome, which does not use external knowledge, reduces the impact and efficiency of the company's open innovation activities to analyze. This study has an analyzed academic value that integrates the impact of ownership structure of domestic firms and the impact of user-innovation activity and absorptive capacity. Domestic ownership managers demonstrate that companies are sensitive to the environment change in order to survive, depending on the nature of their ownership structure, providing practical guidelines that managers must prioritize high quality human resources to improve innovation performance through user innovation. It also suggests that organizations should devise ways to address NIH syndrome in order to improve the performance of consumer engagement innovation.

## **Research limitations/ Implications**

This study shows stewardship of the ownership manager of a Korean manufacturing firms, and

previous studies suggest that unilateral application of corporate ownership structure and agent theory can be problematic depending on cultural background and environmental impact. In 2003; 2, 2005; Lee & O'Neill, 2003).

We also classify the required absorbent capacity according to user characteristics, providing guidance on effective innovation strategies.

However, the study is aimed only at companies with owner managers in the manufacturing industry, so attention should be paid to the generalization of the whole industry.

Low ownership rates for professional managers can affect consumer innovation activities and the organization's ability to absorb.

Finally, the absorbed dose is mentioned by various theoretical backgrounds and factors, but which were measured in a narrow range.

**Keywords:** governance, owner manager ownership rate, innovation performance, user-innovation activities, absorptive capacity

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## **Blockchain Transformation: new innovation of platform economy**

Junic Kim

Assistant Professor, School of Business, Konkuk University, South Korea

### **Abstract**

Blockchain, regarded as the only technology behind digital currencies like Bitcoin, is rapidly spreading beyond the financial industry to all areas of society, such as manufacturing and public sectors. Corporates and governments have been talking about the importance of blockchain technology and its social impact. With the advent of the "hyper-connected society" where everything is connected, blockchain technology is expected to spread further. However, systematic social science research on the blockchain platform is insufficient. Therefore, in order to empirically analyse acceptance factors of blockchain platform users, this study derives a research model based on UTAUT model and verifies the factors that influence users' acceptance of the blockchain platform.

### **Introduction**

In June 2016, the World Economic Forum (WEF) announced blockchain as one of the top 10 emerging technologies in 2016 in Geneva, Switzerland. In the announcement, WEF stressed that the global blockchain market will grow more than 10 times over the next five years, and 10% of the world's gross domestic product will be stored with blockchain technology by 2025 (WEF, 2016). According to Gartner's announcement in 2017, the related blockchain market will grow to \$ 169 billion in 2025 and \$ 3.16 trillion in 2030 (Gartner, 2017). Many governments and corporates try to integrate the field and emphasise on promoting technology development. From 2016, major countries such as the United States and the United Kingdom are rapidly increasing the number of patents based on their focus on expanding investment in technology development. IBM executed more than 100 blockchain-related projects in 2017, and many other corporates are attempting to leverage blockchain technology in various industries.

One of the biggest reasons for the blockchain's popularity is the decentralised platform, which is classified as new technology and business model that can solve the excessive power of current

centralised platform provider. Therefore, this study derives the research model based on the UTAUT model proposed by Venkatesh et al. (2003) and investigates the factors affecting the acceptance behaviour of the blockchain platform. The results of this study will be meaningful in that it suggests strategic implications for building the blockchain platform by suggesting factors that affect user acceptance when adopting the blockchain platform as a new business model.

## **Theoretical Background**

### *Blockchain*

Blockchain refers to a combination of blocks, which are data units, in a chain structure (Drescher, 2017). Goldman Sachs (2016) defines blockchain as a base for distributed transaction data designed to improve transaction transparency, security and efficiency. Although the definition of blockchain is slightly different, the most commonly mentioned feature is that blockchain is a decentralised network platform that uses security technology using 'hash'. Being decentralised and being encrypted via hashes make the blockchain special. In other words, blockchain is a technology that theoretically secures the trustworthiness and integrity of the network by jointly verifying, recording, and archiving information by individuals participating in the network.

Iansiti and Lakhani (2017) summarise the characteristics of these blockchains in five ways. First, the blockchain database is distributed. It means that no individual or central authority can control the network. Second, transactions are made directly between the parties without an intermediary. Third is transparency with guaranteed anonymity. Anyone can access all transaction details, but the transaction details do not contain information about a specific individual. Fourth, the record is irreversible. It makes it impossible to modify the node's information, so there is no risk of manipulation. Fifth, the books are automated by computer logic. This logic allows transactions between parties to happen automatically. Blockchain is, after all, a transparent, decentralized network based on encrypted and consensus (Nakamoto, 2008).

### *Unified theory of acceptance and use of technology (UTAUT)*

The UTAUT is a model proposed by integrating the elements of 8 models and theories such as TRA, TAM, TPB, TPB, MM, MPCU, IDT, and SCT as shown that are most important in the study of technology acceptance (Venkatesh et al., 2003). The UTAUT integration model was designed using three variables that affect, one that affects behaviour, and four control variables that can have a moderating effect on the process. The well-known Technology Acceptance Model (TAM) model usually accounts for only about 50% of users' intentions or behaviours. However, the UTAUT model is known to have 20-30% higher explanatory power than the TAM (Venkatesh et al., 2003). This study sets up a research model based on the UTAUT integration model.

Table 1. UTAUT and theories

| Variables               | Factors                       | Researches             |
|-------------------------|-------------------------------|------------------------|
| Performance Expectancy  | Perceived Usefulness          | Davis, 1989            |
|                         | Relative Advantage            | Moore & Benbasat, 1991 |
|                         | Outcome Expectations          | Compeau & Higgins 1995 |
| Effort Expectancy       | Perceived Ease of Use         | Davis, 1989            |
|                         | Complexity                    | Thompson et al., 1991  |
| Social Influence        | Subjective Norm               | Davis, 1989            |
|                         | Social Factors                | Thompson et al., 1991  |
| Facilitating Conditions | Perceived Behavioural Control | Davis., 1989           |
|                         | Compatibility                 | Moore & Benbasat, 1991 |

### Hypothesis and Research Model

#### *Research Model*

This study presents the research model shown in Figure 1 based on the consideration of previous studies. It is considered suitable to use UTAUT to analyse and predict the acceptance behaviour of the blockchain platform currently evaluated as an innovative business model. The path will be analysed based on the variables; performance expectancy, effort expectancy, social influence, and facilitating conditions. Moderating variable, Gender, age, experience and voluntariness of uses, are considered to be ineffective in this study. Although the interest in the blockchain platform is still high, it is an entirely new technology, so it will study it by setting repeated use as the final dependent variable.

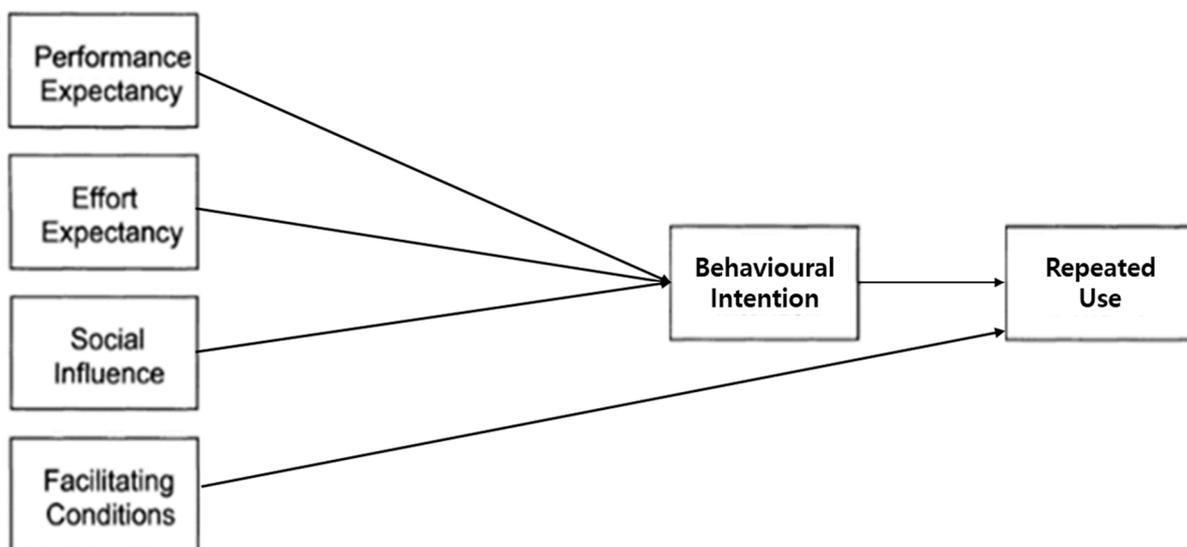


Figure 1. Research Model

*Hypothesis*

Davis (1989) conducted research on the adoption of new information technology and demonstrated that acceptance intention affects acceptance. Venkatesh et al. (2003) also researched new information technology and found that acceptance of information technology had a positive effect on acceptance. Therefore, this study established the following hypothesis.

- H1: Performance expectancy will have a positive impact on behavioural intention
- H2: Effort expectancy will have a positive impact on behavioural intention
- H3: Social influence will have a positive impact on behavioural intention
- H4: Facilitating conditions expectancy will have a positive impact on repeated use
- H5: Behavioural intention will have a positive impact on behavioural repeated use

*Operational Definition of Variables*

The constructs measured and used in this study were based on the use of measures that proved to be reliable and valid in previous studies. The operational definitions of the variables used in this study are as follows.

Table 2. Variable definitions

| Variables               | Operational definition  |
|-------------------------|---|
| Performance Expectancy  | The degree to which users think it will help them to achieve results by using the system.     |
| Effort Expectancy       | The degree of ease with which the user is associated with using the system.                   |
| Social Influence        | The extent to which users are socially affected by the need to use the new system.            |
| Facilitating Conditions | The degree to which you think you need an organized and technical facility to use the system. |
| Behavioural Intention   | The degree to which users plan to use the system in the future                                |
| Repeated Use            | The degree to which users repeatedly use  |

**Empirical Analysis and Hypothesis Testing**

This study plans to survey users who have experience using the blockchain platform from 2017 to 2019. It expects to receive a survey of about 200 people.

### *Reliability Analysis*

Reliability is to obtain consistent results when the same concept is repeated using the same measuring tool or the same measuring tool and indicates the accuracy or precision of the measuring tool. Cronbach's  $\alpha$  coefficient has a value between 0 and 1, and a higher value is preferable, but there is no criterion that it must be more than a few points reliable. Often 0.80 to 0.90 or more is preferred, and 0.6 to 0.7 is considered acceptable. Therefore, this study will analyse the reliability of all questions.

### *Correlation analysis*

There is no criterion on how high the correlation is. However, it considers that there is a problem over 0.5 in multicollinearity. In this study, correlation analysis also will be conducted.

### *Exploratory Factor Analysis*

In general, the basics of factor analysis in the field of social science are that if the eigen value is above 1.0, and the factor loading is above 0.4, it is considered as a significant variable. Therefore, this study will analyse according to this standard.

### *Confirmatory factor analysis*

In this study, to verify the validity, confirmatory factor analysis was conducted using AMOS 21.0. GFI, AGFI, CFI, NFI, IFI, RMSEA values will be used to test the suitability of the data.

**Keywords:** Blockchain, Platform, SEM, UTAUT

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## **The Influence of Digital Native Media Utilization and Network Homogeneity on Creative Expressiveness in an Open Innovation Paradigm**

Eunjoo Kim

Professor, Eulji University, Republic of Korea

Hangsik Park(Corr.)

