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**Special Issue on: ‘New combination between technology, and market or society’**

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**Theme: Technology, Market, and Society in the 4<sup>th</sup> industrial Revolution.**

**We invite papers on open connection and new combination among technology, market, and society in the 4<sup>th</sup> industrial revolution.**

**Submitting Method**

**Manuscripts should be submitted to managing guest editor, [jhyun@dgist.ac.kr](mailto:jhyun@dgist.ac.kr).**

**Editors and Notes**

Manuscripts and all editorial correspondence should be addressed to: Dr V.V. Krishna, Editor-in-Chief, Science, Technology and Society, Centre for Studies in Science Policy, School of Social Sciences, Jawaharlal Nehru University, New Delhi 110 067, India (E-mail: [stsjournal@gmail.com](mailto:stsjournal@gmail.com)).

**2017 FINAL SELECTION OF 3 PAPERS BY STS JOURNAL SUBJECT TO REVISIONS**

No.	Paper Title	Authors (** corresponding. author)	First Author's Affiliation & Email	STS JOURNAL COMMENTS
1	Analysis of the Effect of Technology and Market Dynamism on the SME(Small and	Hun Park, Jae-Young Yoo, Seong-Hee Moon &Hyuk Hahn**	Korea Institute of Science and Technology Information, Korea ( <a href="mailto:hyhahn@kisti.re.kr">hyhahn@kisti.re.kr</a> )	<b>Accepted subject to revisions and comments which will be sent in 1-2</b>

	Medium sized Enterprises) Business Performances by SME Supporting Services			months.
2	How does a social open innovation succeed? Learning from Buro Battery, and Grassroots innovation Festival of India	JinHyo Joseph Yun**, Abiodun A. Egbetokun, Xiaofei Zhao & Choongjae Im	DGIST, Korea ( <a href="mailto:jhyun@dgist.ac.kr">jhyun@dgist.ac.kr</a> )	Accepted subject to revisions and comments to be sent in 1-2 months.
3	The Impact of Local Government Policy on Innovation Ecosystem: Case Study of Changzhou, China	Lei MA & Zheng LIU**	Nanjing University of Science and Technology, China ( <a href="mailto:ypoonsliu@yahoo.com">ypoonsliu@yahoo.com</a> )	Accepted subject to revisions and comments will be given in 1-2 months

**At 2018 SOItmC, We selected 11 papers. Among 22, 6 will be finally selected.**

No.	Paper title	Authors	Corr. Author's Affiliation & Email
1	The model of coaching interaction in organizations for sustainable performance within the life cycle	Rosa, A. (angelina.rosa@rtu.lv), Lace, N.** ( <a href="mailto:natalja.lace@rtu.lv">natalja.lace@rtu.lv</a> ) & Lukassenko, R. (LREXPress@inbox.lv)	Lace, N.** ( <a href="mailto:natalja.lace@rtu.lv">natalja.lace@rtu.lv</a> )
2	The transition of Japanese electrical industry –by the impact of Sharp acquisition by Foxconn-	Chia-Chen Wu	Chia-Chen Wu
3	Research on the Construction of New R & D Organization in the Internet-pule Environment	Xiaojing Huang (huangxiaojing@njust.edu.cn)	Xiaojing Huang (huangxiaojing@njust.edu.cn)
4	Research on the Development Model of "Internet + E - government" in China- International Experience and Basic Paths	Menghang Zhang (897621464@qq.com)	Menghang Zhang (897621464@qq.com)
5	The Study of Chinese Social Organizations Governance Transition' Traits and Path Under the Green Governance Situation	Weian Li (liweiannk@126.com), Yunpeng Lu (oyster618@163.com) & Xiaolin Li (xiaolinwaner@126.com)	Weian Li(liweiannk@126.com),
6	Multiplier innovation and technological DNA with a focus on critics of Disruptive Innovation	Sunghoon Chung (holystarhoon@gmail.com) & Junghee Han (hjh0037@Hongik.ac.kr)	Junghee Han (hjh0037@Hongik.ac.kr)
7	A Study on the Differentiated Knowledge Service Strategy by Addressing the Moderating Effect of Company Growth Stages on	Hun Park (hpark78@kisti.re.kr), Jae-Young Yoo (hyhahn@kisti.re.kr) & Hyuk	Hyuk Hahn** (hyhahn@kisti.re.kr)

	the Organizational Performances	Hahn**(hyhahn@kisti.re.kr)	
8	Deep understanding the relation between open innovation and drug development in Korea	Hyuck Jai Lee (hlee@kisti.re.kr) Heyoung Yang** (hyyang@kisti.re.kr) &	Heyoung Yang** (hyyang@kisti.re.kr) &
9	<b>Regional Innovation Systems as Complex Adaptive Systems: the case of lagging European Regions</b>	Ivana Quinto Research Fellow, Department of Engineering, University of Naples Parthenope, Italy Email: <a href="mailto:ivana.quinto@unina.it">ivana.quinto@unina.it</a>  Giuseppe Zollo Full Professor, Department of Industrial Engineering University of Naples Federico II, Italy Email: <a href="mailto:giuseppe.zollo@unina.it">giuseppe.zollo@unina.it</a>	Cristina Ponsiglione (Corr.) Assistant Professor, Department of Industrial Engineering University of Naples Federico II, Italy Email: <a href="mailto:cristina.ponsiglione@unina.it">cristina.ponsiglione@unina.it</a>
10	An analysis of the effects of investment in transports technologies on the tourism industry	Francesca Pagliara( <a href="mailto:fpagliar@unina.it">fpagliar@unina.it</a> ) Filomena Mauriello(filomena.mauriello@unina.it)	Francesca Pagliara( <a href="mailto:fpagliar@unina.it">fpagliar@unina.it</a> )
11	The effects of Customer Capital on Customer response speed and innovativeness: the mediating role of marketing capability	Asghar Afshar Jahanshahi( <a href="mailto:afshar@pucp.edu.pe">afshar@pucp.edu.pe</a> ) Brem(alexander.brem@fa.u.de)	Khaled Nawaser( <a href="mailto:khalednawaser56@gmail.com">khalednawaser56@gmail.com</a> ) Alexander

## 1.

### **The model of coaching interaction in organizations for sustainable performance within the life cycle**

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#### **Abstract**

##### **Purpose**

In the context of Miller and Friesen's (1984) five-stage model of the *organizational life cycle*, the *appropriateness* of different forms and types of coaching to facilitate organizational sustainable growth and development is investigated. As the companies move from one stage to another during their life cycle, the strategy, structure, requirements and other aspects are changing. Coaching as facilitating practice might reinforce and support organization's capability to grow and develop in alignment with the life cycle stages. In line with a current trend in the literature, the authors hold the opinion that efficiency of coaching depends on the appropriate type and form of coaching interaction that is used under the appropriate circumstances in the certain organization environment.

## **Key Literature Reviews**

### *1. Organizational life cycle model*

There is no consensus on the unique definition of a stage of the organizational life cycle. Hanks (1990) defines a life cycle stage as "a unique configuration of variables related to organization context, strategy and structure". Scholars attempt to explain the life cycle process, as a result, a sufficient number of theories and models are developed. The models assume that organizations move through a series of developmental phases, each of them is related to particular contextual, strategic and structural characteristics. Kazanjian and Drazin, (1989) see the life cycle model as a process of problem resolution and consider that dominant problems that organizations attempt to solve determine the organizational life cycle stage. They assert that the proper match between problem, stage, appropriate structure and processes accelerate the growth of organization.

A conceptual framework of a five-stage model of organizational growth was proposed by Greiner (1972). He identified five dimensions, which are major for a model of organization development: age and size of the organization, stages of evolution and revolution, and growth rate of the industry. Based on the extensive literature review and analyzing the periods of history of organizations, Miller and Friesen (1984) infer five key stages of the corporate life cycle: the Birth, the Growth, the Maturity, the Revival and the Decline. They argue that each stage differs from one another by internally consistent characteristics, among which strategy, structure, decision making. Lester et. al (2003) supports the work of Miller and Friesen (1984) by having adapted and tested a five-stage model appropriate to any type of organization. The scholars also recognize the significance of the decline as a separate stage. Hanks (1990) presents a synthesized a five stage model which incorporated a number of models of organizational life cycle. Each stage is characterized by a distinctive range of variables related to organization context, strategy and structure, decision making and key skills required.

For the purposes of the present research, the following characteristics of the organizational life cycle stages are detected in the literature. Stage 1 "The Birth". The organization is small in terms of revenues and number of employees. The niche strategy is a determine growth strategy. The strategic aim is to find the gaps in the market and defense these niches by making extensive innovations. Coordination among staff is weak since the internal structure is simple and does not fully exist. The owner-manager concentrates the power and makes the key decisions. Decisions may conflict with each other because of the lack of detailed analysis and methodological consideration of alternatives. Success comes from creativity, flexibility, informality, commitment, and willingness to undertake risk on the part of the founder. The founder must be result-oriented, creative and committed to the business idea. There is also a need to develop entrepreneurial skills such as the ability to recognize market opportunity. Entrepreneurial leadership is a vital characteristic the start-up founder must possess (Kim, Jung, 2015).

Stage 2 "The Growth". The organization continues to meet growing demand for the products and as a result experiences continued growth in both sales and number of employees. Market segmentation becomes a determine growth strategy. The product line is broadening. Functional departments are organized for the key areas of business. Structure becomes more complex and less centralized. Managers are appointed to head marketing, production and other departments. Greater effort is devoted to effective communication and coordination among departments. Team approach to management prevails. More levels of managers involve in decision making, as a result, some authority is delegated. However, power is still quite centralized. To be successful, the leaders need to learn to delegate effectively.

Stage 3 "The Maturity". The focus turns from growth to profitability. Innovations switch from product to process to improve production efficiency and reduce unit costs. The tendency is to follow the competition and imitate innovations. Growth is occurring at a slower rate. A stable and circumscribed product line is sold in traditional markets. A short-term tactical rather than a long-term strategic orientation prevails. Departmental, functionally-based structure becomes more formal and bureaucratic. Information processing activity changes: there are more emphasis upon formal cost controls, budgets, and performance measures. Conservatism becomes the norm. Style of decision making is less innovative, less proactive, less responsive and adaptive to the market. To be effective, leaders must be proficient in formal planning, organization and administration.

Stage 4 "The Revival". The organization experiences a period of rapid growth and reaches its largest size. This growth is generated by major and minor product-line and service innovations, acquisition in different industries, diversification and differentiation. Yusr suggests that when the companies seek to achieve competitive advantage though innovation, they need to make more efforts on building their innovation capability (2016). Diversification, market segmentation, acquisition are determine growth strategies. Divisional form of structure with autonomy of divisions and decentralization is adopted. The heads of divisions become responsible for operational decisions and performance in different markets. Highly sophisticated control systems to monitor the performance of the divisions are used. While the divisions have the authority for the operational decisions, the power for overall strategy making is still highly centralized. A major challenge faced at this stage is integration to avoid over controlling the divisions and, at the same time, ensuring the synergy between divisions.

Stage 5 "The Decline". Hanks (1990) argues that organization can enter decline from any stage of life cycle. Profitability drops because of the external challenges and because of the lack of innovation. The product lines become still more outdated. The market scope is quite narrow. There is no particular strategy. The structure of organization is centralized with few control system. Decision-making power is at the top of the organization; even routine operating decisions are executed by higher level managers. Communications between hierarchical levels and across departments are poor. Renewal of organizational mission and strategy is to be a primary business

task for organization. Ignoring of renewal inevitably brings organization to continued decline and finally to the death.