Professor, Eulji University, Republic of Korea

### **Abstract**

#### **Purpose/ Research Question:**

With the acceleration of the global society and the emphasis on the fundamental spread of knowledge and creative innovation in technology-based industries, a new paradigm was presented by Chesbrough in 2003 with the name of open innovation. Open innovation is the activity of innovation that accelerates innovation by actively utilizing external ideas and technologies to diversify the sources of innovation and maximizes the use of technology by deliberately sending internal technologies out. With the recent convergence of new media outlets, public and private media channels have emerged widely simultaneously and simultaneously around the world, highlighting the fundamental spread of knowledge and creative innovation. Yun (2016) revealed that as the knowledge-based economy develops, the amount of knowledge is rapidly increasing with the rate of circulation[1]. In particular, the development of innovative technological civilization provided a high-speed Internet environment, and the use of smartphones enabled people to live in space and time without restrictions.

These open innovation paradigms and the digital native generation, born and raised in a digital environment, are not the technology but the generation that can use the Internet, computers and smartphones in everyday life. They have recently created a one-man media era that creates UCC video content, and this is breaking the boundaries between virtual and real world. As Schumpeter and Georgescu-Roegen(2019) argued in their study that humans' ability to expand their technological and intellectual reach should not be underestimated, this trend is a global trend, and digital native uses digital devices not only in life but also in the field of education as well as in the field of technology and knowledge[2]. It should be able to raise student interest in the rapidly expanding education market, thereby increasing class participation and presenting the direction of smart education from the perspective of digital native, who is accustomed to digital devices. As such, it is necessary to provide one-person creative educational activities with new teaching

methods from the perspective of digital natives and to check their impact on network homogeneity and creative expression capabilities.

Unlike content produced through mass media in the past, contents in the UCC era are not only readable. The contents produced are processed, edited and reproduced by a second producer (C) and exported to the outside, thus having a high degree of open diffusion. UCC learns and experiences new ways of expression as an imaging medium. Understanding and experiencing media suitable for the digital age away from the existing media is helpful to creativity as a new way of expression. This allows us to understand today's visual phenomena, correctly utilize them as a means of expression for life and culture, and ultimately drive open innovation in today's social and cultural lives and in the future.

This study aims to provide education for the production of creative image contents as part of educational activities that suit their interest at the educational site following the advent of a new generation of digital age, and to analyze their creative expression ability with the effectiveness of these educational activities. In particular, we would like to analyze how the nature of digital native differs in the ability of creative expression according to the level of media utilization and network homogeneity.

Among the characteristics of digital native, media utilization levels are first, along with various and enriched media devices. In particular, since absolute time for media utilization is limited, it is common to find a form of communication with friends through SNS while searching for related news via computer or smartphone as a more effective and efficient media utilization. Existing studies related to the media usage patterns of digital native [3–10] have focused on personal factors, such as personality changes and values, rather than media use, for comparative analysis with other generations. It also shows the ideological homogeneity of social homogeneity on SNS networks among the characteristics of digital natives. Norris (2002) said that due to the social network nature of easily finding groups that share their beliefs and values and leaving the group immediately if they are not happy, digital natives reinforce shared beliefs and interests on social networking sites [11]. In terms of preparing for a time when the digital native generation will be led in the future, although the research on network homogeneity is not very much yet, it is meaningful to analyze the impact of network homogeneity and media utilization through UCC production training activities in this paradigm of innovation.

The research issues for this purpose are as follows.

First, what are the media utilization levels, network homogeneity levels, and creative expression skills levels of digital native?

Second, what is the impact of UCC production training on the creative expressiveness of digital native?

Third, what is the impact of digital native media utilization and network homogeneity on creative representation?

### **Key Literature Reviews (About 3~5 papers):**

#### ***Understanding the Digital Age and Characteristics of Digital Native in an Open Innovation Paradigm***

Digital Native refers to a generation that uses digital devices such as computers and various Internet freely like native speakers, and is the first term used by Marc Prensky (2001)[12]. Williams (2015) refers to digital native as the Alpha generation and says they will grow up with digital devices, cannot live without smartphones, and can transmit their thoughts online in a short time[13]. They argue that mobile devices and touchscreens will interact with digital technology at a younger age than other generations, and that closer attachment to technology and networks will form for them to become part of life, not a tool [14]. American futurist Stan Davis, in his book "The Governance of the Future," calls today's global village a "network economy" or a "connected economy." According to him, the access economy created by the spread of the Internet and digital technology is transforming into a paradigm of open innovation through three characteristics: speed, access and intangible value. Digital natives are gaining diverse information quickly and easily through creativity different from others, challenges to new things, speed is important, and diverse media utilization.

Looking at the characteristics of digital natives, these are:

First, it is possible to focus and deal strategically with multiple targets. That is to say, be proficient in multitasking or parallel processing.

Second, seek immediate interaction and rapid response through the network.

Third, seek to actively reveal oneself through various networks, make claims and make one voice through consensus. These characteristics can be called network homogeneity [15].

Based on this, it is necessary to review the level of media utilization and network homogeneity among the characteristics of digital natives and to explore education methods for digital natives that conform to the open innovation paradigm.

#### ***Direction of UCC Video Production Education Activities from a Constructivist Perspective***

From an educational point of view, the open innovation paradigm defines a new method of innovation that increases performance by utilizing outside ideas and technologies and expanding technologists to the outside world [16]. This is in the same context as the constructivist perspective in which the learners themselves utilize the resources and skills given and actively generate results towards the goals through internal reflection. In particular, the activity of producing the UCC is to spread to a large number of members by producing video contents the results of the presentation of creative abilities that the learners have by utilizing the resources and technologies given outside the learners. The principle of constructivism is based on the premise that all members should actively adhere to their roles on the premise of dialogue and cooperation among learners.

Knowledge in constructivism does not exist in the same form for everyone, but is varied and

diffused by the cognitive processes occurring in the individual's brain that make up that knowledge. It also allows learners to think on their own in a constructor's learning environment, and to be discovered and constructed by learners without leaving the contents and goals of the classes to the limited ones set by the teacher. This constructivism and constructivism learning environment could propose UCC video education activities as a necessary educational method for digital native learners in the newly changing open innovation paradigm.

UCC, a genre of visual culture, is a cultural phenomenon that takes place in an online space where video clips produced by one person are uploaded on a website to watch, evaluate and share them. With the expansion of one-person creative broadcasting recently, individuals, businesses, institutions, and organizations have become a space for self-promotion. These sociocultural changes should actively consider introducing them as an appropriate educational method for digital natives.

### ***Model of UCC Video Production Class***

It is necessary to understand the general video production process in order to find a teaching method for video UCC production. In general, the video production process consists of three stages: pre-production, production, and post-production [17]. The general process of UCC production is as follows.

| Step            | Subject  | Course Content  |
|-----------------|--|---|
| Pre-production  | -UCC Planning<br>-Scenario production<br>-Storyboard production        | -Understanding and utilizing one person media<br>Understanding the practical elements of planning<br>-Practice of writing scenario and storyboard by team |
| Production      | -Shooting and collecting pictures and video data                       | -Taken with camera<br>-Music selection<br>-Preparation for editing program  |
| Post-production | -Smart video editing app utilizing editing, compositing and publishing | -Understand basic photography tools<br>-Video editing app (anchovy, Quick, KineMaster)<br>-Use free music YouTube audio library                           |

### **Design/ Methodology/ Approach:**

The purpose of this study is to design a teaching-learning plan of UCC production class step by step in order to enhance the creative expression ability of digital native in an open innovation paradigm, and apply it to the class, We will analyze the difference in expressive ability.

To this end, first of all, the model of UCC production class is suggested through consideration of the direction of the functions and roles of UCC from the standpoint of open innovation paradigm. After conducting these UCC production classes, the multiple regression analysis was conducted to examine the effect of UCC production education activities on creative expression ability of college students and to examine the influence of media utilization level and network homogeneity level on creative expression ability among characteristics of digital native. Is carried out. In addition, variance analysis is conducted to see if there is a difference in college students' creative expression ability according to media utilization level and network homogeneity level.

**(Expected) Findings/Results:**

1. Media utilization level of digital native, network homogeneity level, and creative expression ability level
2. The Influence of UCC Production Education on the Creative Expressiveness of Digital Native
3. The Influence of Digital Native Media Utilization and Network Homogeneity on Creative Expressiveness

**Research limitations/ Implications:** Contents

**Keywords:** Open Innovation Paradigm, Digital Native, Media Utilization, Network Homogeneity, Creative Expressiveness

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# **Does the Patent become a proxy of the firm's market value?**

## **Case of South Korea**

HeeYoung Jang<sup>1</sup>, and Junghee Han<sup>2</sup>

<sup>1</sup> Researcher of Center for Technology and Innovation Management,  
Graduate School of MOT, KOREATECH University

<sup>2</sup> Corresponding authors, Professor of Management of Technology Program,  
Graduate School of Smart city Science Management Hongik University  
Room 306-2, Sejong-ro Sejong city Korea,

### **Abstract**

This paper empirically explores patents as indicator of market future valuation of the firm. Although the patent counts as a proxy for R&D success is relatively limited by the very large variance in the significance or value of individual patents, rendering patent counts an extremely noisy indicator of R&D success, number of patents shows representative of the firm's innovation activity. If patents contribute positively or negatively to the firm's future market valuation, stock price as a proxy of market value shows the similar pattern according to each firm's patent activity and intensity. This implies that a firm's R&D investments should be capitalized in the firm's market value. In order to analyze, we utilize the patents data comprised 464 firms each 14 industrial sectors, collected and gathered from KISVALUE, released by Korea Intellectual Property Office. From the findings, this paper shows fruitful results. First, on firm side, patents have an important role to give a positive signal of their firm's value for investors and customer. Second, market side, each firm's research productivity (intellectual property rights) shows the indicator of future market value of the firm.

Keywords: Intellectual property rights, Patent, Stock price, Market value

**Inclusive planning in the smart city : Case study of Sejong City, Korea**

Ji-in Chang

Prof., Graduate School of City Science and Management, Korea

Jeongsun Choi (Corr.)

Prof. Chung-Ang University, Korea

**Abstract**

The Korean government has built smart cities since the early 2000s, regarding it as an engine for future growth for Korea. Since its inception, Korea's smart cities were characterized by cutting-edge technology and the provision of service solutions and urban infrastructure. From 2016 onwards, the Korean smart city concept is being reconstructed to actively accommodate not only technological innovations but also to foster job creation and quality of life for the residents. In 2017, the Korean government announced policies to foster thirteen fields of future growth engines to respond to the fourth industrial revolution. These are new industries based on ICT, represented by ICBM (IoT, Cloud, Big Data, Mobile) which is reliant on the flow and use of information. Incorporating new technologies, the smart city aims to solve urban problems and improve quality of life by utilizing ICT technology. However, there is a dearth of research considering whether gender differences exist among men and women residents in how smart city is planned, used and experienced. This paper seeks to identify problems caused by the neglect of a gender perspective in the smart city through case study research. It incorporates sex and gender analysis in reviewing the plan and operating system of Korea's smart city with a focus on crime prevention solutions. Sejong City's 2-2 District is selected as a case study, because it has been purposefully designed and built by the government to provide a "women-friendly" urban environment. This paper examines the district plan and design guidelines, and relates them to existing smart solutions for the different safety needs of women and men in public space design. To this end, research methods include literature review, field observation, and interviews of experts concerning the smart city and the women-friendly city in order to accurately diagnose existing problems, to look at solutions, and to compare them against relevant guidelines or performance criteria. The aim of this paper is to draw attention to the explicit and implicit gender bias which may be inherent in current smart city solutions and to argue for the relevance of gender as an indicator for inclusive smart cities.