## **2.Types and forms of coaching**

For the purposes of the present research, coaching is defined as a goal-oriented, structured, interactive learning process, the core of which is the coach - client alliance. The literature and practitioners argue that coaching is beneficial for a person and for a client's organisation because achieved results and personal growth are considered as the key expected coaching outcomes (Rosha, Lace, 2016).

There are different approaches to classify coaching. Cox et al. (2011) investigated and summarized 12 theoretical approaches which constitute the conceptual background of coaching and 10 genres, i.e. forms of coaching, and contexts, i.e. the subject of coaching.

The other approach to coaching categorization is by the form and the scope of its application (i.e. type). The following forms and types of coaching are chosen for the present research. The reason of this choice is the scope of their application in the organizational context. 1) Individual (one-to-one or dyadic) coaching. Individual coaching is delivered by a coach to a single coachee. 2) Team coaching. Group coaching is provided by a coach or coaches to a group of individuals (clients). Such group may embody individuals who share mutual goals and closely work together to achieve these goals, in this case, a group is called a team, and coaching delivered in this group is called team coaching.

3) Executive coaching deals with individuals who have managerial responsibility. The purpose of executive coaching is to enhance the client's professional performance and behavior change, and thereby contribute to individual and organizational success. 4) Entrepreneurial coaching is an individual support to entrepreneurs to facilitate developing entrepreneurial self-efficacy and encourage entrepreneurs to transform their own strategic vision into action. 5) Managerial coaching (Manager as coach) implies a supervisor or manager facilitating support to subordinates aims to improve productivity and develop subordinates' professional skills. 6) Coaching for innovation. Tighter competition and rapid changes in the marketplace challenge the companies to be innovative and develop products fast. Coaching for innovation aims to drive innovative processes in organization from finding ideas and developing them to linking innovations to the company's strategy by facilitating the development and improvement skills contributing to innovation culture. 7) Career coaching occupies a special place in the classification system for coaching because career coaching can be used in different contexts and life situations. However, in contrast to workplace coaching which is concerned with achieving business results, career coaching is person-centered approach. Career coaching is focused and goal-oriented type of coaching. The goal of career coaching is to assist the client to develop a career path and achieve career goals.



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

For the purpose of the study it was decided to apply expert opinion survey. Expert judgment is a research method which is widely used in management science, forecasting and statistics. Judgmental methods are used when appropriate information is not available for using statistical methods.

The aim of the expert opinion survey is to clarify the issue relevant to organizational sustainability. The survey seeks to gain the experts' view about the ways of utilizing coaching to accelerate and sustain organizational growth and development. Specifically, the experts are asked to rate the appropriateness of the certain forms and types of coaching to the organizational life cycle stages. Individual coaching, team coaching, executive coaching, entrepreneurial coaching, managerial coaching, coaching for innovation and career coaching are analyzed in the context of Miller and Friesen's (1984) five-stage model of the organizational life cycle.

The questionnaire consists of two parts: 1) evaluation of the level of priority, 2) expert self-evaluation. In the first part, on a scale of 3 to 0, with 3 being "high priority", 2 "middle high priority", 1 "low priority" and 0 "not applicable", the experts are asked to rate the appropriateness of the types of coaching to the organizational life cycle stages "Birth", "Growth", "Maturity", "Revival" and "Decline". A brief description of the organizational life cycle stages is provided in the text of the questionnaire. A file "Definitions of Coaching" enclosed to the invitation letter provides experts with working definitions accepted for the purpose of the research.

In the second part of the questionnaire, the experts are asked to evaluate the level of their implication in the field of coaching. Self-assessment method is used to measure the competence of experts. The experts are asked to rate the level of their awareness for particular coaching types, with 10 being "perfect awareness" and 0 "absolute unfamiliarity". In addition self-confidence in theoretical knowledge, practical issues and capability to forecast for each expert is determined. Based on self-confidence evaluation, the coefficient of confidence in the expert's opinion in the survey is calculated.

The following criteria are considered in the selecting experts: professional status, reputation, recognized competencies, academic degree, versatility and objectivity are developed. The optimal number of experts is still disputable question in the literature. The scholars consider that number of experts depends on the nature of the problem and expected degree of uncertainty. Rowe and Wright (2001) argue that while a larger group of experts may potentially provide more intellectual resources, the conflict of opinions and information overload may embarrass the elicitation. To increase the accuracy of forecast, it was decided to compose the pool with experts whose knowledge and expertise complement each other and reflect the full scope of the subject matter.

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

The expert opinion survey launched in November 2017 and it is planned to be completed by February 2018. The preliminary list consists of 40 experts who have been individually invited to participate. It is expected that this study gives a general awareness in the tendency which is important at the initial stages of research. The analysis of the experts' responses is made by summarizing expert opinions to derive an agreement among experts. In overall the analysis is made in two dimensions. First, the most valuable types of coaching under each stage of organizational life cycle are extracted and analyzed. Second, the most valuable types of coaching across all the stages of organizational life cycle are identified.

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

The results derived from the current research have a high practical business value. It allows organizations to choose the right types of coaching at any stage of development and to optimize the investment strategy so that investments are done in those types of coaching that maximizes ROI.

Further steps in the present research might be related with deeper analysis of individual responses of experts to fetch additional valuable information from the research. First, each individual expert might be asked to construct careful arguments in support of their judgments. Second, more complex mathematical analysis of diversity of experts' views might be applied.

**Keywords:** coaching, organization life cycle, organization development, sustainability, expert opinion survey

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## 2.

### **The transition of Japanese electrical industry –by the impact of Sharp acquisition by Foxconn–**

Chia-Chen Wu

#### **Purpose**

The purpose of this paper is to analyses the current problems of the Japanese electric industries and show the reason why the major Japanese maker, Sharp, was acquisit by Taiwanese maker.

How the alliance with Taiwanese maker is affecting Japanese electrical makers in terms of competitiveness with innovation.

Also, this paper analyses the positive impacts of Taiwan alliance for the Japanese electrical makers.

#### **Research questions**

Why Japanese makers lost competitiveness?

How is the alliance with Taiwanese maker affecting Japanese electrical makers?

What are the positive impacts of Taiwan alliance for the Japanese electrical makers?

#### **Background**

Since 1980's, Japanese electrical makers obtained international competitiveness in TFT-LCD, however, Korean and Taiwanese makers improved rapidly and took the leading position.

80'S-1996 Japanese makers were leading in TFT-LCD

1997 Korean makers took the TFT-LCD World No.1 share

2004 Taiwan took the TFT-LCD World No.1 share

## **Literature Review**

In 90's, Japanese technology was transferred to Taiwan and electric industrial technology and skills were upgraded by technology transfer from Japan. (Fujimoto 2009)

Transition started in the 2000's when Japanese makers started alliance cooperation with Taiwan makers in order to increase their production volume and expand their market. (Shintaku 2006) (Won 2007)

However, these technology transfer and expansions gave opportunities for Taiwan makers to obtain their capabilities and increase competitiveness in turn. (Nakata 2007) (Sadoi and Wu 2013)

As the result, Japanese electric makers lost competitiveness gradually and in 2017, Sharp acquisition by Foxconn happened.

## **Methodology**

- Literature survey

Technology transfer from Japan to Taiwan

Taiwanese innovation process

Taiwanese business philosophy

- Corporation survey

Corporate Data, News

Interview survey to Sharp and Foxconn

Interview survey to Taiwan makers

- Case study

Sharp

Foxconn

## **Findings 1**

The competitive smile curve analysis shows that the competitiveness shift from Japan to Taiwan.

Taiwan makers are strong for the manufacturing process at first.

Japanese makers were strong in whole process at the beginning, but gradually leave from

manufacturing and shift to upper process.

Later, Taiwan makers also shift toward upper process as same as Japanese makers.

Japanese makers lost competitiveness.

## **Findings 2**

Vertical integration of supply chain strategy increased competitiveness for Taiwanese companies.

Entire supply chain is owned by the same company.

The vertical integration such as the case of Sharp and Foxconn gave Sharp opportunities to produce in East Asia.

Produce right parts at best region strategy makes companies more competitive.

## **Findings 3**

Sharp & Foxconn alliance shows new type of alliance, which create mutual benefit.

SHARP's advantage in brand and technology and Foxconn's advantage in production process will integrate mutual advantage of both companies.

This study showed a new type alliance of the Taiwan and Japan.

This cooperation is not only asset purchase, but create new direction

## **Reference**

Yusr, M. 2016 Innovation capability and its role in enhancing the relationship between TQM practices and innovation performance. *Journal of Open Innovation: Technology, Market, and Complexity* 2:6 <https://doi.org/10.1186/s40852-016-0031-2>

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日本はなぜ液晶ディスプレイで韓国、台湾に追い抜かれたのか?--擦り合せ型産業における日本の競争力低下原因の分析

Why Japan was passed by South Korea and Taiwan in manufacture of liquid crystal display?: analysis of degradation causes of Japanese competitiveness in integral architecture industry

By 中田 行彦

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Ritsumeikan Asia Pacific University

組織間関係が規定するグローバル戦略的提携の成否::シャープ, 台湾鴻海, 中国 CEC の事例から

Strategic Alliance determined by Inter-organizational Relations::Cases of Sharp, Hong Hai and CEC

中田 行彦

Nakata Yukihiro

立命館アジア太平洋大学

Ritsumeikan Asia Pacific University

液晶産業～日本からグローバル化した産業に従事して

Looking Back My Concern on LCD Business: Engaged to the Globalization of the Industry Grown up in Japan

名雪 稔

NAYUKI Minoru

### 3.

#### **Research on the Construction of New Cooperative R&D Organization in the Internet pule Environment**

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

Government, industry, university and research institutions cooperation innovation is a new mode of cooperation and innovation to promote the progress of science and technology and economic development in today's society. It plays a crucial role in the national level of science and technology innovation and production, and affects the development of the country and society. In the context of implementing the strategy of innovation driven development in China, strengthening the cooperation of government, university and research institutions is an important support for the innovation chain and the promotion of innovation and development. Around the implementation of innovation driven development strategy, relying on the "Internet plus" and public entrepreneurship, innovation and other efforts to build a cooperation platform for innovation, trimaran Zhongli, accelerate the establishment of enterprises, market-oriented with the depth of integration of technology innovation system, will effectively promote scientific and technological achievements and problems of poverty, fostering the growth of the new economic growth momentum of China's economy, enhance the innovation capacity and competitiveness.

The world economy has been confronting low economic growth for several years. Many experts agree that concepts such as openness, convergence, and creation of new market demand through new emerging technologies (e.g. Internet of Things, big data, and Artificial Intelligence) may solve the current economic crisis throughout the world.<sup>[1]</sup>

“Internet plus” is a new format innovation under the development of the Innovation 2.0, it uses the Internet platform and the traditional industry to make a deep integration to create a new development ecology, that is to make full use of the Internet to optimize the allocation of resources in the community and integrated function, then innovation will be the integration of the Internet in the depth of the economic and social fields, enhance social innovation and productivity, a wider range of Internet based tools for the realization of economic development in the new form. Innovation2.0 in the Internet plus environment, is an adaptation of the knowledge society, user centric, social practice as the stage, mass innovation, common

innovation, open innovation for the characteristics of the users to participate in the innovative form. Government, universities, research institutions and users are the four main bodies of the mode of Innovation 2.0. They are especially important for open innovation of the first main body enterprise. However, in the five main collaborative innovation process, due to personal opportunism, limited rationality, asset specificity, uncertainty of external environment, information asymmetry and other factors, often lead to cooperation in the interests of both sides is not harmonious, and increase transaction costs, hinders innovation and ongoing activities. Therefore, we need to optimize and improve the traditional collaborative production and research activities mode, build a new cooperative R & D organization, create a new platform for collaborative innovation, and improve the efficiency and quality of collaborative innovation. In this paper, combined with the enterprise Internet plus environment innovation requirements, analysis of political research with five major parts in the collaborative innovation in motivation and interests, combined with the relevant innovation platform case, focusing on political research with collaborative innovation platform construction and operation mechanism research.

### **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”.<sup>[2]</sup> 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.<sup>[4]</sup> Open-innovation is a typical example of coordinative activity that a manufacturer should share a profits generated through reverse supply chain with retailer.<sup>[5]</sup>

#### **2. The “three spirals” innovation model of government, industry, universities and research institutions**

Henry and Rohit Laudersdorf put forward in 1995 Aizikeweici biology three screw principle research “three spiral” model based on innovation.<sup>[3]</sup> The “three spiral” model is composed of three strands of chains: the first is the administrative chain represented by the government; the second share is the production chain of the enterprise; the third shares are the scientific chain of universities and scientific research institutions. Three strands of chains are independent and intertwined, forming an organic whole. Three kinds of institutions of political production and industry can play the role of some other institutions, but they do not mean that there is no limit between the three groups. According to the “porcupine theory”, it is still necessary to maintain a certain tension and balance between the government, the universities and the research institutions: if the government has a strong role, it is possible to form a mode of state intervention; if the three are weak, it will lead to the laissez faire model because of the



weak interaction. In their ideal state, their relationship is usually composed of government, universities, research institutes and enterprises, which are involved in information integration and resource sharing: as the main body of market innovation, enterprises have the most innovative power, can play the role of innovative resource allocation in the market, and use the market to test new products and technologies; through the guidance, adjustment and financial support of the macro policy, the government can create a good environment for innovation, so that enterprises can organize innovative R & D activities in a normal and orderly way.

### 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. In the era of Industry 4.0, firms are facing with greater uncertainty. Accordingly, it is important to select quality risk measures to analyze newsvendor problems under risk. Then, open innovation can be a good remedial option for such risk-averse newsvendors because open innovation can offset the profit losses from risk aversion by sharing revenues in supply chains. <sup>[6]</sup>

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

This paper use the survey method and case study. Through the above research methods on the research background, the goal and the innovation of the study and so on can be seen, the theme of the research paper is mainly based on related theory of open innovation and so on, at the same time in the course of the study, this paper uses different research method: firstly literature research, that is the proposition of the thesis first needs support of theory, therefore, through the method of literature research to collect, identify and organize the related literatures, the related literature at home and abroad on the basis of the innovation system, innovation platform, cooperation mode and innovation policy review, systematic review of related research results have been achieved; secondly case analysis, that is field trips to collect and analyze the existing innovation resource sharing implementation platform, while selectively fieldwork benefited from the innovation platform for the enterprise, understand the actual situation of them to carry out innovation activities, and then analyzed by Internet plus collaborative innovation platform to promote enterprise innovation activities under the network environment, social status, problems and effect based on the reasons, which lays a foundation for the research in this paper.

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

Aiming at the characteristics and needs of open innovation, we discuss the construction of an integrated information service platform for government, industry, research institutions, users and other innovative subjects through the Internet for information integration, resource sharing and participation. In this innovation platform, enterprises, as the main body of market innovation, release corresponding modules' collaborative innovation needs according to market demand, and the externally produced resources of research, learning and research can be

interacted and innovating together through different media; at the same time, enterprises and universities, research institutions and users and other external resources carry out interactive innovation and interest sharing around the unified goals, and self organize operation based on corresponding evaluation criteria, forming an ecosystem that continuously updates resources and outputs innovative results; through the guidance, adjustment and financial support of the macro policy, the government can create a good environment for innovation, so that enterprises can organize innovative R & D activities in a normal and orderly way. This paper puts forward an open innovation platform based on Internet environment, which is multi-agent participation and enterprise oriented. It provides reference for government departments to make decisions.

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

Although much progress has been achieved in this paper, we can't deny that there is still some shortcoming in this paper. This study also has some shortcomings, and the operation mechanism involved is not perfect. Because the platform involves multiple parties' participation, the behavior of market players needs further research, so the practice stage is uncertain. In the next research, we will continue to make up for the lack of research, analyze the effect of different innovation subjects on different operation mechanisms, and explore a more complete innovation mode.

**Key word:** Internet plus; Government, industry, university, research institutions and users cooperation innovation; collaborative innovation; innovation ecosystem

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#### 4.

### **Research on the Development Model of "Internet + E - government" in China —International Experience and Basic Paths**

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

There has been ongoing discussion of government innovation to improve efficiency and democracy in public services. In particular, with the arrival of the smart era and ICT advances bringing changes not only to modes of communication between government and citizens, but also to systems used to carry out administrative operations, there is a rising need for corresponding government innovations. (Eun Hyung Park and Jea-Wan Lee, 2015) In March 2015, Premier Li Keqiang first proposed the concept of "Internet +" in the government work report. In March 2016, the national "Thirteenth Five-year Plan" was officially released, putting forward the strategy of implementing network power and national big data. This outline marks that "Internet +" has risen from the wisdom of the people to the status of a national strategy. The state has also put forward the "Internet +" plan of action. In the era of "Internet +", the upgrading of information network technology not only brings about tremendous changes in all aspects of public life, but also puts forward a higher level of developmental requirements for government service capabilities. E-government construction, with information network technology as its core, has always played an important role in service-oriented government construction projects. Owing to qualitative advances, along with a quantitative explosion of data over the past decade, data is being gathered in an increasing number of areas, and the picture it gives of the real world is becoming more and more precisely delineated. (Si-jeoung Kim<sup>1</sup>, Eun-mi Kim<sup>2\*</sup>, Yoonkyo Suh<sup>3</sup> and ZeKun ZHENG<sup>3</sup>, 2016). The more widespread and far-reaching data becomes, the more effectively government will be able to apply innovations to analyze and predict the real world. Second, through the creation of derivative data, advances in data processing technology allow government to more easily obtain the data required for public policy decision-making and implementation. Combining with the emerging background of "Internet +", how to use advanced information technology to promote e-government and service-oriented The closer integration of the two governments must be the subject of urgent research nowadays. This essay is based on the inherent consistency between e-government and service-oriented government building. Combined with the current emerging background of "Internet +" in our country, this paper analyzes the experience of e-government construction in advanced countries, excavates the available value and seeks for the current service-oriented government in our country E-government construction to achieve the further development of the right path. E-government, using advanced information networks as a means to creatively transform the government service model, can speed up

the process of building a service-oriented government and solve the technical problems encountered in its development so as to further enhance the public's choice of access to services. At the same time, e-government can also help the government improve the level of information openness and increase the transparency of its work. This has a far-reaching impact on the public's active participation in building government affairs and improving the government-citizen relations. Under the new era of "Internet +", if we want to make further leap forward in the construction of E-government, "Internet + government affairs" will definitely become the new direction of the development of E-government in our country. First of all, the development of E-government is constantly adapting to the new changes of Internet information technology, making full use of emerging technologies to create a favorable environment for government services and providing favorable external guarantee for the sustainable development of service-oriented government. Second, E-government actively absorbs the advanced concept of "Internet +" and innovatively uses "user thinking" to improve the efficiency of providing services to the public. Finally, "Internet + government affairs" will bring about the in-depth development of transparency in government affairs information, and the government information will realize more and more practical value in practical application and will truly serve all aspects of civic life.

### **Key Literature Reviews:**

Foreign research on e-government originated in the late 20th century, developed to the present, has made a rather rich and profound research results. E-government compared to the previous model of service-oriented government development, there are essentially different. The development of e-government to improve the government to help improve the quality of service at the same time, but also can promote the development of relations between the government and the government and the development of benign. Douglas Holmes(2003) proposed that the government must achieve three goals in building e-government: "The first is to improve the efficiency of government administration and reduce the cost at the same time. The second is to actively communicate with the public so as to realize the sound development of the relationship between the two. Finally, The continuous development of government affairs promotes the rapid growth of social and economic development. " In an article published in the United States, Kamaien • Scavo mentions that internet skills provide public managers with a metaphysical opportunity to practice management. The most important strength behind this technique is to inspire public managers to double the quality of service. Internet information technology has two major advantages: First, it can help governments more efficiently and quickly provide the public with the government services they need. Once again give the public a quick and rich form of feedback, the public opinion will receive enough attention and will be reflected in the follow-up of government services. This can greatly improve the relationship between the government and the public. After years of research, the "Network Services and Government" policy group of Kennedy School of Government pointed out that the development of e-government should be the continuous improvement of organizational structure of government agencies, constantly optimizing the construction of government functions and continuously improving government service capabilities. In their opinion, how to apply the latest information network technology to the construction of service-oriented government and how to use e-government to improve the government reengineering and to promote the transformation of government functions are of great importance to the theoretical research of e-government and service-oriented government in various countries research direction. Through such changes, the channels of communication between government and the public have diversified, expanding from conventional face-to-face and telephone communication to milieus like SNSs and mobile smart apps. Public demand for disclosure of public data has also skyrocketed. In addition, with wider availability of big data analysis, there is growing demand for provision of personalized administrative services based on individualized information.( Abiodun Egbetokun1, Adekemi Jessica Oluwadare,2017).

The existing research on e-government in our country mainly explores from the following three aspects. The first is the essay on the concept of essay research, mainly elaborated on what is e-government, e-

government concepts and the establishment of the core issues of e-government; The second is the effective fit between e-government and e-government. It studies how to gradually establish e-government on the basis of developing e-government and combining with government functions, discussing the relationship between e-government and government functions and how to realize the transformation of government functions; The third is to study the means and methods of implementing e-government, mainly to solve how to realize e-government under the existing conditions and to put forward the solution to a series of problems appearing in the process of construction. Administration of China's government information technology group has pointed out in the "China e-government research report," a paper pointed out that with the rapid development of network technology, e-government construction has become the focus of development of all countries in the world century, The report made an objective assessment of the current development of e-government in our country and pointed out the problems existing in the construction of e-government in our country at this stage. In response to the existing problems, a series of coping strategies and development plans were put forward. The report clearly pointed out that the fundamental goal of the development of e-government is to improve the quality of government services and service efficiency, to meet the needs of the public. In view of the actual situation in our country, the article puts forward three key points in the concrete implementation: One is to integrate the existing network resources; the other is to popularize information technology such as office automation; The third is to speed up the formulation of relevant laws and regulations on government information, and select some cross-sectoral and cross-sector public service projects that have a direct bearing on the interests of enterprises or the people. As a breakthrough point for interconnection and interoperability, which Take the lead in the implementation of online services in some services, and gradually expand its service areas. Zhang Rui listen to the "government Internet access and administration" in a book, made a number of innovative ideas. For example, under the premise of building e-government, the functions of the government are expanded, and the concept of government information is defined, and the steps of e-government construction and the transformation of government administration mode are creatively proposed .