**Key Literature Reviews (About 3~5 papers):**

ITU. (2013). Smart Cities Seoul: A Case Study. ITU-T Technology Watch Report.

Kwon, Youngsang (2015). Sejong Si (City): are TOD and TND models effective in planning Korea's new capital? *Cities* 42, 242-257.

Lee, JH, Hancock, M. G., Hu, Mei-Chih (2013). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. *Technological Forecasting & Social Change* 89, 80- 99.

Swim, J. K., Vescio, T. K., Dahl, J. L., Zawadzki, S. J. (2018). *Global Environmental Change* 48, 216-225.

**Design/ Methodology/ Approach:** Contents

- 1) Locational scope: Sejong smart city      2) Scope of study

**Sejong: basic information**

- Location:
  - Net area: 465 km<sup>2</sup>, Built-up area: 73km<sup>2</sup>,
  - Administrative system: 1 eup 9 myeon 9 administrative dong (행정동) 14 legal dong (법정동)
  - Metropolitan council
  - Established on July 1, 2012
- Population
  - Population: 335,826 명(2019)
  - Distribution by size: Areum-dong)Jochiwon)Dodamdong )Hansoldong (75.8% of total population)
  - Male-female ratio: 100.6
  - Female age (2015): 30-39 years (19.5%), 40-49 years (16.5%), 0-9 years (13.9%)
  - Elderly index (2015): 52.8%
  - Female farmers: 7.6%

**Research on smart city solutions related to pedestrian environment and walkability**

- Analysis of women-friendly district, based guideline focused on pedestrian environment
- Study of intersection between planning/operation of smart pedestrian solutions and women-friendly district
- Delineate gender issues concerning smart pedestrian solutions

**3) Methodology**

|  | Description   | Method  | Result   |
|--|---|---|--|
| <b>Smart city solutions: existing conditions</b>                     | <ul style="list-style-type: none"> <li>■ Smart city solution focused on pedestrian environment</li> </ul>                               | <ul style="list-style-type: none"> <li>■ Literature survey</li> <li>■ User interview</li> <li>■ Expert interview</li> </ul> | <ul style="list-style-type: none"> <li>■ Typology of smart city solutions</li> <li>■ Existing conditions</li> <li>■ Understanding of issues</li> </ul> |
| <b>Women-friendly pedestrian environment: analysis of guidelines</b> | <ul style="list-style-type: none"> <li>■ Study of women-friendly guideline</li> <li>■ Compare guideline to built environment</li> </ul> | <ul style="list-style-type: none"> <li>■ Literature survey</li> <li>■ User interview</li> <li>■ Expert interview</li> </ul> | <ul style="list-style-type: none"> <li>■ Safety features of pedestrian environment</li> <li>■ Walkability features</li> </ul>                          |
| <b>Case study: smart city solutions</b>                              | <ul style="list-style-type: none"> <li>■ Case studies of smart pedestrian environment</li> </ul>  | <ul style="list-style-type: none"> <li>■ Literature survey</li> <li>■ Interview</li> <li>■ Survey</li> </ul>                | <ul style="list-style-type: none"> <li>■ Smart city solutions</li> <li>■ Issues concerning smart city solutions</li> </ul>                             |
| <b>Study of smart city solution: planning and operation</b>          | <ul style="list-style-type: none"> <li>■ Gendered perspective: smart city pedestrian solutions</li> </ul>                               | <ul style="list-style-type: none"> <li>■ Gender analysis</li> </ul>   | <ul style="list-style-type: none"> <li>■ Formulation of issues</li> <li>■ Improvements/Recommendations</li> </ul>                                      |

**(Expected) Findings/Results: Contents**

**Expert interviews and survey of residents**

**Interview findings:**

- **Silo administration prevents integrated operation**
- **Minimal cooperation between smart city and women-friendly urban planning professionals**
- **Minimal shared knowledge of the two fields**
- Planning stage: Women-friendly guidelines incorporated broadly in smart city planning. No distinct smart solution in District 2-2. CCTVs, IOC, safety bell, alarm bells installed as basic smart solutions
- Operation stage: No awareness of women-friendly district by smart city IOC representative. No differentiation of District 2-2 compared to other districts
- Integration: No synergy effect found. Recommendations for natural surveillance and one-stop location of amenities ignored in the operation stage
- Cooperation between actors in construction and operations agencies: Three agencies involved (National Agency for Administrative City Construction (NAACC), Korea Land & Housing Corporation, Sejong City). After NAACC completes construction, facilities are transferred to Sejong City without adequate transfer of information for efficient management
- Post-occupancy: Post-occupancy evaluation lacks clear responsibility in cases of malfunction or inadequacies. Problems with avoidance of responsibility arise

**Survey of residents:**

- Effect of smart solutions in women-friendly district and pedestrian movement
- Major questions regarding levels of physical safety, most effective smart solutions, CPED, walking after dark and use of amenities

| Survey (100 people)                  |               | Persons | Percentage (%) |
|--------------------------------------|---------------|---------|----------------|
| Total                                |               | 100     | 100.0          |
| Gender                               | Male          | 54      | 54.0           |
|                                      | Female        | 46      | 46.0           |
| Age                                  | 10-19         | 16      | 16.0           |
|                                      | 20-29         | 20      | 20.0           |
|                                      | 30-39         | 18      | 18.0           |
|                                      | 40-49         | 15      | 15.0           |
|                                      | 50-59         | 15      | 15.0           |
|                                      | 60+           | 16      | 16.0           |
| Number of family members             | 1~3 person(s) | 55      | 55.0           |
|                                      | 4+ persons    | 45      | 45.0           |
| Family member less than 18 years old | 0 person      | 39      | 39.0           |
|                                      | 1 person      | 33      | 33.0           |
|                                      | 2+ persons    | 28      | 28.0           |

**Sense of safety**

**Safety from crime was the foremost reason for women-friendliness**

- 1<sup>st</sup> reason: 'Relatively safe from crime'
- Males: 'Sufficient public amenities, like community centers'
- Females: 'Safety from crime'
- Fear of crime is shown to be much higher among women than men

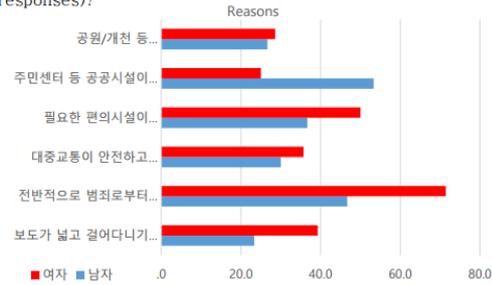
**Important reasons for sense of safety**

- 1<sup>st</sup> 'Safety from crime', 2<sup>nd</sup> 'Wide walkway'
- Men regarded wide walkways to be important
- Sense of safety differ according to gender
- 92% of males relate safety with pedestrian safety, while women show wider distribution safety from crime (44%), wide walkway (22%), amenities (15%), public transportation (13%)

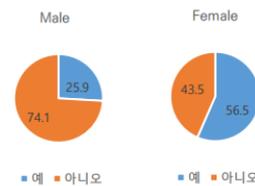
Table. Importance of smart solutions

|        |        | First choice |      |                |            |                                  | Total |
|--------|--------|--------------|------|----------------|------------|----------------------------------|-------|
|        |        | CCTV         | BIS  | Smart lighting | Alarm bell | Others (Electronic signage etc.) |       |
| Total  | (100)  | 66.0         | 11.0 | 4.0            | 18.0       | 1.0                              | 100.0 |
| Gender | Male   | (54)         | 77.8 | 7.4            | 1.9        | 13.0                             | 100.0 |
|        | Female | (46)         | 52.2 | 15.2           | 6.5        | 23.9                             | 2.2   |

<Q9> Why do you think Saerom-dong is women-friendly (multiple responses)?



<Q13> Are you aware of 'women-friendly district'?



**Research limitations/ Implications: Contents**

○ Gender-equality achieved due to 'women-friendly' planning and smart city solutions

- Even though both male and female respondents regarded the district to be safe, women were more aware of alarm bells and other crime prevention measures. Women showed more fear of crime after dark. These differences in gender awareness shows different needs. Thus different approaches in safety measure planning in public spaces is required for greater sense of safety for both male and female pedestrians

- Even though a relatively equitable environment has been achieved, however, these differences are not recognized in the planning and operation of smart solutions in Sejong City. Gender differences need to be recognized and incorporated in future planning and installations of crime- prevention measures.

Keywords: At least more than three keywords are kindly requested.

Gender equality, pedestrian-friendly environment, smart solution, crime prevention, inclusive city

## CHANGING METHODS OF TRAINING TO IMPROVE THE QUALITY OF E-LEARNING IN THE CURRENT PERIOD

Author: LL.M PHAM THANH NGA

Commercial Mediator | Department of Justice, Hanoi

Lecturer of law | TOPICA EduTech Group

**Abstract:** *E-learning with many outstanding advantages in training has drastically changed the self-study process due to the ability to personalize and effectively meet the learning activities of learners. E-learning and building an E-learning environment are currently paying attention and being deployed in many universities in Vietnam with different scope and levels. Especially in the current period, when science and technology are developing, many applications of technology and technology products have been applied in the field of education, changing the way of teaching and learning activities, practice of both lecturers and students. Big Data and Artificial Intelligence (AI) technologies have replaced people not only for manual labour but also for intellectual labour, including the teaching of teachers. Many software applications have been used to replace people in the transmission of knowledge, testing and evaluation of training quality, especially E-learning online training programs. However, in Vietnam today, the output quality of these online training programs has not been highly appreciated compared to similar programs in the world. The cause of this situation is that the training, teaching and learning are not really effective. Therefore, in this article I will give some analysis, evaluate the current teaching and learning methods and propose solutions to enhance the interaction and initiative in the teaching and learning process of Lecturers and students to improve the quality of online training in the future.*

**Key words:** *E-learning; teaching methods; lecturers; students*

### Reference:

1. Vietnam Law on Education and Training 2019
2. Vietnam Law on Higher Education 2012
3. Circular 10/2017/TT-BGDĐT of Vietnam Ministry of Education and Training 2017 on E-learning training Higher Education level
4. Documents training skills for lecturers of Higher Education level
5. 7 ways to improve E-learning, <https://elearningindustry.com>
6. <https://elearningindustry.com>

7. How to make e-learning effective and tips to increase it's effectiveness, <https://www.talentlms.com>

50.

### Ecosystem Services Assessment In the Busan Eco-Delta City Development

Sangdon Lee\*, JiYoung Choi · ·

Dept. of Environmental Science and Engineering, Ewha Womans University\* Korea

Abstract:

Natural environmental ecology of the environmental impact assessment (EIA) is very much lacking in quantitative evaluation. Thus, this study attempted to evaluate quantitative assessment for ecosystem service in the site of Eco-delta project in Busan. As a part of climate change adaptation, this study evaluated and compared with the value for carbon fixation and habitat quality using the InVEST model before and after development with three alternatives of land-use change.