In summary, we can see that the study of e-government presents a diversity. At present, the development and research of foreign e-government have reached a certain level. In particular, the developed countries represented by the United States not only have corresponding policies for planning the development prospect of e-government, but are also implementing it step by step. However, the e-government of our country is still in the trial phase and it is impossible to copy and copy the actual situation of the development of e-government in our country, The choice of e-government theory in our country is mostly conducted from the national macro level. The theory about the development of local e-government is a little thinner. There are few researches on the theory of e-government in China and other countries, A series of factors, such as attaching importance to electronics and neglecting government affairs, constrain the development of e-government in our country

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

(A) literature review method In the preparation and writing process in the pre-up has been insisting on extensive access to relevant information, to learn the latest relevant theoretical literature at home and abroad, analysis and analysis of valuable historical data. To "Internet +", e-government and other key theories as a breakthrough point, theoretical data collection. (B) comparative analysis At the same time, I also collected and compiled the latest policies and guidelines for the implementation of e-government in our departmental cities and the status quo of implementation, compared with the advanced construction experience of developed countries, a comprehensive analysis.

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

With the rapid development of network information technology and the rise of "Internet +", the degree of global economic integration is deepening constantly. It is imperative for China to perfect the task of building a service-oriented government e-government. In the current era of information age, the old traditional government structure and mode of operation have hardly played a positive role in building a service-oriented government. This requires that our government further intensify the transformation of its functions. It not only needs to change management as a service but also develops "Internet plus government affairs." By using the new ideas and technical measures brought by the development of information technology, the government can enhance the ability and the quality of service of the government to serve the public. Through summarizing the successful experiences of foreign advanced countries in e-government construction and combining with the development environment in our country at home and abroad, this paper summarizes the current situation of e-government development in our country and points out the shortcomings. Combining with the emerging concept of "Internet +", this paper gives a concrete direction for our country to combine the development of service-oriented government and e-government in the future. As one of the means of service-oriented government building, e-government can make use of the emerging information network technologies such as Internet of Things, cloud computing and big data brought by "Internet +" to help the government achieve the optimization and reengineering of functional structure and government affairs process which help our government upgrade the level of e-government so as to enhance its ability to serve the public..

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

Due to the author's limited level, the conclusions drawn in this paper are only theoretical development opinions. The construction of e-government is long-term and complicated. What we have done in this paper is just the thinking and theoretical supplement to the theory of e-government construction of service-oriented government. However, combining theory with China's constantly evolving domestic and international environment and local environment and seeking for a suitable development path suited to our government as a whole, as well as all levels and localities and departments themselves, we also need to continually explore and practice it.

**Keywords:** Internet + government service, E-government.China

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5.

**The Study of Chinese Social Organizations Governance Transition’  
Traits and Path Under the Green Governance Situation**

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In the green governance theory system, green governance always adheres to the concept of “pluralistic governance”, namely it takes the interests and appeals of all parties into considerations, through identifying the relevance of each player in the governance system. Green governance aims to build governance system including diversified, democratic structure and coordinated, synergic mechanisms with “trinity” framework, which top-level design and push by the governments, market based implementation with interests driven by enterprises, and active advocacy and supervision with participation by social organizations. As the member of green governance synergic mechanism, the concept of green governance emphasizes inclusive development, requiring the social organizations being the true independent third-



party legal person. Furthermore, social organizations should strengthen themselves professional and normalized operations. Though actively undertaking the transfer of government-related functions and playing their own specialized advantages, social organizations could further improve the green governance structure and governance environment to closely adhere to the main governance bodies so as to accomplish in supervising, evaluating, coordinating, educating, training and guiding other governance bodies. Under this background, although China as the pioneer of green governance, it also cannot hide the fact that Chinese social organizations lack of independent civil personality, and because of the government power too strong, the social organizations show typical administrative governance. These factors not only can hinder Chinese social organizations effective and healthy development, meanwhile compared with government and enterprises, the power and social influence of Chinese social organizations are obvious weaker, causing the three main governance parties out of balance and it is hard to achieve the communicative rationality of ethic concerns and respect in the each other. In the end it will trigger the domino effect, putting off the whole green governance mechanism effects effectively running. From this perspective, Chinese social organizations exert the governance transition and relative theoretical research is quite urgent and necessary.

However, the study of Chinese social organizations governance and its governance transition is still in the preliminary stage at present. Most of the theoretical researches put main focus on the recognition of Chinese social organizations governance traits, and normative analysis of the reasons about the formation and relative solutions of Chinese social organizations governance. Here are some examples. Wang & Jia (2002) hold this opinion that Chinese social organizations show actively in various field including society, economy and culture at the transformation phase, especially in the environmental protection field where Chinese social organizations have become the most influential and distinctive group. But we should also notice that the legal status of Chinese social organizations and theirs actual properties are not quite equal, which means most of Chinese social organizations are lack of independent and self-governing because of the organization identity shortage, the government relative reform lag effect and the dual defect of basic values and institution construction in the Chinese social transition. While, as the concept of “unit” gradually differentiation and the administrative intervention from top to bottom further decreases, Chinese social organizations

realizing self-governing or real autonomy capability is predictable. Yan (2010) further points out that on account of the “twin-track policy” execution to the social organizations, Chinese government actually utilizes “administrative level”, this invisible net entangling the social organizations from top to bottom. Meanwhile, Chinese government strictly controls the social organizations concerning the organization legality acquisition from bottom to top. All these factors lead to the Chinese social organizations self-governing capability becoming obvious weak. For this reason, Chinese government should optimize its administrative environment, which refers to the government transfers from the “versatile” to the “governance” and through perfecting the legal institution and rebuilding the governance culture, the government provide a better governance reform space for the social organizations. If we study further, however, we could notice staying in the transformation reform phase and comparatively complicated social environment, the specific route and pattern of these “self-governing” capabilities improvement becoming vague and fickle. As Huang (2014) argues that due to a plenty of macro policy signals existing in the Chinese social organizations living environment, different government departments show multiple governance logic at the same time, so they adopt so called “flexible governance” mode. All in all, this multilevel interaction structure gives birth to an unstable self-governing space for the social organizations.

From the above arguments, we could notice that Chinese social organizations lack of self-governing capability, and because of the local authority governance concept transition, Chinese civil society gradually awakening and the other reasons, the issue about Chinese social organizations traditional governance pattern transformation has basically reached an agreement in the community of scholars at present. At the same time, which direction might Chinese social organizations governance mode transforms after all? The scholar Li (2015) relatively draws a clear outline. He holds the view that as the internet era arrived, the efficiency of information transmission is pushing the social group interaction into the vertical way, and then the traditional “unit” concept is fading. It is hard to satisfy the practical requirements for the all-directional, three-dimensional all kinds of information dissemination and social organization form towards flattening. From this point of view, in order to suit the need of constantly deepening reform and Chinese social transformation development, the governance mode of Chinese social organizations needs to transfer from the administrative governance to the social governance.

Looked from the overall, the available literature basically gives us a general picture about Chinese social organizations governance transition. It is widely believed that Chinese social organizations traditional governance, namely the administrative governance, has impeded the social organizations effectively executing their influence on the environmental protection, public service and the other aspects in the current political, social and technological context. At the same time, we should also point out that the perspective of existing research is relatively single and static, placing extra emphasis on the transition results, while ignoring the process guidance which is more important. Therefore, it is difficult to sufficiently explain the actual situation of Chinese social organizations. In addition, some scholars have realized that Chinese government adopts to the “flexible governance” considering complex and varied conditions, but what are the features of this kind of governance? What the specific governance phase does Chinese social organizations stay in at present? Which direction and which way might Chinese social organizations governance mode transforms? All kinds of stakeholders do not give clear and direct answers for these critical questions.

Based on the above arguments, considering the important effects of social organizations in the Chinese environmental protection system and the historical inevitability of Chinese social organizations governance transition, this paper would take document analysis method and cross-disciplinary research method, from the green governance aspect, focusing on the research concerning traits and path of Chinese social organizations governance transition and making relatively specific explanations about a variety of governance modes and features during Chinese social organizations governance transition process. By systematically summarizing the established laws and regulations about social organizations in China, this paper will also makes a basic judgment on Chinese social organizations governance stage and its features. Moreover, along with the view of green governance concept evolution, we may outline Chinese social organizations governance transition direction in a whole picture.

Here are the main expected conclusions in this paper:

From the perspective of the essential attributes and the inner logical requirements, green governance emphasizes on equality, willingness, coordination and cooperation, which adheres to the concept of order of "pluralistic governance", bases on the self-governance, and commits to "shared responsibility, pluralistic coordination, democratic equality and moderate carrying capacity". This essentially demonstrates that there should be a prerequisite that social

organizations need to be existed with independent legal entities, if they plans to play an effective role of initiative and supervision in a green governance system. With the historic necessity of the governance concept transforming to the green governance, the transformation of the social organization governance also has its righteousness.

Along with environmental history and based on the relationship between human and nature, this paper teases out logical thinking evolution of Chinese green governance. Actually, Chinese green governance would experience chaos phase, sporadic growth phase, ideological conflict phase and systematic development phase. In this situation, through sorting out of typical historical events, the governance thought and essence reflected by the green governance have high consistent with the social organizations. In general, social organizations in China will experience in four successive stages including fragmented governance, administrative governance, discretionary governance, and social governance. The critical phase is the discretionary governance for it directly affects the quality and speed of the growth of our social organizations and their governance transformation. In addition, there is a high degree of consistency between the path of governance transformation and the logic evolution of governance in China's social organizations.

Currently, Chinese green governance is staying at the ideological conflict and transition phase. Similarly, Chinese social organizations are in the discretionary governance phase, namely the transition stage right now, and this phase is showing gradualness, ambiguity and duality features. On the one hand, it reflects Chinese social organizations governance transformation from administrative governance to the social governance needs a long transition phase. On the other hand, it also appears the administrative power of government not really shrinks in this stage, which is still keeping the initiative to the Chinese social organizations control. Chinese government just makes some ambiguity intentionally or unintentionally and releases some social development space gradually and moderately for Chinese social organizations spontaneous formation and construction by the social power to promote theirs dependence.

In order to realize Chinese social organizations transition from the discretionary governance to the social governance, the basic and key point is how to construct a complete law system. As the centralized reflection of state will, law could exceed the administrative control structure, and gradually moving towards the self-governance social structure that

depends on the moral constraint and self-initiated demand. Through the clear authority, responsibility and profit partition, this kind of social structure could provide a stable and clear development space for Chinese social organizations.

About the theoretical contributions, firstly, this paper is from the green governance circumstance to emphasize the study necessity of Chinese social organizations governance transformation, and utilize the typical historical events, dividing Chinese social organizations into four types, systematically explaining the basic definition, features and governance requirements of these four governance modes. All of these efforts could greatly enrich the governance theory, especially in the field of social organization governance and green governance. Secondly, absorbing the green governance classification and synergy ideology, this paper holds the view that Chinese social organizations transition governance is just an actual governance mode, which could provide a new thought for the relative research and refinement. While from the practical meaning side, the above conclusions from this paper is not only can offer an instructive guidance for Chinese social organizations standardizing themselves development and reinforcing themselves independence, but also can provide some feasible advises for the Chinese government deepening social organization governance reform, perfecting relative law system and pushing Chinese social organizations realizing governance transition.

However, we also need to point out that the main conclusions of this paper mainly rely on integrating the literature, laws and administrative regulations, lacking of relevant empirical tests. To improve the practical value of this paper, we will look for some typical cases in the future to demonstrate these conclusions, and then enrich the theoretical research in this field.

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6.

## **Multiplier innovation and technological DNA with a focus on critics of Disruptive Innovation**

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### **Abstract**

In this study, we analyze the nature of destructive innovation in terms of technical DNA. To do this, we first extract the DNA and environmental condition elements that are fundamental attributes of products and services. Then, we predict the possibility of DNA change depending on the correlation between extracted DNA and environmental condition elements. Finally, based on the results obtained and the success stories of the destructive innovation, we compare the resultant differences with the theories claimed by the existing destructive innovation and redefine the destructive innovation as a new meaning of innovation. As a result, the Disruptive Innovation in terms of survival environment, evolution process, evolution result, and evolution condition has been influenced by environment change such as customer (market) and has made intermittent macroevolution, and new products and market have been created in the process, DNA was not changed when the product or service was first born. In this sense, the

innovation theory called Disruptive Innovation is defined as multiplier innovation. In addition, this study suggests that new industries can emerge by fusion of technology DNA through multiplier innovation.