Methods:

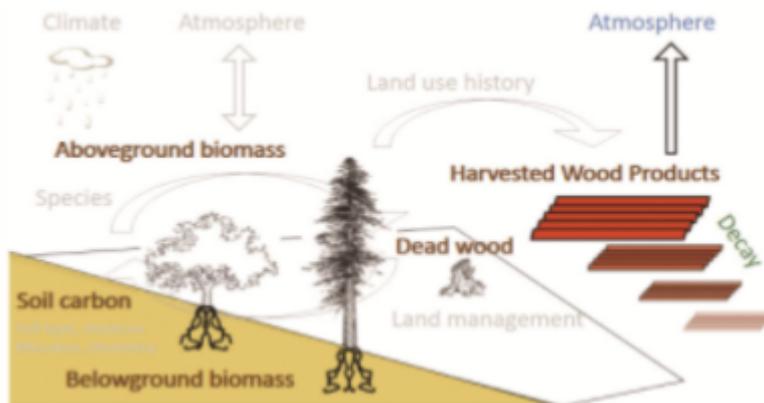


Figure 1. InVEST carbon model process (<https://naturalcapitalproject.stanford.edu/invest/> 2018).

Results :

Carbon fixation showed 216,674.48 Mg of C (year 2000), and 203,474.25 Mg of C (year 2015) reducing about 6.1%, and in the future of year 2030 the value was dropped to 120,490.84 Mg of C which is 40% lower than year 2015. Alternative 3 of land use planning was the best in terms of

carbon fixation showing 6,811.31 Mg of C. Habitat quality also changed from 0.57 (year 2000), 0.35 (year 2015), and 0.21 (year 2030) with continued degradation as development goes further.



Figure 2. Study area.



Figure 3. Busan Eco-delta city area.

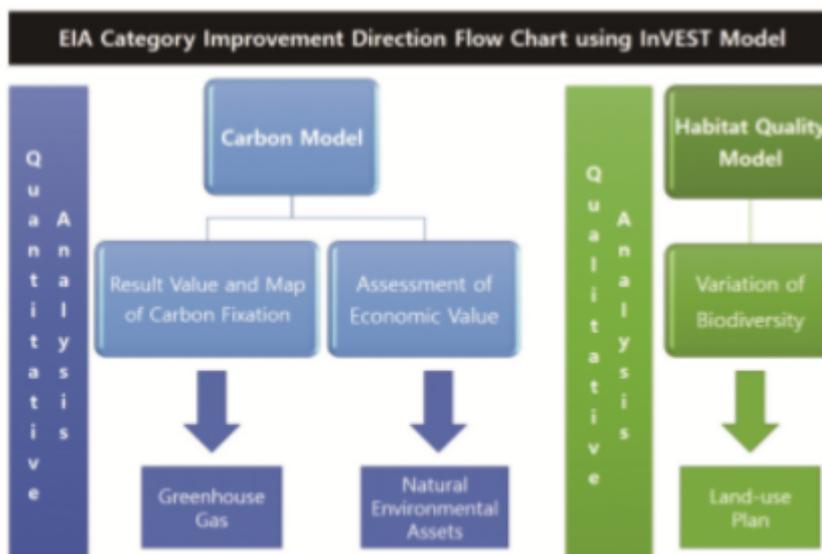


Figure 4. Suggestion for improvement of natural ecology field in EIA.

Conclusions:

Alternative 3 also was the highest with 0.21(Alternative 1 : 0.20, Alternative 2 : 0.18). In conclusion,

this study illustrated that quantitative method for land use change in the process of EIA can help decision making for stakeholders and developers with serving the best scenario for low impact of carbon. Also it can help better for land use plan, greenhouse gas and natural environmental assets in EIA. This study could be able to use in the environmental policy with numerical data of ecosystem and prediction. Supplemented with detailed analysis and accessibility of basic data, this method will make it possible for wide application in the ecosystem evaluation.

## 51.

### Phenological change in response to climate change in the Korean peninsula

Sangdon Lee and Sojeong Lee

Ewha Womans Univ.

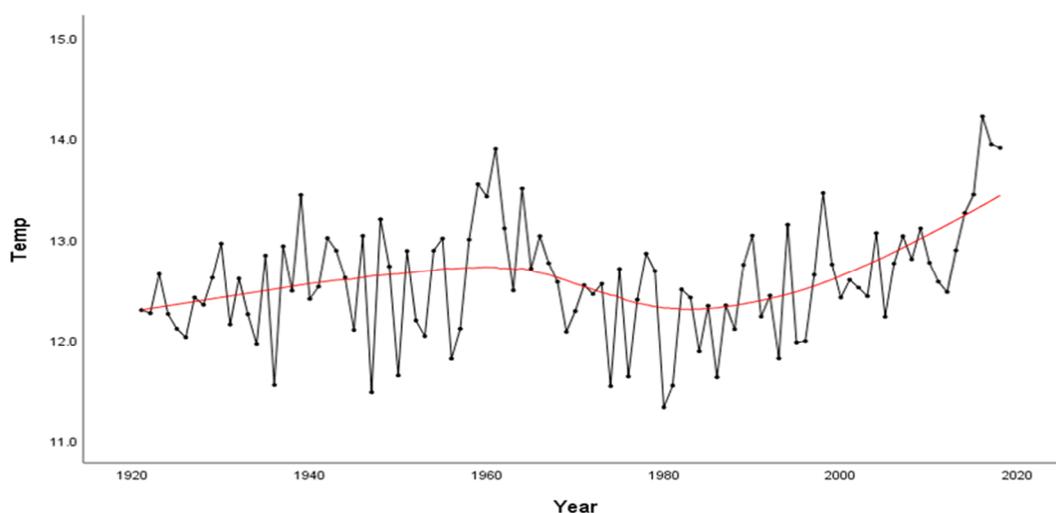
#### Introduction:

⊙As temperatures rise around the world, the timing of biological events in spring and fall is changing

⊙ Changes in biological events of plants affect the length of the growth period, and the length of the growth period has a great ecological and biochemical significance to the biological community

⊙Phenological changes can have a great impact on conservation of the natural world, and can cause ecological divergence between species and the organic environment.

#### Methods:



58.

59.

◎ Temperature change since 1980



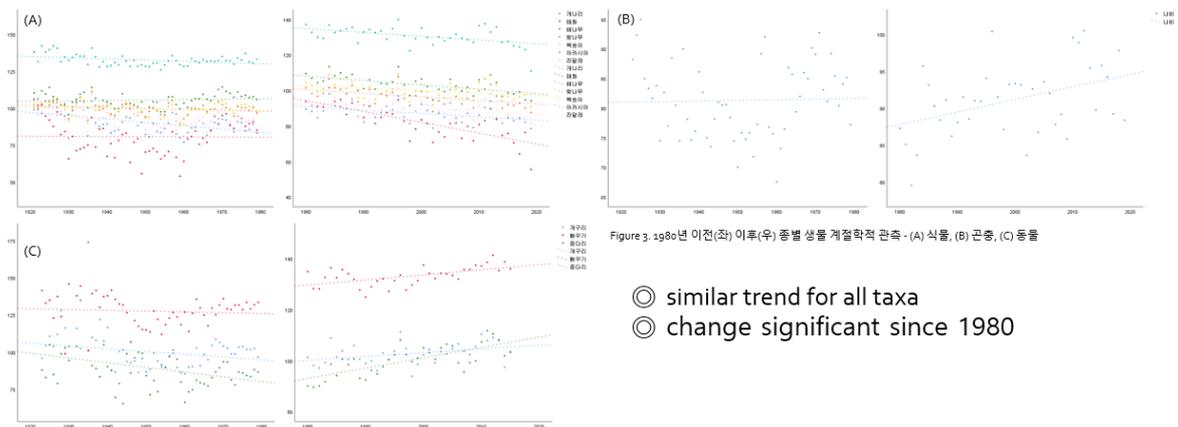
- ◎ During 1920-2019, 85 stations in South Korea
- **Plants 7** (Forsythia, apricot, cherry, pear, acacia, rhododendron, peach)
- **Insect 1** (white-cabbage butterfly)
- **Animals 3** (black backed frog, cicadas, skylark)
- Phenological event in the spring time

◎ Changes in the Observation Period of Biological Events of each species and the Correlation Analysis between the Changes in Observation Period and Climate

Results:



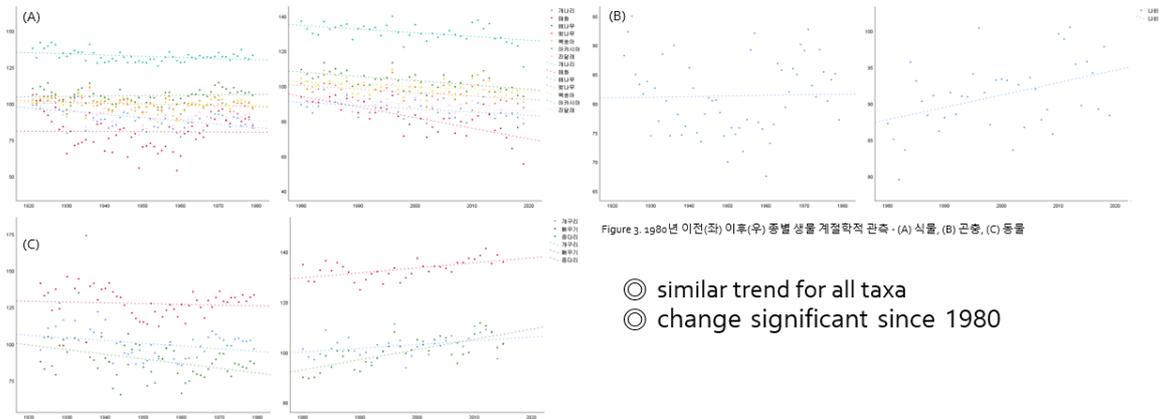
Phenological observations



- ◎ similar trend for all taxa
- ◎ change significant since 1980



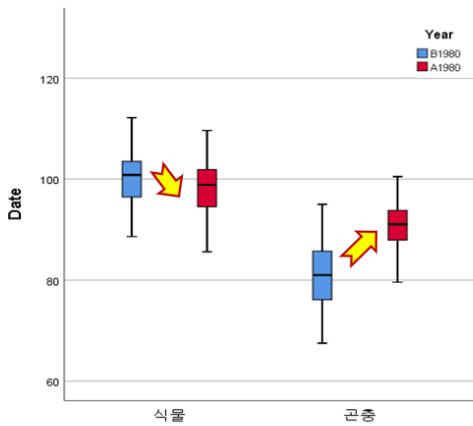
## Phenological observations



## Discussion:



## Asynchrony



**Plants: earlier Phenological event**  
**Insect: later Phenological event**



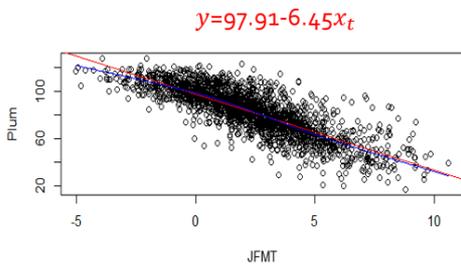
Disorder in the event of flowers and Butterflies for pollen



Chaos of ecosystem due to asynchrony



## Regression analysis



- Apricot: most sensitive to Phenological event
- Precipitation not so important for Phenological event
- Temperature : Plants > Insects > Animals

Reference:

- Both, C., Bouwhuis, S., Lessells, C. M. & Visser, M. E. 2006 Climate change and population declines in a long-distance migratory bird. *Nature* 441
- Parmesan, C. & Yohe, G. 2003 A globally coherent fingerprint of climate change impacts across natural systems. *Nature* 421
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**52.**

**The Multivariate Performance Analysis of Government Support Public Policy  
for Korea SMEs: Insights from the Statistical Simulation**

Hyun-ji Kim

Lecturer, Dept. of Management of Technology, William F. Miller School of MOT, Konkuk  
University, Seoul, Korea

Dong-Hoon Oh(Corr.)

Professor, Dept. of Urban Administration at The University of Seoul, Korea

Sun-Young Park

Professor, Dept. of Management of Technology, William F. Miller School of MOT, Konkuk  
University, Seoul, Korea

**Abstract**

**Purpose/ Research Question:**

Accordingly, the objective of this research is to investigate the influential factors on performance by suggesting technological development results and technology commercialization as the outcome of technological development capacity and identifying the capacity required for successful technological development performance and technology commercialization for companies through academic preceding research. Moreover, the study aims to investigate performance differences according to technology business groups by dividing the groups into high-technology companies, mid-technology companies and universal-technology companies.

**Key Literature Reviews (About 3~5 papers):**

Recently, a lot of small and mid-sized enterprises have emerged through continuous technological development and start-up successes in spite of insufficient scales and resources compared to medium enterprises or conglomerates in the fierce competition of the market. Technological development capacity that is required to acquire, select or utilize source technology for company competitiveness becomes the competitive edge and key capacity to have distinctiveness.

**Design/ Methodology/ Approach:**

In this study, we set two dependent variables as the achievement of technology development capability and technology development achievement. In detail, we considered technology competitiveness, which means whether we have entered into new business field from technology development achievement, and product competitiveness, which means improvement of product quality and performance. As an independent variable, technology development capacity was used for analysis. First, technology development personnel are divided into researchers and research assistants who are engaged in research and development activities. In other words, research and development personnel are set up. Second, technology and R & The third is the presence of a dedicated research institute for technology development, and finally, the level of technical ability (new technology development ability, development technology commercialization ability).

In this study, statistical package program STATA 12.0 was used for empirical analysis to verify the research hypothesis. Basic descriptive statistical analysis was conducted to analyze the characteristics of survey data. In addition, correlation analysis, multiple regression analysis, and logistic regression analysis were conducted to verify the effect of technology development capacity on technological development performance and technological performance.

**(Expected) Findings/Results:**

As a result of the analysis, among indicators constituting technological development capacity, manpower in technological development and technological development-specialized research centers had positive influence on product competitiveness of technological development performance. Also, technological development expenses and technology capacity levels were

verified to have positive impacts on technology competitiveness of technological development performance. As for technology commercialization performance, the more the manpower in research and development, the higher the sales amounts by technological development; also, the higher the technology capacity levels, the higher the export amounts by technological development. Moreover, technology business groups had differences in performance.

#### **Research limitations/ Implications:**

Future research is expected to draw new variations different from the analysis results from existing studies by setting variations, investigating complementary relationships among variations in detail and utilizing statistical techniques that can control mutual relationships among variations.

#### **Keywords:**

small and mid-sized enterprises, technological development capacity, technological development performance, technology commercialization, technology business groups

#### **Reference**

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### 53.

## **Why Korean Kosdaq Companies Have Been Failed: Learning from the 15-year period in Korea**

Kyung-Uk Min

Ph.D. Student, Konkuk University, Korea

Sun-Young Park(Corr.)

Prof., Konkuk University, Korea

### **Abstract**

The CEO of a company is the chief decision maker of the company, the replacement of the CEO affects the organization, and the replacement of the CEO is a very important event considering the overall change of the organization before and after the replacement. Several preceding studies have found that CEO turnover is closely related to management performance factors. In other words, CEO's with poor management performance report more frequent management changes. The preceding study found that it may be difficult to replace the CEO, even if the CEO's ownership interest is high, even if the management performance is poor.

In a sample of Korean companies with many owners who are both controlling shareholders and CEOs, CEOs who do not perform as well as professional managers need to analyze whether there is a high incentive for managerial change. This empirical analysis is a good reflection of the current state of Korean businesses, which have changed their business environment due to the capital

market opening and the internal accounting management system, and if efforts to improve corporate governance have become visible, CEOs who do not perform well regardless of their top management freedom will have a high incentive for managerial change.

In addition, the important characteristic of Korean companies regarding CEO turnover is that it is difficult to classify who will be considered CEO since there are many titles such as CEO, CEO vice chairman, etc. And there are many owners who are also controlling shareholders. Despite its importance, there is a lack of empirical research that analyzes the relationship between CEO replacement and management performance based on limited samples of Korean companies and the sample period is prior to the 2000s.

This study examines the relationship between management performance and CEO replacement according to the type of CEO, based on the Korean companies listed on the Korea Stock Exchange from 2009 to 2015. According to the analysis, the worse the management performance, the more frequent CEO turnover is. And the probability that a CEO with poor financial performance would be replaced was higher when the CEO was a professional manager than when the CEO was a controlling shareholder and its related owner. The results of the empirical analysis suggest that while the nation's corporate governance has improved significantly in recent years, but the replacement of owners is still inelastic compared to professional managers. On the other hand, professional managers had a higher chance of replacing the CEO even when the company's financial position was sound, or the company's resources were efficiently operated.

This study examines the correlation between management performance and CEO replacement with financial performance indicators and analyzes whether there are any differences depending on CEO replacement type. In this case, the replacement type of CEO is identified in the business report with information on the equity ratio, executive status and ownership structure.

As a sample, it was selected as a company that was listed on the Korea Stock Exchange between 2009 and 2015, a company that can extract specific data required for analysis in KIS-VALUE database of Korea Credit Information and the Corporate Information Ware House, TS2000, and an electronic public disclosure system (DART) business report provided by the Financial Supervisory Service. The important characteristic of Korean companies regarding CEO turnover is that it is difficult to classify who is the CEO due to many titles for CEO and many CEOs are also controlling shareholders. Despite its importance, there is a lack of empirical research that analyzes the relationship between CEO replacement and management performance based on limited samples of Korean companies and the sample period is prior to the 2000s.

Expected result is that the poorer our business performance, the more likely our CEO will be to be replaced. The objective is to select ratio variables from financial performance indicators for the regression analysis to demonstrate that there is a negative relationship between the probability of

CEO turnover, the rate of return on sales and the rate of return on equity (ROE). These results mean that companies in Korea are more likely to replace CEOs if their business performance is poor, and they support a negative correlation between corporate financial performance and CEO replacement. The results of this study are significant in that they produced empirical research on the effects of financial performance on CEO turnover with samples of domestic companies from 2009 to 2015. There are a total of four types of CEO replacement: Replacement among professional managers, the replacement among the controlling shareholders, a change from a controlling shareholder to a professional manager, and a change from a professional manager to a controlling shareholder. In addition, the change from ownership manager to professional manager may be different from the other three cases in resistance. In the future, therefore, it is necessary to further refine and analyze the CEO replacement type.

**Keywords:** Delisted, small and medium enterprises(SMEs), CEO turnover

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**Finding solutions of PDEs using meta deep learning**

Doo Seok Lee (Corr.)

Prof., Daegu Gyeongbuk Institute of Science and Technology, Korea;

Heungju Ahn

Prof., Daegu Gyeongbuk Institute of Science and Technology, Korea;

## Abstract

Physics-based deep learning is a very dynamic field.

To model a physical system of interest, we should describe the governing physical laws mostly using differential equations including partial differential equations(PDEs).

To simulate or predict the behavior of the physical system, numerical approximation methods are used.

There have been several works on applying deep learning to generate the solution of the Poisson equation, special Navier-Stokes equation, etc.

In recent, the combination of deep neural networks and numerical schemes are used to numerical approximation of differential operators by convolutions and symbolic deep neural network when the underlying equations are not clear.

This research aims to construct deep neural networks to solve not a specific PDE but a class of PDEs using meta-learning methods, even when the underlying parameters are not clearly defined.

## Purpose/ Research Question: Contents

How to approximate the PDE model by deep neural network.

How to approximate the continuous solution of PDE by deep neural network to the target accuracy.

How to find the PDE parameters when the exact parameters of PDE are not known.

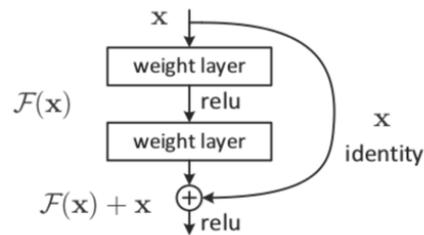
How to accelerate solving PDE solver networks using meta learning model.

What is the relation of some PDE solver networks with another PDE solver networks.

## Key Literature Reviews

### Time evolution approximation by using residual networks

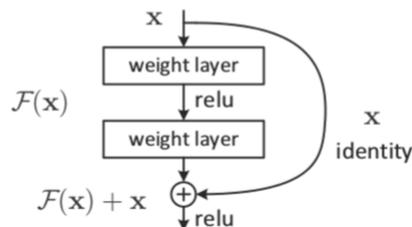
- Let the PDE be  $u_t(t, x) = f(u, u_x, u_y, u_{xx}, u_{xy}, u_{yy}, \dots)$ .
- Then the time evolution of  $u(t, x)$  to  $u(t + \Delta t, x)$  by the Euler forward method is
$$u(t + \Delta t, x) \approx u(t, x) + \Delta t \cdot f(u, u_x, u_y, u_{xx}, u_{xy}, u_{yy}, \dots).$$
- This approximation can be implemented by the residual networks using skip connections:



<https://medium.com/@ml.at.berkeley/neural-ordinary-differential-equations-and-dynamics-models-1a4277fbb80>

### Time evolution approximation by using residual networks

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- This approximation can be implemented by the residual networks using skip connections:



<https://medium.com/@ml.at.berkeley/neural-ordinary-differential-equations-and-dynamics-models-1a4277fbb80>

## Neural ODE(Ordinary Differential Equation)

- Replacing Neural Networks with Black-Box ODE Solvers
- Resnets are Euler integrators
- Parametrize  $\frac{dz(t)}{dt} = f(z(t), \theta(t)), 0 \leq t \leq T$
- Define  $z(T)$  to be top layer of residual network, or recurrent neural network
- Optimizing the loss using reverse-time autodiff

$$L(z(t_1)) = L(z(t_0)) + \int_{t_0}^{t_1} f(z(t), t, \theta) dt = L(\text{ODESolve}(z(t_0), f, t_0, t_1, \theta))$$

Tian Qi Chen, Yulia Rubanova, Jesse Bettencourt, David Duvenaud University of Toronto, Vector Institute

## Higher order differentiation approximation using ConvNets

**Definition 2.1 (Order of Sum Rules)** For a filter  $q$ , we say  $q$  to have sum rules of order  $\alpha = (\alpha_1, \alpha_2)$ , where  $\alpha \in \mathbb{Z}_+^2$ , provided that

$$\sum_{k \in \mathbb{Z}^2} k^\beta q[k] = 0 \quad (3)$$

for all  $\beta = (\beta_1, \beta_2) \in \mathbb{Z}_+^2$  with  $|\beta| := \beta_1 + \beta_2 < |\alpha|$  and for all  $\beta \in \mathbb{Z}_+^2$  with  $|\beta| = |\alpha|$  but  $\beta \neq \alpha$ . If (3) holds for all  $\beta \in \mathbb{Z}_+^2$  with  $|\beta| < K$  except for  $\beta \neq \bar{\beta}$  with certain  $\bar{\beta} \in \mathbb{Z}_+^2$  and  $|\bar{\beta}| = J < K$ , then we say  $q$  to have total sum rules of order  $K \setminus \{J + 1\}$ .