Keywords: Innovation, Disruptive Innovation, Multiplier innovation, Technology DNA, Technology evolution, Product and Service evolution, New Industry

## **1. Introduction**

Knowledge exploitation and explore complementary asset are fundamental resource for both incremental innovation and radical innovation (Han, 2017).

In this study, we point out the nature of destructive innovation as the emergence of other new technology by breaking down the existing technology, pointing out the mistake and suggesting that it is the existing application rather than the technology destruction. In other words, it will be called Multiplier innovation instead of Disruptive Innovation. We will discuss it again later, but this paper suggests that the word destruction of destructive innovation means only a new application of existing technology. The purpose of this study is to review the existing framework of the destructive innovation theory. In addition, through reviewing the destructive innovation activities, we will emphasize the need for Schumpeterian innovations as well as destructive innovation in the innovation activities of companies for continuous growth. In addition, this paper contributes to academic research in that new industries can emerge due to the fusion of technical DNA through the Multiplier innovation theory presented in this study.

<Figure 1 / Process of Multiplier Innovation>

## **2. Theoretical Review**

Disruptive Innovation requires detailed and distinct strategies, rather than sustained innovation. This process focuses on unexpected opportunities, problems and success, rather than intent and focus on improving what is effective and what is not. In addition, businesses developed through destructive innovation can't achieve substantial profits in a short period of time because they are aimed at new markets or sub-markets. In this regard, venture capitalists and investors can be disturbed by the failure



of new businesses to profit quickly. And while destructive innovation designs products and services that reflect current customer needs, it also innovates new products and services by analyzing and understanding the new, undiscovered needs of people.

<Table 1 / Criticism of Disruptive Innovation>

### **3. Technology DNA and Technology Evolution**

<Table 2> Mutual coherence of evolutionary theory and destructive innovation

There is no inherent value in a technology per se. The value is determined instead by the business model used to bring it to market. An inferior technology with a better business model will often defeat a better technology commercialized through an inferior business model (Fumio Kodama and Tamotsu Shibata, 2015).

Different coordination mechanisms (markets, policies, knowledge) provide different perspectives on the same information and thus generate redundancy. Increased redundancy not only stimulates innovation in an eco-system by reducing the prevailing uncertainty; it also enhances the synergy in and innovativeness of an innovation system (Leydesdorff and Inga Ivanova, 2016).

we can conclude that the same species diversity and intense competition in nature of all plants and animals make it possible for genetics to change species (Darwin & Beer, 2001).

This evolutionary perspective is similar to that of the destructive innovation described in the previous chapter. First, in terms of the survival environment, as living things exterminate, evolve, and survive according to the influence of nature, products and services are also used as products and services. It can be seen that it is extinct, evolved, and survives depending on the influence of the customer (market) in which it belongs. Second, in terms of the process of evolution, it can be said that the repetition of progressive microevolution and interdependent macroevolution is similar to the repetition of product and service in sustained innovation and destructive innovation. Third, it is similar that new products

and new markets are created by the evolution of life, the birth of new species, and the destructive innovation of products and services. Fourth, in terms of the conditions that cause evolution, it is similar that destructive innovation takes place through rapid changes in technology and market environment, such as the dawn of rapid changes in the natural environment. Therefore, it can be seen that living things, products and services are mutually consistent in terms of survival environment and evolutionary process, evolutionary result, and evolutionary condition.

### **3.1. Product & service evolution hypothesis**

First, products and services evolve toward optimal conditions as the environment changes, and companies control them. Second, only products and services that have evolved to optimal conditions are selected by the customer (market), and the rest are gradually scrapped. Third, products and services evolve by the needs of customers (markets), and the underlying attributes (DNA) that determine species of products and services do not change. Fourth, when the DNA of products and services is changed appropriately to the environment, destructive products and services with new customer values are created and new markets are created. The evolution of products and services consists of DNA and technology, the fundamental attributes of products and services, environmental conditions affecting products and services, such as changes in markets, and products and services innovated by the enterprise. Here, DNA is a fundamental element that determines the direction of product evolution, environmental conditions play a role in influencing fundamental factors, and products and services are defined as the outcome. The evolution of products and services means that when a company that is the organizer of innovation applies the new environmental conditions to improve product and service performance, it continually innovates while maintaining its fundamental attributes. When creating new DNA-based products and services, it can be defined as a destructive innovation. DNA is a fundamental property that has been preserved unchanged since the first product or service was born. That is, the property is maintained even when the appearance or function of the product is changed. Therefore, DNA is a

common attribute found in past products and current products through evolution of products. Environmental conditions include products that provide customer value from DNA, physical elements such as materials and technologies that affect the appearance and functioning of the service, psychological elements that dominate the customer's perception of the product, and an acceptance condition element of the attribute formed by the service. We have used the following method to demonstrate that DNA is replaced by a customer (market) choice when new products or services are applied to it, and new forms of innovation occur, using the above evolutionary model. First, we extract DNA and environmental condition elements that are fundamental properties of products and services. Then, we predict the possibility of DNA change depending on the correlation between extracted DNA and environmental condition elements. Finally, based on the results obtained, we compare the resultant difference with the theory claimed by the existing destructive innovation and redefine the destructive innovation as a new meaning of innovation.

### **3.2 DNA extraction**

<Table 3> DNA extraction

In order to extract the DNA of products and services, we used the following method to analyze the fundamental attributes (customer value) that do not change to past and present products in a specific field. First, the product evolution process is created using the product and service evolution model. At this time, we record not only the products of the currently selected company but also the major products from past to present including names of other companies in name and form. Second, under the product evolution process, write the underlying attributes and the improved attributes in the order of evolution. Among the initial attributes of products and services, those that do not change constantly are written in the essential attribute part, and the improved attribute is written in the improved attribute part. According to a study by Schilling (2010), the portable personal digital assistant (PDA) industry has become a dominant design competitor to major companies such as Nokia, Motorola and Samsung after

the initial PDA industry, and the successful launch of Palm Pilot and Black Berry It has gone through an evolutionary process that has led to the market share of the late-entry Apple iPhone. The PDA evolution process can be expressed in the following form. Like the above process, PDA has been continuously evolving since the occurrence of the initial PDA industry to the present, but the fundamental nature of software, memory, connectors, and information input devices based on batteries has been maintained. The means to enter information during the course of evolution has changed from electronic pens to QWERTY keyboards and touchscreens, but this is an evolution of performance.

### **3.2.1 Extraction of environmental condition elements**

<Table 4> Environmental condition factor

Environmental condition factors can be divided into technologies and other products that can affect the evolution of products and services, and customer perception. The technology element extracts five to ten key core technologies that are relevant to the product. The third-party element creates other rapidly evolving products with attributes. The perceived space factor consists of lifestyle and customer needs.

### **3.2.2 gene replacement**

<Table 5> Genetic Substitution

By analyzing extracted DNA and environmental condition elements, companies can predict the direction of DNA substitution that can provide new customer values that are completely different from existing products. To replace the DNA, first prepare the table by comparing the environmental condition elements with the extracted DNA elements. It then links the DNA elements individually one by one to the environmental condition element and predicts how the environmental condition element can change the DNA element and thereby create some innovative customer value. Finally, we assign DNA sequences to the DNA element replacement candidates, assign them to environmental condition

elements, and select the DNA substitution patterns that are expected to provide the most innovative value.

#### **4. Success stories of Disruptive Innovation**

<Table 6> Successful cases of destructive innovation

This result is characterized by the fact that the minimal function / low price of the destructive innovation wins the competition with the products and services of the mainstream company and the new market is created by meeting the needs of the customers who did not use the existing products and services for economical or functional reasons Feature. Ultimately, the technology applied to the destructive innovation is also the same as the existing technology in the DNA of the product or service in a specific field, but it is proved that it is slightly different in accordance with the change of the environmental conditions such as minimum function, low price, it is. As a result, new industries emerge through technical DNA and Multiplier innovation.

<Figure 2> New Industries Emerge through Technical DNA and Multiplier Innovation

#### **5. Conclusion**

From the results obtained through gene substitution, it can be seen that even though the environmental conditions change, DNA, which is a fundamental property of products and services, is constantly maintained and unchanged. The improved attributes of the evolution of the product when it was applied to the environmental condition elements were continually added and changed, but the original properties maintained from the time the product or service first came into existence were unchanged. Therefore, we can now apply Disruptive Innovation as a Multiplier Innovation to understand how to create new customer value continuously in customer (market) environment where products and services belong. In addition, Multiplier innovation fosters convergence of technology

DNA to attract new industries and make continuous innovation possible. In this way, we are looking for ways to contribute to start-up based on innovative technologies.

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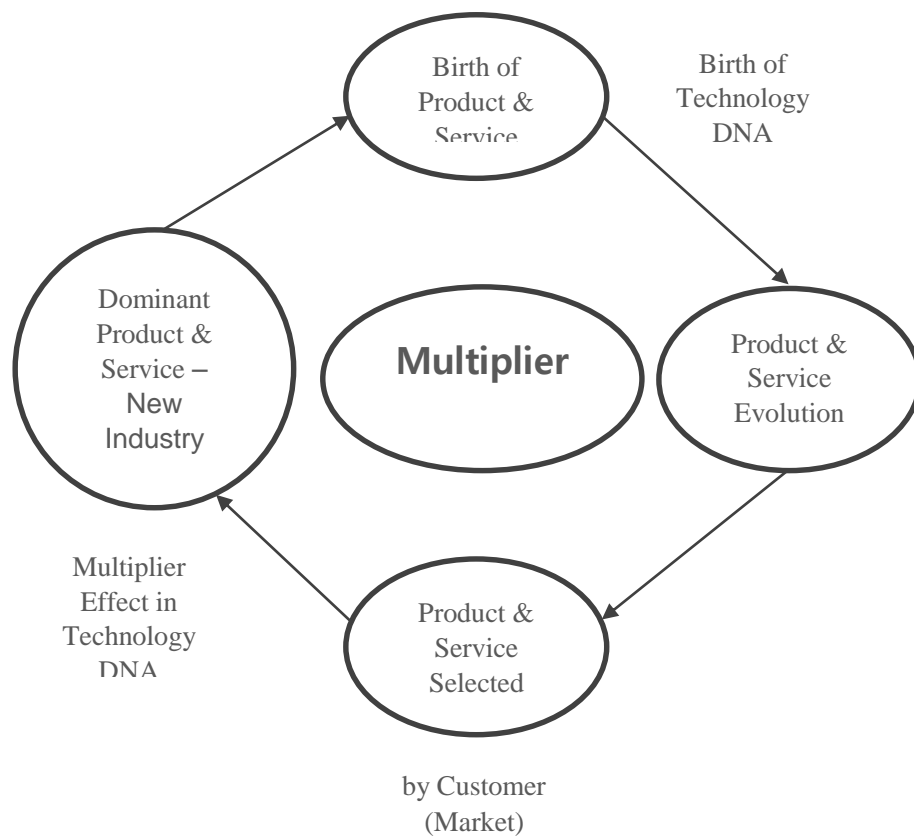
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<Figure 1> Process of Multiplier Innovation



<Table 1> Criticism of Disruptive Innovation

Author	Opinion
<b>Will Oremus (2014)</b>	The book that created the term destructive innovation relies on uncertain anecdotal evidence. Destructive innovation theory has no predictive value. Christensen and others should not be confused now. Disruptive innovation is simply a theory of why a company fails.
<b>Gulati and Garino (2000)</b>	Barnes & Noble decided to establish a completely separate division (barnesandnoble.com) for online retailing, giving up the synergy of purchasing, information sharing, branding, cross-promotion and customer service.
<b>Gulati and Garino (2002)</b>	Traditional retailers involve trade-offs when deciding on the integration or separation that they face when they enter the online retail business.
<b>Iansiti, McFarlan, and Westerman (2002)</b>	Existing retailers that integrate business and web operations are more efficient at generating revenue than retailers who maintain in the autonomous sector
<b>McDermott and Colarelli O'Connor (2002)</b>	Isolation can protect a project from adverse effects in the mainstream, but it shrinks the project from the most important source of learning, capacity and resources.
<b>Cohan (2000)</b>	When the destructive business grew large enough to require enough resources, it returned to the mainstream business.
<b>Useem (1999)</b>	Schwab actually set up a separate department (called Christensen's recommendation) called e-Schwab, but after integrating the channel after experiencing channel conflict. This indicates that creating a separate department has both advantages and disadvantages.
<b>Markides, C. (2006)</b>	The new business model is not necessarily superior to the business model established by the company. In fact, it is not necessarily the best strategy for an existing company to give up its existing business model and prefer a new one, or to grow a new model with an existing business.
<b>Markides and Geroski (2005)</b>	Existing companies should not attempt such innovation, but small start-up companies with the necessary skills and attitudes to succeed in this game should create this kind of market. The established firm should focus instead on integrating the young market into a massive mass market.

<b>Tellis, G. J. (2006)</b>	The technology does not evolve along the S-curve, does not cross performance once, and does not always start or end before the previous technology level. Rather, the performance path of a competing technology may follow irregular step functions, never intersect, or intersect multiple times.
<b>Wladawsky-Berger, I. (2014)</b>	Exponential innovation has the power to destroy existing ones in three main ways: By challenging existing business models, market assumptions, and overall culture, by discarding a substantial portion of existing assets and installed base, by allowing them to erode their existing income and profit streams.
<b>Joshua Gans (2014)</b>	If the new technology can be successful for the elderly, then not only must we be satisfied with the established value proposition of the existing technology, but must also improve it in terms of speed, quality or differentiation. And it was essentially unknown. Incumbents can innovate and lose too quickly, innovate too late, and suffer losses. At this level, this theory does not help to distinguish and identify the factors that link innovation to the company's ongoing success.
<b>Lynne Kiesling (2014)</b>	The origin of innovation lies in uncertainty, not risk. Innovation can break that historical relationship if it is truly destructive. And until the innovators have triggered the process, it is not possible to know that. Some of the factors that lead to success or failure are actually unknown.
<b>Jill Lepore (2014)</b>	Destructive innovation does not work as advertised when switching from specialty steel manufacturing to educational services, and does not work well when applied to manufacturing. Crucially, sustained innovation recognized by Christensen's theory is much more successful.
<b>Andrew A. King and Baljir Baatartogtokh (2015)</b>	Christensen argues that established companies are doing a great job of launching innovations to please their best customers, but that effort is in return for the "destructive innovation" of start-ups aimed at a variety of markets with new products do. Some companies are replaced by destructive innovation, but they are not as common as Christensen suggests.
<b>Vivek Wadhwa (2015)</b>	Christensen's theory of destruction is wrong. Competition no longer begins in industries other than the market. Now Uber is trying to deliver groceries on the day with UberFresh, and is promising a 10-minute lunch with UberEats. Uber is simultaneously challenging the supermarket, Amazon and food supply industries. In addition, UberHealth is planning to provide flu vaccine to people who need it. When Uber completes its autonomous vehicle software, all industries that rely on the transportation sector will face a real destructive tsunami.

<b>Peter Thiel &amp; Blake Masters (2014)</b>	<p>If start-ups are tied to destructive innovation, it's easy to get in the way of obstacles just before your eyes to offset the dominance of your existing market. Disruptive innovation is not the view of a new company, but the view of existing companies. Therefore, it can't be said that the position against the existing companies is necessarily new.</p>
<b>Yunokami Takashi (2011)</b>	<p>In the 1990s, as the main consumer of DRAM moved from large PCs to general PCs, Japan, which had the largest share of the DRAM market for large PCs, ranked first in Korea, which was optimized for mass production of DRAMs for PCs. What is required for PC DRAM is low cost and small size, high quality and long-term guarantee required for large PCs has not satisfied demand.</p>

<Table 2> Mutual coherence of evolutionary theory and destructive innovation

	<b>Theory of Evolution</b>	<b>Disruptive Innovation</b>
<b>Subject</b>	nature	Enterprise
<b>Object</b>	Life	Products, Services
<b>Survival Environment</b>	nature	Customer (Market)
<b>Process</b>	Gradual, intermittent	Persistent, destructive
<b>Evolutionary Condition</b>	Natural environment change	Technology, Market Environment Change
<b>Evolutionary Result</b>	The birth of a new species	New product, market birth

<Table 3> DNA extraction

	<b>DNA extraction</b>			
	<b>PDA</b>	<b>-&gt; NEW PDA -&gt;</b>	<b>Black Berry</b>	<b>-&gt; Smart Phone</b>
<b>Fundamental attribute</b>	Information input device Software (OS) Modem (Connector) Power (battery) Memory	Information input device Software (OS) Modem (Connector) Power (battery) Memory	Information input device Software (OS) Modem (Connector) Power (battery) Memory	Information input device Software (OS) Modem (Connector) Power (battery) Memory
<b>Improved Attributes</b>	none(origin)	Speed improvement  Functional simplification  Low-cost strategy	Fast wireless internet  User-to-user networking  QWERTY Keyboard	Stylish Design  Large, clear touch screen  high quality Taking pictures and videos  Download music, video, game data



		Electronic pen		Fingerprint, iris, facial recognition
				Electronic financial transaction

<Table 4> Environmental condition factor

	Environmental condition factor																			
	Technical factors							Other Product Elements							Customer awareness space factor					
Element Attributes	V	I	W	P		M	B	X	F	T	U	P		L	N	J	C	C	S	A
DNA Element	O	N	I	H	O	E	L	A	O	A	B	O	B	I	E	O	C	C	S	A
	I	F	R	O	S	M	C	O	D	B	O	S	E	F	N	B	O	T	E	
	C	F	E	T		O	O	M	E	E	K	I	A	E	E		T	U	X	
	A	O	S	C		R	M	B	P	T	N	O	N	S	D		R	R		
	L	N	C	O		R	M	E	H	P	E	A	A	T	S		E	E		
		Input		I																
		Output		N																
		Save		G																
Information Input Device								√												
Software (OS)															√					
Modem			√																	

(Connector)																						
Power (Battery)								√														
Memory																√						

<Table 5> Genetic Substitution

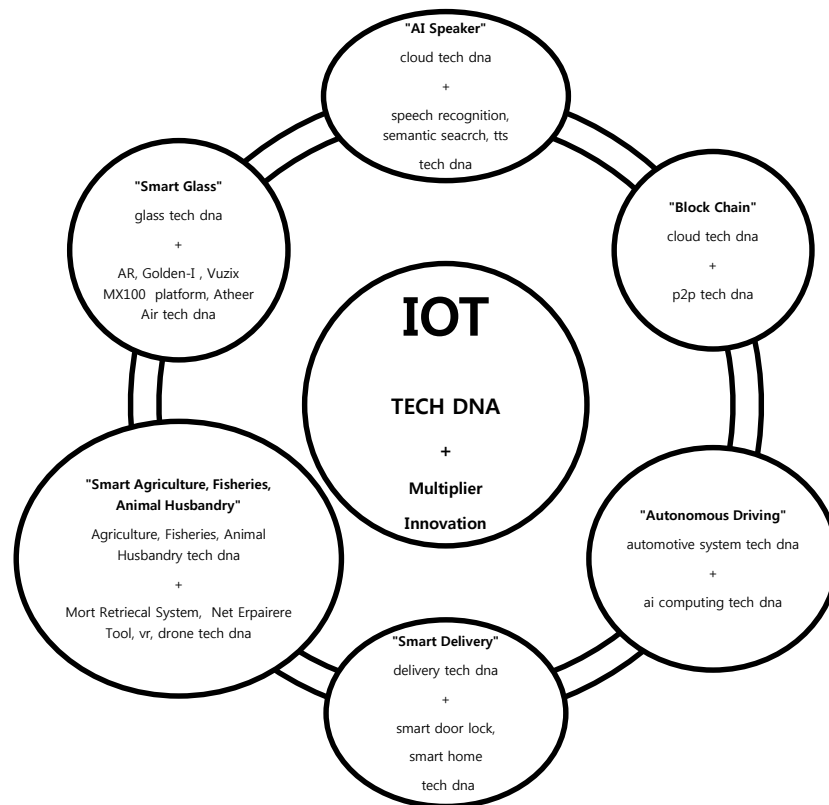
	Genetic Substitution						
Technical Factors	Voice Call	Information Input Output Save	Wireless Communication	Photo Shooting	OS	Memory	Battery
Other Product Elements	Black Berry	Xiaomi Battery	Folder Phone	Tablet PC	Ultra Book Net Nook	Professional Camera	Beats by Dr. Dre
	QUERTY Keyboard (Physical Board)	Large Capacity Battery	Folding (Vintage) Design	Relatively Large Screen	Lightweight Multifunction High Performance	High Quality Multifunction	High Quality Sound Sensational Design
Customer Awareness Space Factor	Lifestyle	Needs	Job	Country	Culture	Sex	Age

<Table 6> Successful cases of destructive innovation

TYPE	Number of patents of Existing products (based on Kipris)	Number of patents for Disruptive products (based on Kipris)
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‘Hearing Aid’ H04R 25/00 H04R 1/02	‘Original Hearing Aid’ (2,020 registered patents)	<b>DELIGHT</b> ‘Hearing Aid’ (2 registered patents)
‘Indoor Tent’ E04H 15/10 E04H 15/00	‘Original Indoor Tent’ (566 registered patents)	<b>BYMOM</b> ‘Indoor Tent’ (1 registered patents)
‘Electric Driver’ B25B 23/147 B25B 23/18 B25B 21/00 B25B 23/00	‘Original Electric Driver’ (1,572 registered patents)	<b>THE HIVE</b> ‘Electric Driver’ (1 registered patents)
‘Shampoo (ingredient extraction method)’ A61K 36/81 A61K 9/20 A23L 5/20 A23L 17/60 B01J 2/06 B01J 19/18 A61K 8/97 A61K 31/01 A61Q 19/00 C12P 23/00 A61K 36/03 A61K 36/899 A61P 9/12 A61K 9/22	‘Original Shampoo (ingredient extraction method)’ (3,669 registered patents)	<b>ECOMINE</b> ‘Hair Loss Prevention Shampoo’ (10 registered patents)
‘Air Freshener’ A61L 9/12	‘Original Air Freshener’ (7,350 registered patents)	<b>PIUM LABS</b> ‘Smart Defuser’ (1 registered patents)
‘Piping Loosening Prevention Technology’ F16L 19/02 F16L 55/00 F16L 15/08 F16L 33/24 F16K 27/12 F16L 27/02 F16L 33/24 F16L 19/02	‘Original Piping Loosening Prevention Technology’ (New Market Creation)	<b>SSOLLOCK</b> ‘Piping loosening lock, Fitting loosening prevention hole’ (4 registered patents)
‘Cosmetics (raw material manufacturing method)’ C07K 1/00 C07K 1/12	‘Original Cosmetics (raw material manufacturing method)’ (16,907 registered patents)	<b>MARIN TECHNO</b> ‘Marine Collagen Cosmetics’ (1 registered patents)
‘Wearable Device (program)’ G02B 27/01 G03B 17/00 G06K 17/00 G06K 19/06 G08G 1/005 G08B 21/02 G08B 25/10 G06F 21/31 G06F 21/32 G02B 27/02	‘Original Wearable Device (program)’ (1,183 registered patents)	<b>NEXSYS</b> ‘Wearable Device Utilizing Video Transmission Device, System’ (7 registered patents)
‘Bluetooth (sound wave communication)’ H04W 12/06 H04W 4/00 H04L 9/32 H04L 29/06 G06F 3/16 G06F 3/01 G06Q 50/10 H04B 11/00 G06Q 50/10 G06Q 30/02 G06K 17/00 G01S 3/80 G06Q 20/38	‘Original Bluetooth (sound wave communication)’ (23,826 registered patents)	<b>PERPLES</b> ‘SoundTAG(sound wave communication technology), BLE (Bluetooth Low Energy technology)’ (9 registered patents)
‘Wearable Device (Biometric)’ A61B 5/11 A61B 5/00 G06F 21/32 H04W 2/06 G06F 3/01	‘Original Wearable Device (Biometric)’ (1,183 registered patents)	<b>ZIKTO</b> ‘Wearable band arki, Biometrics / Authentication method’ (7 registered patents)