**Proposition 2.1** Let  $q$  be a filter with sum rules of order  $\alpha \in \mathbb{Z}_+^2$ . Then for a smooth function  $F(x)$  on  $\mathbb{R}^2$ , we have

$$\frac{1}{\varepsilon^{|\alpha|}} \sum_{k \in \mathbb{Z}^2} q[k] F(x + \varepsilon k) = C_\alpha \frac{\partial^\alpha}{\partial x^\alpha} F(x) + O(\varepsilon), \text{ as } \varepsilon \rightarrow 0. \quad (4)$$

If, in addition,  $q$  has total sum rules of order  $K \setminus \{|\alpha| + 1\}$  for some  $K > |\alpha|$ , then

$$\frac{1}{\varepsilon^{|\alpha|}} \sum_{k \in \mathbb{Z}^2} q[k] F(x + \varepsilon k) = C_\alpha \frac{\partial^\alpha}{\partial x^\alpha} F(x) + O(\varepsilon^{K-|\alpha|}), \text{ as } \varepsilon \rightarrow 0. \quad (5)$$

Bin Dong, Qingtang Jiang, and Zuowei Shen. Image restoration: Wavelet frame shrinkage, nonlinear evolution pdes, and beyond. *Multiscale Modeling & Simulation*, 15(1):606–660, 2017.

## Symbolic Network for Equation Construction

The symbolic neural network is introduced to approximate the multivariate nonlinear response function  $F$  of a PDE:

$$u_t(t, x_1, x_2) = F(u, u_{x_1}, u_{x_2}, u_{x_1x_1}, u_{x_1x_2}, u_{x_2x_2}, \dots)$$

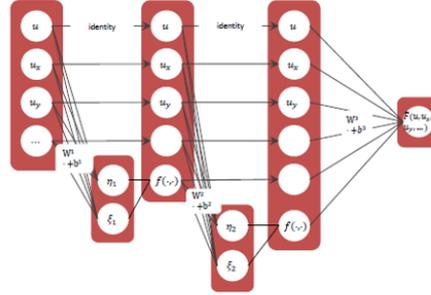


Figure 3: The schematic diagram of *SymNet*  
*PDE-Net 2.0: Learning PDEs from Data with A Numeric-Symbolic Hybrid Deep Network* (Zichao Long, Yiping Lu, Bin Dong, arXiv:1812.04426, 2019)

Meta-learning network for pseudo-differential operators  $L_\mu u(x) = f(x), x \in \Omega \subset \mathbb{R}^n$

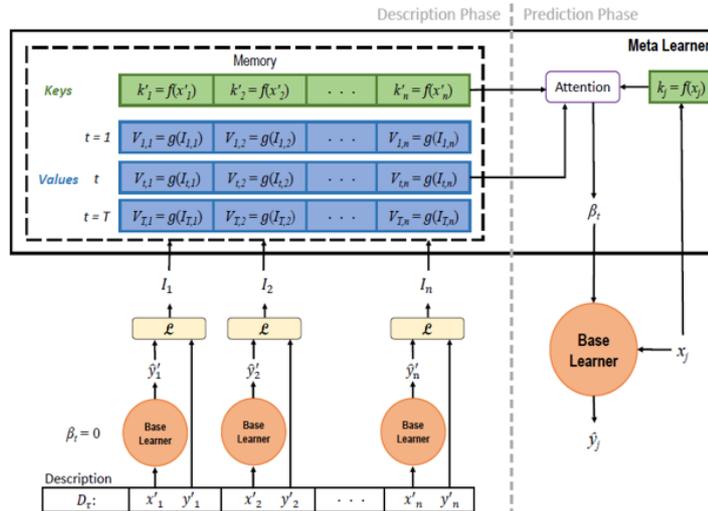


Figure 1. Schematic illustration of our model with conditionally shifted neurons. In the description phase, the meta learner populates working memory with keys and values, based on the base learner's performance on the task description; in the prediction phase, the meta learner retrieves task-specific shifts from memory through key-based attention and feeds them to the base learner to adapt it to the task.

### Rapid Adaptation with Conditionally Shifted Neurons from Microsoft research

**Design/ Methodology/ Approach:** Contents

- Navier-Stokes equations for incompressible fluids:

$$\begin{cases} \frac{\partial u}{\partial t} + (u \cdot \nabla)u = -\frac{\nabla p}{\rho} + g + \nu \nabla^2 u \\ \frac{\partial \rho}{\partial t} + (u \cdot \nabla)\rho = 0 \\ \nabla \cdot u = 0 \end{cases}$$

- Generate noisy data for Navier-Stokes equations with diverse parameters
- Develop meta learning networks to model and solve Navier-Stokes equations with diverse parameters
- Compare performance

**Keywords:** deep learning, PDE, numerical analysis, dynamical system.

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55.

**A study on the utilization of women in science, technology, engineering and mathematics(STEM) in industrial restructuring**

Saimi Woo

Senior Researcher, Busan Innovation Institute of Industry, Science & Technology Planning, Republic of Korea

Email: smwoo@bistep.re.kr

Hyunju Jung

Research Fellow, Busan Women and Family Development Institute, Republic of Korea

Email: hjjung05@bwf.re.kr

Junwon Chae

Team Chief Busan Innovation Institute of Industry, Science & Technology Planning, Republic of Korea

Email: jw1214@bistep.re.kr

**Abstract**

Not only the size of productive population, which represents the driving force of economic growth, in the city of Busan has decreased since 1998, but also the rate of the decrease of productive population by 2047 compared to 2017 by city and province in Busan is expected to reach 46%, the highest within South Korea. This rapid decrease of productive population indicates that the city of Busan needs to transform strategically its manufacturing industry into service industry for its survival. It is necessary to provide for the manpower needed for the innovative growth in the region by bringing idle women educated in science, technology, engineering and mathematics(STEM) into the industry, and to expand on innovative resources in order to convert manufacturing industry into R&D and advanced technology-based, high value-added industry.

Although 73% of women who majored in women in STEM between ages 25 to 29 are participating in economic activities, the figure decreases to less than 62% once women reach their thirties. In particular, there occurs the phenomenon of career interruption among women in their thirties, which shows an "L-shaped curve" that is more problematic than the usual an "M-shaped curve"(Chungnam National Policy Institute, 2017:27). Science and technology human resources are regarded as an expert group, because skills and resources embodied in a particular

individual(Bozeman and Boardman, 2014). There is a demand of time for improving the utilization of idle women who majored in STEM, and female talents as part of innovative leader groups can contribute to the future of industry and the economic development in Busan. Therefore, it is imperative to think about how to expand the participation of women in innovative industry. The role of the local government in the utilization of women who majored in STEM as major players in reconstructing the industry of Busan into that of high value-added, highly-advanced technology needs to be discussed as well.

The research questions of this study for utilizing women who majored in STEM for reconstructing the industry of Busan are as such: First, what are the employment needs of women who majored in STEM whose careers have been interrupted? What are the factors that influence their employment? Second, what are the demands of STEM personnel in the industry and what are the factors that influence their recruitment? Third, what is the discrepancy between employment needs of women who majored in STEM whose careers have been interrupted and that of the industry? Fourth, what should the local government do in order to resolve such discrepancy?

According to the survey results, 84.2% of women who majored in STEM who are going through career interruption expressed their desire to work in the position related to their background. Although 75.9% of the industry in Busan wanted to put their STEM personnel into R&D, only 54% of the jobs the industry considers as appropriate for women who majored in STEM were R&D related. That is, the industry wants to utilize women who majored in STEM in positions where knowledge of science and technology can be irrelevant to their major, rather than relevant. The government and civil society should collaborate and design innovation together(Yun and Yigitcanlar, 2017). Therefore, the local governments needs to work together with women who majored in STEM who are going through career interruption as well as the industry, and map out a blueprint for reconstructing the industry.

In addition, both women who majored in STEM who are going through career interruption and the industry asked for provision of information from the local government. The women wanted employment information; the industry was in need of information about trustworthy personnel. As the meaning of the term, "work related to major," seems to be perceived differently by each surveyed party, the local government needs to create new industries and professions through which this difference could be resolved. For example, the local government may be able to provide education for the women on how to facilitate turning technology into business, or on how to screen science-related laws or patents, which can, in turn, create employment opportunities. Furthermore, the local government needs to continue striving for increased utilization of local resources by providing tailored information on employment and on personnel in the field of STEM.

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56.

**Efficiency Analysis of Excellent National R&D Performance(100 Awards) in Korea**

Eun Song Bae

Research Fellow, The Incheon Institute, Incheon, Republic of Korea

Nam Hyun Dong

Graduate School of Governance, Sung Kyun Kwan University, Republic of Korea

Mun Sang Kang

Research Fellow, Korea Institute of S and T Evaluation and Planning, Republic of Korea

※ Dae-cheol Kim(Corr.)

Professor, School of Business, Hanyang University, Seoul, Republic of Korea

**Introduction:**

The purposes of this study are to improve national R&D efficiency by identifying efficiency factors and improving inefficiencies by presenting efficiency analysis of excellent national R&D performance 100 awards.

To this end, we use the data envelopment analysis(DEA) of the 2018 excellent national R&D Performance 100 Awards to present relative efficiency and to determine efficiency factors through Tobit regression analysis and average difference analysis verification.

**Methodology**

- DEA(Data Envelopment Analysis)
- DMU : in 2018, Excellent National R&D Performance (100 Awards),  
(except for 5 : has a missing value)

| Classification  | Variables                          | Unit           |
|-----------------|------------------------------------|----------------|
| DMU (95EA)      | Excellent National R&D Performance | Unit of People |
| Input Variable  | National R&D Investment            | KRW(₩)         |
|                 | Number of national R&D Project     | EA             |
|                 | Researcher                         | Unit of People |
| Output Variable | SCI paper                          | EA             |
|                 | Domestic Patent                    | EA             |
|                 | International Patent               | EA             |

## Results

Result of DEA

| DMU | TE(CRS) | PTE(BCC)      | SE(TE/PTE) | Cause of inefficiency |    | Returns to Scale |
|-----|---------|---------------|------------|-----------------------|----|------------------|
|     |         |               |            | PTE                   | SE |                  |
| 1   | 0.3393  | 0.3899        | 0.8700     | ●                     |    | Decreasing       |
| 2   | 0.2194  | <b>1.0000</b> | 0.2194     |                       | ●  | Increasing       |
| 3   | 0.4925  | 0.4943        | 0.9964     | ●                     |    | Increasing       |
| 4   | 0.8397  | 0.8739        | 0.9609     | ●                     |    | Increasing       |
| 5   | 0.3451  | 0.3585        | 0.9625     | ●                     |    | Increasing       |
| 6   | 0.0169  | 0.0173        | 0.9762     | ●                     |    | Increasing       |
| 7   | 0.7297  | <b>1.0000</b> | 0.7297     |                       | ●  | Increasing       |
| 8   | 0.0494  | 0.0612        | 0.8085     | ●                     |    | Increasing       |
| 9   | 0.3361  | 0.3433        | 0.9792     | ●                     |    | Increasing       |
| 10  | 0.1218  | 0.1368        | 0.8905     | ●                     |    | Increasing       |
| 11  | 0.3959  | 0.4223        | 0.9377     | ●                     |    | Increasing       |
| 12  | 0.2711  | <b>1.0000</b> | 0.2711     |                       | ●  | Increasing       |
| 13  | 0.3537  | 0.4607        | 0.7678     | ●                     |    | Decreasing       |
| 14  | 0.3908  | 0.3913        | 0.9986     | ●                     |    | Increasing       |
| 15  | 0.1398  | 0.1412        | 0.9905     | ●                     |    | Increasing       |
| 16  | 0.0738  | 0.0772        | 0.9562     | ●                     |    | Decreasing       |
| 17  | 0.1594  | 0.1626        | 0.9806     | ●                     |    | Increasing       |
| 18  | 0.1378  | 0.1431        | 0.9632     | ●                     |    | Increasing       |
| 19  | 0.0539  | 0.0585        | 0.9212     | ●                     |    | Increasing       |
| 20  | 0.3722  | 0.7951        | 0.4681     |                       | ●  | Increasing       |
| 21  | 0.0530  | 0.0532        | 0.9967     | ●                     |    | Increasing       |

|     |        |               |        |     |     |            |
|-----|--------|---------------|--------|-----|-----|------------|
| 22  | 0.1616 | 0.1624        | 0.9950 | ●   |     | Increasing |
| 23  | 0.0556 | <b>1.0000</b> | 0.0556 |     | ●   | Increasing |
| 24  | 0.0402 | 0.0461        | 0.8730 | ●   |     | Decreasing |
| 25  | 0.0779 | 0.0829        | 0.9402 | ●   |     | Increasing |
| 26  | 0.0192 | 0.0199        | 0.9651 | ●   |     | Increasing |
| 27  | 0.4089 | 0.5866        | 0.6970 | ●   |     | Decreasing |
| 28  | 0.1746 | 0.1746        | 0.9999 | ●   |     | Increasing |
| 29  | 0.0274 | 0.0394        | 0.6956 | ●   |     | Decreasing |
| 30  | 0.0204 | 0.0617        | 0.3305 | ●   |     | Decreasing |
| 31  | 0.1948 | 0.2644        | 0.7367 | ●   |     | Decreasing |
| 32  | 0.3340 | 0.7842        | 0.4259 |     | ●   | Decreasing |
| 33  | 0.0207 | 0.0218        | 0.9490 | ●   |     | Increasing |
| 34  | 0.0859 | 0.0898        | 0.9561 | ●   |     | Increasing |
| 35  | 0.0236 | 0.0325        | 0.7251 | ●   |     | Increasing |
| 36  | 0.1398 | 0.1435        | 0.9744 | ●   |     | Increasing |
| 37  | 0.0252 | 0.0294        | 0.8571 | ●   |     | Increasing |
| 38  | 0.2902 | 0.3109        | 0.9334 | ●   |     | Increasing |
| 39  | 0.1296 | 0.1608        | 0.8060 | ●   |     | Increasing |
| 40  | 0.3868 | 0.4138        | 0.9349 | ●   |     | Increasing |
| 41  | 0.2570 | 0.2586        | 0.9936 | ●   |     | Increasing |
| 42  | 0.2435 | 0.3373        | 0.7220 | ●   |     | Increasing |
| 43  | 0.0569 | 0.1014        | 0.5613 | ●   |     | Decreasing |
| 44  | 0.9026 | 0.9065        | 0.9956 | ●   |     | Increasing |
| ... | ...    | ...           | ...    | ... | ... | ...        |

|             |               |               |               |                              |                 |
|-------------|---------------|---------------|---------------|------------------------------|-----------------|
| <b>Mean</b> | <b>0.2647</b> | <b>0.3781</b> | <b>0.7951</b> | <b>Cause of inefficiency</b> | <b>CRS : 3</b>  |
| <b>Min.</b> | <b>0.0169</b> | <b>0.0173</b> | <b>0.0556</b> | <b>- PTE : 78</b>            | <b>DRS :21</b>  |
| <b>Max.</b> | <b>1.0000</b> | <b>1.0000</b> | <b>1.0000</b> | <b>- SE : 17</b>             | <b>IRS : 71</b> |

Results

Potential Improvement Levels

| Agencies of Research | Classification |                  | Benchmarking  |       | Potential Improvement Levels (%) |          |            |           |                  |                       |
|----------------------|----------------|------------------|---------------|-------|----------------------------------|----------|------------|-----------|------------------|-----------------------|
|                      | DMU            | Efficiency (BCC) | Number of DMU | Times | Investment R&D                   | Projects | Researcher | SCI Paper | Domestic Patents | International Patents |
| Industry             | 6              | 0.0173           | 61,77         | 2     | -24                              | -39      | 0          | 0         | 5692             | 8077                  |
|                      | 8              | 0.0612           | 46,59,61      | 3     | -2                               | 0        | 0          | 0         | 1535             | 0                     |
|                      | 29             | 0.0394           | 59,61,65,72   | 4     | 0                                | -30      | 0          | 2437      | 2437             | 5981                  |
|                      | 30             | 0.0617           | 59,61,72      | 3     | 0                                | -67      | -42        | 1521      | 1521             | 2803                  |
|                      | 33             | 0.0218           | 65,77         | 2     | -35                              | -23      | 0          | 4479      | 0                | 0                     |
|                      | 34             | 0.0898           | 61,65,77      | 3     | -15                              | -33      | 0          | 1013      | 1013             | 0                     |
|                      | 37             | 0.0294           | 61,77,92      | 3     | -24                              | 0        | 0          | 0         | 3512             | 3296                  |
|                      | 39             | 0.1608           | 46,59,61      | 3     | 0                                | 0        | -17        | 0         | 522              | 3339                  |
|                      | 43             | 0.1014           | 59,61         | 2     | 0                                | -44      | -29        | 0         | 887              | 0                     |
|                      | 45             | 0.3241           | 02,12         | 2     | -11                              | 0        | -75        | 0         | 411              | 209                   |
|                      | 49             | 0.1466           | 46,59,61,65   | 4     | 0                                | 0        | -30        | 582       | 582              | 1390                  |
|                      | 62             | 0.1688           | 61,77         | 2     | -79                              | -1       | 0          | 0         | 493              | 700                   |
|                      | 67             | 0.1132           | 46,61,65,87   | 4     | -58                              | 0        | 0          | 783       | 783              | 0                     |
|                      | 75             | 0.0339           | 46,59,61      | 3     | 0                                | 0        | -8         | 0         | 2854             | 0                     |
|                      | 81             | 0.0517           | 46,59,61,65   | 4     | -50                              | 0        | 0          | 1834      | 1834             | 9004                  |
| 평균                   | 0.0947         | 46,59,61,65      | 3             | -20   | -16                              | -13      | 843        | 1605      | 2320             |                       |

**Benchmarking DMU(15 EA)** : DMU65(65 times), DMU61(55 times), DMU77(41 times), DMU59(20 times), DMU46(16 times), DMU72(7 times), DMU84(5 times), DMU87(5 times), DMU92(5 times), DMU50(4 times) 등

Potential Improvement Levels

| Agencies of Research | Classification |                  | Benchmarking   |       | Potential Improvement Levels (%) |          |            |           |                  |                       |
|----------------------|----------------|------------------|----------------|-------|----------------------------------|----------|------------|-----------|------------------|-----------------------|
|                      | DMU            | Efficiency (BCC) | Number of DMU  | Times | Investment R&D                   | Projects | Researcher | SCI Paper | Domestic Patents | International Patents |
| University           | 4              | 0.8739           | 65,77          | 2     | -62                              | -49      | 0          | 14        | 120              | 133                   |
|                      | 9              | 0.3433           | 61,65,77       | 3     | -6                               | -40      | 0          | 191       | 191              | 2157                  |
|                      | 13             | 0.4607           | 59,61,65,72    | 4     | 0                                | -34      | 0          | 117       | 117              | 571                   |
|                      | 20             | 0.7951           | 61,65,77       | 3     | 0                                | -16      | -37        | 26        | 26               | 0                     |
|                      | 22             | 0.1624           | 65,77          | 2     | -16                              | -42      | 0          | 516       | 591              | 0                     |
|                      | 27             | 0.5866           | 65             | 1     | -90                              | -30      | -52        | 70        | 149              | 75                    |
|                      | 28             | 0.1746           | 61,65,77       | 3     | -47                              | -21      | 0          | 473       | 473              | 0                     |
|                      | 31             | 0.2644           | 65             | 1     | -26                              | -36      | -44        | 278       | 530              | 0                     |
|                      | 32             | 0.7842           | 65             | 1     | -77                              | -57      | -69        | 28        | 91               | 169                   |
|                      | 44             | 0.9065           | 61,65,77       | 3     | -8                               | -36      | 0          | 10        | 10               | 152                   |
|                      | 47             | 0.4991           | 65,77          | 2     | -15                              | -42      | 0          | 100       | 1258             | 0                     |
|                      | 52             | 0.6049           | 61,65,77,84    | 4     | 0                                | -8       | 0          | 65        | 182              | 65                    |
|                      | 53             | 0.1354           | 61,65          | 2     | -71                              | -40      | -43        | 639       | 924              | 639                   |
|                      | 63             | 0.2279           | 59,61,65,72    | 4     | 0                                | -44      | 0          | 339       | 339              | 1308                  |
|                      | 64             | 0.1629           | 61,65,77       | 3     | 0                                | -23      | -46        | 514       | 514              | 890                   |
|                      | 68             | 0.2136           | 50,61,65,77,92 | 5     | 0                                | 0        | 0          | 368       | 368              | 520                   |
|                      | 71             | 0.0315           | 61,65,77       | 3     | -8                               | -63      | 0          | 3076      | 3076             | 0                     |
|                      | 73             | 0.1578           | 61,65,77       | 3     | 0                                | -14      | -56        | 534       | 534              | 732                   |
|                      | 76             | 0.2632           | 65,77          | 2     | -42                              | -38      | 0          | 280       | 326              | 449                   |
|                      | 83             | 0.0897           | 59,61,72       | 3     | 0                                | -13      | -11        | 1015      | 1015             | 0                     |
|                      | 88             | 0.2888           | 61,65,77       | 3     | -37                              | -49      | 0          | 246       | 246              | 0                     |
|                      | 89             | 0.1109           | 65,77,84       | 3     | -34                              | -43      | 0          | 802       | 2802             | 802                   |
|                      | 94             | 0.2340           | 65             | 1     | -77                              | -36      | -69        | 327       | 411              | 775                   |
| 95                   | 0.0435         | 65,77            | 2              | -2    | -43                              | 0        | 2198       | 0         | 0                |                       |
| 평균                   | 0.3506         | 61,65,77         | 3              | -26   | -34                              | -18      | 509        | 596       | 393              |                       |

Result:

- As a result of DEA, the CCR model to be 3 DMUs, and the BCC model was 15 DMUs.
- Used the efficiency of scale out of 95 DMUs, the cause of inefficiency was examined. The optimum size of DMU was 3, 71 DMUs, 75% were SE (scale efficiency), and 21 DMUs were responsible for pure technical efficiency.
- The DMU that causes the SE can eliminate the inefficiency by increasing the input.

## Conclusion:

The excellent national R&D performance(100 Awards) is a selection of studies that have generated excellent results. But, the analysis shows that the number of participating researchers per project is necessary. It means that the government's investment for national R & D is continuously increasing. Still, it is urgent to secure human research resources for participating researchers, and sufficient research manpower must be input.

Depending on the research subjects and the characteristics of the research, the creation of an environment for optimal research should be supported by the appropriate government-funded research fund, the number of projects, or the participation of participants.

We believe it is necessary to operational efficiency through proper resource allocation and supplement measures such as orthodox investment costs, projects, and research personnel of national R & D.