<Figure 2> New Industries Emerge through Technical DNA and Multiplier Innovation



## 7.

### **A Study on the Differentiated Knowledge Service Strategy by Addressing the Moderating Effect of Company Growth Stages on the Organizational Performances : The Case of South Korea**

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## **Abstract**

### **Purpose/ Research Question**

The objective of our study is to find the effect of knowledge services on the business performances according to the company growth stages. Our previous findings showed that decision making and information competitiveness of SME executives play a mediating role while information provided by knowledge services affects business performances.(Park et al., 2017; Park et al.; Yusr, 2016; Kim et al., 2016; Kim and Jung, 2015) In this study, the moderating role of company growth stage has been added to our previous research model(Park et al., 2017) in order to determine which stage of company growth we should concentrate on in providing knowledge services.

Our research questions are as follows.

RQ1. Does the company growth stage play a significant moderating role in the relationship between knowledge services and business performance?

RQ2. Does the company growth stage play a significant moderating role in the relationship between knowledge services and mediating variables such as decision making and information competitiveness of SME executives?

RQ3. Does the company growth stage play a significant moderating role in the relationship between mediating variables and business performance?

### **Key Literature Reviews**

M. Scott and R. Bruce proposed a model of company growth in small business.(Scott and Bruce, 1987) The

model isolated the five stages of growth in small business: inception, survival, growth, expansion and maturity. N.C. Churchill and V.L. Lewis also developed a small business framework for company growth stages.(Churchill and Lewis, 1983) They divided the stage of growth in small business into five stages: existence, survival, success, take-off, and resource maturity. In our study, based on the previous studies, we redefined the growth stage of the company into three stages as follows: start-up, growth and maturity.

C. Tendai investigated the effect of networks in the start-up and growth stage of the life cycle on the small business performance.(Tendai, 2013) They identified networks that dominate at the start-up and growth stage of the firm's life cycle and addressed the role of strong and weak ties in the SMEs performance. K. Elsayed and H. Wahba discussed the relationship between inventory status and firm performance from the perspective of an organizational life cycle.(Elsayed and Wahba, 2016) They investigated correlations of inventory and firm performance in the initial growth, rapid growth, maturity and revival stages of organizational life cycle. S. Su et al. studied the moderating effect of the stages of organizational life cycle on the association between the approach to using controls (interactive vs diagnostic) with organizational performance.(Su et al., 2015) They classified the stage of organizational life cycle into four stages: birth, growth, maturity and revival.

## **Methodology**

Small and medium-sized firms which received KISTI knowledge services more than once have been selected to gather survey data. An e-mail invitation to 1397 target users of KISTI knowledge services was sent by implementing an online questionnaire to find the moderating role of company growth stage in the effect of knowledge services on business performances. The online survey had been conducted for two months and 341 firms responded to the survey.

Information utilization of knowledge services has been used as an independent variable. Contribution degree to decision making and information competitiveness have been introduced as mediating variables. SME performances such as contribution degree to the growth of current revenue, future export, and employment have been selected as dependent variables. The moderating role of the company growth stage of the survey-responded firms has been investigated by using structural equation modeling. Multi-group analysis has been conducted to analyze the moderating effect of company growth stages of the firms. Smart PLS program was used to analyze the data.

## **Expected Results**

Evaluation of PLS-SEM is composed of two stages: outer model(measurement model) assessment and inner model(structural model) assessment. In the outer model assessment, indicator loadings will be examined in the first step. And the constructs' internal consistency reliability will be assessed in the second step. In the third step, the convergent validity of constructs will be examined. In the inner model assessment, path coefficients, determination( $R^2$ ) and cross-validated redundancy( $Q^2$ ) will be examined. Differences of path coefficients among each group of company growth stages will be analyzed and the insights from the PLS-MGA results will be discussed.

## Research limitations and Implications

There are few research articles addressing the effect of information on firm performances according to the company growth stages. And an academic method for measuring information utilization and contribution degree to decision making needs to be established.

**Keywords:** Company growth stage, business performance, SME supporting service, multi-group analysis, PLS-SEM

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## 8.

### Deep understanding the relation between open innovation and drug development in Korea

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#### Abstract

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

The problem of low productivity in the pharmaceutical industry is a long-standing issue. (Munos, 2009, Schuhmacher et al, 2013) The cost of investment in the pharmaceutical industry has increased to an extent not comparable to that of other industries, and the risk for new drug development is also increasing. On the other hand, healthcare expenditure is increasing due to aging and improving quality of life around the world (Rho and Kim, 2017), and the financial stability of health insurance has been threatened, leading to demand for effective new drug development. Open innovation in the pharmaceutical industry is a hot topic in order to mitigate risks and improve the effectiveness of new drug development. (Kaitin, 2010) This is no exception in Korea. Korea has not been an active country in the development of new drugs. In recent years, Korea's pharmaceutical industry is expanding its efforts for R&D to develop new drugs, then there have been remarkable achievements related to the new drugs in Korea. In this study, to understand the characteristics of open innovation in the pharmaceutical industry, especially the characteristics of open innovation for latecomers who are not global major pharmaceutical companies, we will examine the mechanism of cooperation in relation to successful drug development in Korea.

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

Kaitin(2010) explained that other technology-based industries have often changed their technology development processes to accommodate environmental changes, but pharmaceutical sector is still inefficient and risky. Kaitin argued that the pharmaceutical industry, faced with productivity limits, should improve its current R&D model to overcome the current crisis. An important issue, especially in the pharmaceutical industry, is that the success rate of new drug development is declining. Until the 1990s, the approval rate for new drugs was 21.5%, but dropped to 16% in the early 2000s. In order to increase the success rate of new drug development, they need a new business mode to apply to pharmaceutical R&D. Kaitin explained the new role of academia, small pharmaceutical and biotechnology companies, CROs and other partners, and large pharmaceutical companies.

Dougherty(2017) suggested that “grand challenges” like as pharmaceuticals, health care, alternate energy systems, climate control etc. is the next frontier in terms of technology and innovation management, and these problems should be newly approached by co-evolution and complex innovation eco-system of sciences and technologies. These problems cannot be solved with the existing managing model, leading the need for a new theory for managing multiple organizations. Dougherty argued that taking advantage of emergence of complex innovation eco-system is important, which means that it is important to know how global dispersion of new emerging knowledge and utilize new emerging knowledge achieved in complex networks of multiple organizations. As new knowledge is created on the complex network and its knowledge is communicated, new value is also created via this process on the complex network. The ability to capture and respond quickly to the opportunities for new value creation is the appropriate policy of technology management for the new era. This is particularly significant in the pharmaceutical industry, which has faced productivity problems.

Patra and Krishna(2015) analyzed the linkages status of company-company, and company-university, in their research on globalization of R&D and open innovation in India. Globalization in R&D and open innovation is no



longer limited to a few companies. Especially, multinational firms actively promote globalization of R&D. Patra and Krishna analyzed the collaborative networks of multinational firms with local firms and local academies in the IT fields, IT hardware firms such as Sun Microsystems, Hewlett-packard Co., etc., Semiconductor firms like Intel Corporation, Texas Instruments Inc., etc., and IT software firms like Microsoft Corporation, IBM, etc. They found that multinational firms are mainly cooperating with local firms and that their partnerships with local academies are relatively weak. Based on the results of the analysis, they argued that policies are needed to strengthen industry-academia linkage.

The pharmaceutical sector is faced with a more severe productivity crisis than any other technology sector. Therefore the interest in open innovation is increasing. As in the case of Patra and Krishna, analyzing pharmaceutical partnerships and understanding the knowledge transfer and success mechanisms of drug development will be of great help in addressing future challenges of pharmaceutical and health care.

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

Clinical trials are the most costly and time-consuming area for new drug development. Clinical trial data is published by ClinicalTrials.gov, administrated by the FDA, where information on participating companies, universities and institutions, as well as information on the target diseases, participants, and places can be obtained. Therefore, clinical trial database is an importance information source to understand the collaborative network and open innovation status in pharmaceutical industry. In this study, we will analyze the open innovation of the pharmaceutical industry with the data of ClinicalTrials.gov.

Recently, Korea is investing heavily in the pharmaceutical sector, and some new drug development success cases are emerging. It is good for pharmaceutical companies if we get some knowledge about what kind of open innovation has been conducted through a collaboration network of new drugs that have been approved by the FDA.

In this study, the authors will identify new FDA-approved drugs by Korean pharmaceutical companies and extract clinical trials data for the new drugs from ClinicalTrials.gov. Then parsing the data extracted from ClinicalTrials.gov by item and generating information of main sponsors and collaborators of clinical trial data will be done. Constructing a collaborative network for each new drug, degree of globalization, degree of academia, degree of complexity, degree of dynamics will be measured for each network. This study identified and characterizes the characteristics of the clinical trial cooperative network for successful cases of new drug development. In particular, we analyze the evolution of open innovation by observing evolutionary changes in clinical trial collaboration networks.

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

This study is an attempt to explore cases of successful open innovation in the field of pharmaceutical industry. Especially we focus on success stories from relatively small pharmaceutical companies, not global giant pharmaceutical companies. Identifying and typifying the characteristics of the clinical trial cooperative network on successful drug development cases of Korean pharmaceutical companies can provide significant implications for open innovation in the pharmaceutical industry. Open innovation models are expected to be constructed in terms of collaboration with global firms, local firms and academia for successful drug development.

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

This study is an analysis of successful cases of Korean drug development by Korean companies, reflecting the characteristics of national environment such as policies, institutions and regulations. Therefore, it is desirable to consider the environment impact of Korea when interpreting the results of this study.