**Keywords:** National R&D, Excellent National R&D Performance(100 Awards), DEA, Efficiency Analysis

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## **A Study on the Effect of Team Members' Competence on the Project Success and Sustainability**

Minjeong Oh

Assistant Prof., Division of Global Elite in charge of Business Administration Major, Yonsei University, Korea

Sungyong Choi (Corr.)

Associate Prof., Division of Business Administration, Hanyang University, Korea

### **Introduction**

#### Research Background

The business environment in all areas of globalization, digitalization and transculturation has changed so rapidly that it is unpredictable.

Project execution ability has become a prerequisite for survival as well as for the development of the enterprise.

More recently, researchers investigated the impact of project managers on project success with a special focus on the relevance of their competencies (Turner et al., 2009).

In particular, the ability of project manager to achieve the project's business strategic objectives has important impact on project performance (Podgórska and Pichlak, 2019).

ISO21500 defines a Project as “a unique set of processes of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective.”

Kerzner (2013) noted that the project organization is a goal-oriented, professional system that ensures project success by concentrating man-power and technology.

There is a great need for research on the expertise and individual competencies of project team members.

- Categorization of Members within the PMT (Project Management Team)
  - Project Owner
    - Director of the unit responsible for the project task
  - Project Manager (similar to Project Leader)

- Perform tasks according to the objectives and scope of the project.
- In charge of conducting, controlling, coordinating overall project activities.
- Project Member
  - Principal to carry out the project.
- Management capabilities of project members for innovations
  - Project member communicates and collaborate with each other based on their respective professional areas and technical skills.
  - As **innovative and professional project management** becomes an essential requirement for success, the **need for management capabilities of the project members** as well as project managers is growing.

#### Purpose of study

Find out what management capabilities of PMT members need to have.

Analyze the priorities of the management capabilities factors PMT members.

Examine the relationship on the impact of the management capabilities of PMT members on project success.

Analyze and compare the differences between the management capabilities of project managers and team members that affect project success.

#### Key Literature Reviews

- Competence of **previous studies** are about the Project Manager
  - Alvarenga *et al.* (2019) identified seven groups of competencies to project success: leadership, self-management, interpersonal, communication, technical, productivity and managerial.
  - Podgórska and Pichlak (2018) examine the relationship between the three dimensions of leadership competencies and impact on project success. The three leadership dimensions: emotional competency, managerial competency, intellectual competency.
  - Orecchibi *et al.* (2012) suggest that choosing the project manager with three key attributes; deeper depth of technical needs, tendency to network beyond functional and organizational boundaries, connectivity between research and product application opportunities.
  - Choi *et al.* (2018) conducted that researchers and project managers should

cooperate with each other to find innovation and true problem-solving ideas. It said that it could find efficient methods for open innovation.

- **Thus, Innovative success of the project requires the development of the management capabilities of project team members.** <Difference between the previous studies and our work>

## Methodology

- **AHP(analytic hierarchy process) technique**
  - AHP is a mathematical technique used for multiple criteria decision making(MCDM).
  - To find the selective attributes of project management members' capabilities for the AHP, the Delphi procedure was adopted.
  - And then we conduct a survey for the second questionnaire collection
- **Second questionnaire survey for empirical research.**
  - The first section aimed to profile the respondents and their firms. Sections 2 and 3 presented competence variables and project success variables. (five-point Likert scale)
  - **Analyzed by using structural equation modeling(SEM), multiple regression analysis, factor analysis, reliability analysis.**
- **Project team members' management capabilities criteria**

| Dimension (hierarchy 1) | Competencies (hierarchy 2)      | Characteristic   |
|-------------------------|---------------------------------|--|
| Emotional               | Self-awareness                  | The awareness of one's feeling and the capability to recognize and manage them   |
|                         | Emotional resilience            | The ability to perform consistently under pressure in a range of situations and to stay focused on a course of action or need for results when faced with personal challenge or criticism        |
|                         | Intuitiveness                   | The capacity to arrive at clear decisions and drive their implementation in spite of incomplete or ambiguous information using both rational and "emotional" or intuitive perception             |
|                         | Sensitivity                     | The ability to be aware of, and take account of, the perceptions and needs of others in arriving at decisions and proposing solutions  |
|                         | Influence                       | The capacity to encourage others to change a viewpoint based on understanding of their position and the recognition of the need to listen to this perspective and provide a rationale for change |
|                         | Motivation                      | The energy and drive to achieve clear results and make an impact   |
| Managerial              | Conscientiousness               | The ability to display clear commitment to a course of action when faced with a challenge and to match "words and needs" when encouraging others to support the chosen direction                 |
|                         | Managing resources              | The capability to organize resources and coordinate them efficiently and effectively as well as the ability to establish clear objectives and convert long-term goals into action plans          |
|                         | Engaging communication          | The capability to engage others and win their support through communication tailored for each audience, as well as ability to be approachable and accessible                                     |
|                         | Empowering                      | The capacity to know one's direct report's strengths and weaknesses and encourages them to take on challenges, to solve problems and develop their own accountability                            |
|                         | Developing                      | The capability to encourage others to take on ever more- demanding tasks roles and accountabilities, develop others' competencies and invest time and effort in coaching them                    |
| Intellectual            | Achieving                       | The ability to show an unwavering determination to achieve objectives and implement decisions  |
|                         | Critical analysis and judgement | The ability to gather relevant information from a wide range of sources, sound judgments and decisions making awareness of the impact of any assumptions made                                    |
|                         | Vision and imagination          | The capacity to be imaginative, innovative and to have a clear vision of the future  |
|                         | Strategic perspective           | The ability to be aware of wider issues and broader implications as well as abilities to balance short- and long-term considerations and to identify opportunities or threats                    |

Dulewicz and Higgs(2003), LDG(leadership questionnaire dimensions)

## Project Success criteria

- Meeting project's overall performance(scope, time, budget)
- Meeting customer's satisfaction
- Meeting the project purpose
- Clear communications channels
- Availability of resources
- and so on..
- *H1.* project management team member's competencies have positive impact on project success.
- *H2.* project management team member's competencies have positive impact on project success depending on the complexity of a project

## Expected Results

- The impacts of project team members' capabilities on project success.
  - a. Emotional competency: Self-awareness, Emotional resilience, Intuitiveness, Sensitivity, Influence, Motivation, Conscientiousness
  - b. Managerial competency: Engaging communication, Empowering, Developing, Achieving
  - c. Intellectual competency: Vision and imagination, Strategic perspective, Critical analysis and judgment
  - d. Differences between project manager's capabilities and project team members; capabilities in their impact on project success

## Implications of Study

- In a rapidly changing and innovative business environment, the firms can improve its competitiveness by distributing to team members the management capabilities concentrated only on managers in carrying out successful projects.
- In terms of open innovation, It is meaningful that we focus on the capabilities of project team members to carry out projects not the project managers.

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## Opportunities and Threats of Business Model Digital Transformation

Iveta Simberova<sup>1</sup>

Associate professor, Brno University of Technology, Faculty of Business and Management, Czech Republic

Alena Kocmanova

Professor, Brno University of Technology, Faculty of Business and Management, Czech Republic

### Abstract

**Purpose/ Research Question:** The purpose of the paper is looking for, and characterizes the opportunities and threats of business model digital transformation for companies. Today, digitization affects almost every aspect of our lives. It means for the companies not just a lot of opportunities, but also threats. We can generally look at define today's environment as VUCA: Volatility, Uncertainty, Complexity and Ambiguity. They are just some of the features of the world in which we live. And whether the megatrend of digitalization will contribute toward a sustainable development of companies in the long run depend on how we shape it and understand. Our research generally is intended to characterization of business model digital transformation. Research questions of our interest: How does the ongoing move towards a digital world contribute-positive or negative-to more sustainable world? What opportunities, threats can we expect at the macro level? What kind of opportunities and threats we could expect and accept for the business models transformation of companies?

**Key Literature Reviews (About 3~5 papers):** Background and the necessity to characterize business model digital transformation are depending on the biggest challenge of digitization trend, which is time. Its biggest enemy is the organizational and individual indolence, which can be found particularly in SMEs and which are blocking necessary change process. But reaction to changes needs to be quick, because the strategic window of opportunity is only open for a limited amount

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<sup>1</sup> Corresponding author

of time (Kreutzer, Neugebauer, Pattloch, 2018, p.1). The first wave of digitization was the domain of starts-up, which were free of conventions, established structures, and processes while being innovative without great cost pressures. Digital transformation is affecting every business sector, and as investor capital, top talent, and customers shift toward network-centric organizations, the performance gap between early and late adopters is widening. New, scalable, digitally networked business models are impacting on growth, scale, and profit potential for companies in every industry (Libert et al. 2016). The digital economy offers enormous opportunities: You can reach undeveloped areas of this world with state-of-the-art education, intelligent machines can do jobs that human don't want to do, patient care can improve through new forms of caretaking, and of course we all don't want to miss the comfort of accessing all our data anytime and. In the wake of digitalization, megatrends such as mobile internet, the internet of things, big data or digital innovations are creating development opportunities faster than even anywhere (Osburg, Lohrmann, 2017). We can also identify an area where digital transformation will ultimately change the game, enabling new models of social, economic and environment drivers often based on sharing and more sustainable behavior-which is a key principle of sustainability thinking. This can be understood as the "economization of environmental/social aspects of sustainability". The another important part regardless how great technological opportunities are, if people do not want it, for rational or irrational reasons, resistance in the commercial and political systems will be such that formidable obstacles will emerge, up to banning specific use.

**Design/ Methodology/ Approach:** Assessing existing literature on opportunities and threats arising from digitization at the macro level and their adaptation to the transformation of the business model. We employ threat-rigidity (Staw et al. 1981) as well as prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) to examine business model adaptation in response to external threats and opportunities.

**(Expected) Findings/Results:** Opportunities, threats on macro level: A) **Ecological sustainability:** 1) Improving forecasts of natural events or disasters. 2) Optimizing global agricultural production and food supply. 3) Anticipating traffic congestion and managing low emission zones. 4) Limiting energy production up to the precise needs of consumers. 5) Allowing preventative maintenance that avoids failure and replacement. B) **Economic sustainability:** 1) less waste, less energy consumption, time saved. 2) Attracting consumers who are motivated by environmental concerns. 3) Positive contribution to the Triple-Bottom-Line reporting of the company. 4) Using only needed resources through "...as a Service" concepts, enabled largely by Cloud Computing, where only the actual usage of product or service is paid for. C) **Social sustainability:** 1) New economic models, where providing personal data in exchange to free services and products. 2) Ethical projects with usually little success in finding seed money can be facilitated through crowdfunding: trust is needed but sustainability is generally a world of trust. 3) Mobility is obviously a way to enhance availability and connectivity, again building on trust of systems and people. 4) The reinvention of work, often referred to as

"Industry 4.0", is certainly a major breakthrough in delivering enhanced productivity, environmental benefits and collaborative work concepts.

We expect to present the transformation framework for digitalization of companies through business model based on the assessing of existing literature on opportunities and threats arising from digitalization.. Conclusions should bring us basic issues for definition of the digital transformation, and to introduce a structured approach to drivers, objectives and impacts of digitalization to business model transformation.

**Research limitations/ Implications:** The main limitation is lack of the real data and missing practical evaluation of the theoretical concept. The paper is part of designing the theoretical concept of our wider research intending to digital transformation for innovation business models. The evaluation and confirmation of the theoretical concept will be part of our further research phases.

**Keywords:** digital transformation; business model; threats; opportunities; social, economic, environmental, social, sustainability;

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