**Keywords:** pharmaceutical industry, new drug development, clinical trial, collaborative network, network analysis, open innovation

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## Regional Innovation Systems as Complex Adaptive Systems: the case of lagging European Regions

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### Abstract

#### 1. Purpose/ Research Question:

Although a large stream of literature is focusing on Regional Innovation Systems and on how to support their development and competitiveness (e.g. Asheim et al., 2011; Doloreux and Parto, 2004; Foray et al., 2011), we are witnessing a strong discrepancy among theoretical frameworks, adopted innovation policies, and related regional performances. In fact, numerous studies have shown that RISs with similar industrial structures and characteristics can strongly differ from each other even in terms of innovation and competitive performance. This gap is more evident in the case of the so-called lagging regions (characterized by moderate and modest level of innovativeness) (Regional Innovation Scoreboard, 2009; 2012; 2014), notwithstanding the adoption of specific policies and incentives. Evidently, there is something deeper than the failure of an innovation policy devoted to support the innovation and economic growth.

The emergent viewpoint is that regional performances are affected by powerful inertial mechanisms and dimensions, which are undervalued by both researchers and policy-makers (Egbetokun et al., 2017). Discovering the virtuous mechanisms of most innovative regions, and the vicious ones of lagging regions, should be the key goal of every regional innovation policy.

According to this, the paper aims to address the following research questions:

*What are the resources, competencies and mechanisms able to support the so-called lagging regions to trigger virtuous innovation and economic growth processes? What are the main barriers which hinder the development of effective innovation processes notwithstanding the public incentives?*

In order to address these research questions, we propose a computational laboratory, called CARIS, to support policy-makers in defining proper and effective regional innovation policies, specially for the lagging regions of Europe. The CARIS laboratory appears to be consistent with a new emerging perspective in the analysis of local productive-economic systems, in which the central point is the framing of these systems as generated from complex interactions among internal and external agents (Pilotti et al., 2013). Such complexity could explain the

existence of differences among the worldwide regions in terms of innovation, economic development and growth. The CARIS lab is built upon the claim that complexity and social simulation can be used to support policy-makers in defining proper and more effective innovation policies. Once fully developed and validated, the CARIS laboratory could be used as policy advice tool to define and evaluate effective innovation policies.

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

The concept of Regional Innovation Systems (RISs) has been gaining increasingly attention not only from academic researchers, but also from policy-makers. In literature, RISs are defined as territorially embedded institutional infrastructures supporting innovation within the production structure of a region (Doloreux and Parto, 2004). Innovation is meant as an evolutionary and social process, given that it derives mainly from collective learning and synergic processes among different actors, both internal and external to the organizations (Cooke, 2016). In other words, regional innovation processes are built on the basis of cumulative learning, social interactions and are strictly path-dependent (Dougherty, 2017). These characteristics make them difficult to replicate.

Inspired by this literature and compelled by the environmental turbulence, policy-makers have added a regional dimension in the definition of innovation policies (Werker, 2006) by paying much attention on RIS literature.

In the last years, academics, practitioners and policy-makers started to discuss about what are proper and effective policies able to foster virtuous innovation and growth processes (Foray et al., 2011). Within this policy framework three perspectives are relevant to better understand the state of the art of current innovation policies, namely:

- The Learning Region Perspective that analyze how different actors (e.g. firms, customers, universities) learn to cooperate in addressing economic and social innovation, by sharing the same regional context;
- The Smart Specialization Theory that advocates that innovation policies must be embedded in the local reality;
- The Ecology of Innovation Perspective that emphasizes the importance of diversity and social interactions for the innovation.

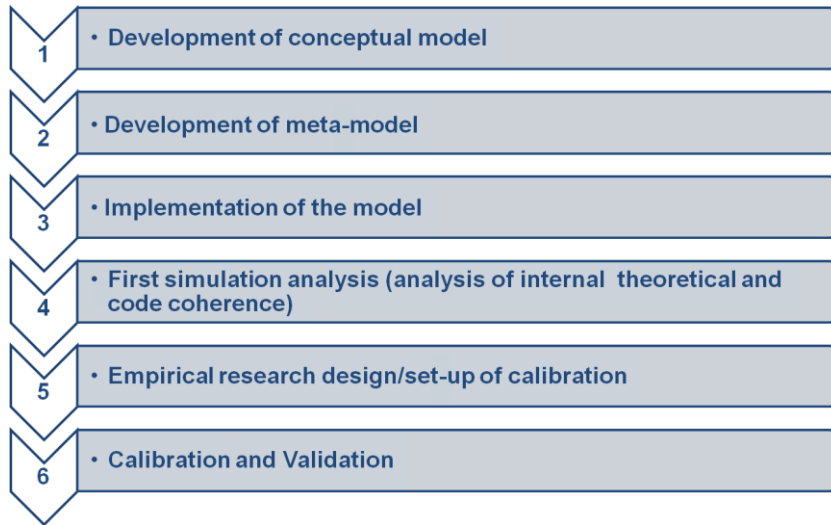
This last approach shows several common elements with the growing body of literature that defines productive-economic innovative systems (e.g industrial districts, regional clusters) as Complex Adaptive Systems (CAS). A CAS is composed of a set of connected or interdependent different virtual agents, which interact each other on the basis of simple rules (Holland, 1995, p. 10).

As a consequence, increasingly, conceptual and policy frameworks relating to territorial innovation systems refer, more or less explicitly, to the high complexity characterizing them. Despite main concepts of complexity science have been used from a theoretical point of view to characterize territorial innovation systems we claim that these concepts are poorly explored from a practical point of view.

## **3. Design/ Methodology/ Approach**

The methodology adopted to answer the research questions above is the agent-based modeling (ABM) and simulation. The CARIS lab is built to explore self-sustaining innovation cycles in regions and to support policy makers in designing adequate interventions toward innovation and growth in lagging Regions.

The methodology to build up a computational laboratory involves six main steps as depicted in Figure 1.



**Figure 1: The methodology for CARIS construction and implementation.**

In the first step, the theoretical background is translated in a conceptual model. In the second step, a pseudo-code is built, in which micro-specifications about agents' behaviors are reported. The next step, the implementation of the meta-model, requires the choice of an adequate software platform and the activity of code writing. The model here proposed has been implemented and simulated using NetLogo 5.0.4. The implemented model, thus, should be verified and validated.

Through verification it is studied whether the implemented model is coherent with theoretical and empirical available knowledge about the investigated system. External validation refers to the relationships between the simulated results and the empirical data. In our case, through some simulative experiments we tested the coherence of the code with the meta-model and the capability of the proposed computational laboratory to generate expected results as showed in the literature.

To externally validate the model, we adopted the calibration of input and output parameters using empirical data available in ProInno Regional Innovation Scoreboards and Eurostat.

At this stage of the research the calibration is completed and external validation can be initiated. Next sub-sections introduce and briefly describe the agent-based model on which the CARIS lab is based and the methodology used to calibrate parameters.

### **3.1 The Agent-Based Model**

The agent-based implementation of CARIS (figure 2) is characterized by two different classes of agents: 1) the Competitive Environment (CE) and 2) the Competent Actor (CA), the latter representing different categories of actors - such as firms, research groups, research institutions, mediators of innovation, local institutional actors – incorporating different competencies.

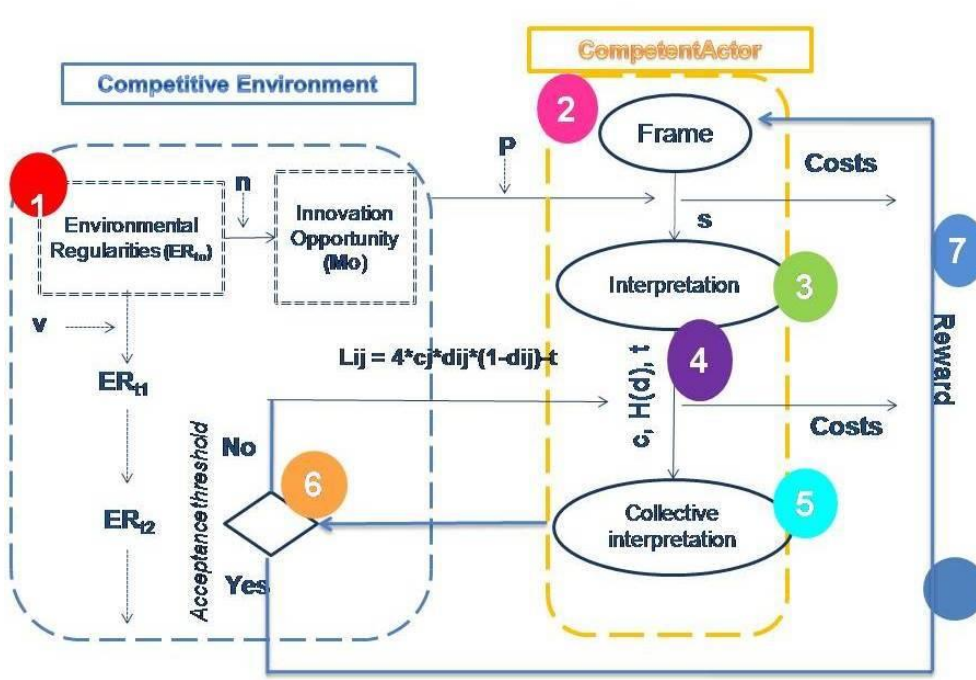
#### *The Competitive Environment CE*

The CE is characterized by a binary string (-1 or 1) ER of length  $l$ , representing the Environmental Regularity that a CA should discover and match up. The Agent CE makes three actions:

- The generation of Environmental Regularities (ERs). The ER changes over time according to a given

volatility ( $v$ );

- The generation of Innovation Opportunities (IOs). An environmental noise ( $d$ ) alters the content of the string  $ER$ , and transforms them in a new set of strings called Innovation Opportunities IOs. The Individual Competent Agents (ICAs) have access only to IOs.
- Evaluation and Reward of Proposals made by the CA.



**Figure 2: The CARIS agent-based model**

#### *The Competent Actor CA*

The CA is a collective agent, made by a set of ICAs. Each ICA is endowed with a set of Frames, namely a set of ternary strings  $\{-1, 1, 0\}$  of length  $l$ , which represents the set of agent's capabilities. The value 0 indicates the lack of that specific competence. Each agent is also endowed with a budget distributed among the frames. The CA makes the following actions.

- The generation of initial frame of each agent depends on two parameters: the scope  $s$  and the competence ( $c$ ). The scope ( $s$ ) is the probability that the agent ICA has the complete knowledge to produce the requested interpretation of CE. The scope measures the specialization of an agent. The competence ( $c$ ) is the probability that an element of the frame matches the corresponding element of the IO string. The generation of the frame of each agent depends on both the probabilities:  $F = f(s, c)$ .
- Each ICA develops an Exploration activity - that is the interpretation of an IO basing on its frames in order to produce an Individual Interpretation. Each ICA has a probability  $P$  to modify its Frame to "catch" an IO. The modified Frame is the Individual Interpretation.
- ICA also develops an Exploitation activity. Each ICA must choose the most suitable partners in order to combine its Individual Interpretation with that of other agents and to create a Collective Interpretation (CI). This activity  $h$  is guided by:

- the Cooperation propensity ( $T$ ) of each agent;
- the value of Competence  $c$  of possible partners;
- the Hamming  $H(II)_{ij}$  distance between two Individual Interpretations.

We assume that forming a partnership has a probability of success strictly related to the optimal overlap of Individual Interpretations (knowledge stocks) of possible partners.

Therefore, ICAs form multiple collaborations by combining their Individual Interpretations to produce a Collective Interpretation to be submitted to the CE for evaluation and reward. Of course, the Collective Interpretation is embodied in a product or service that can be delivered to the market. This exploitation activity has a cost. Each CI is evaluated by the CE on the basis of an Acceptance Threshold. If the CI overcomes such threshold, it is accepted and rewarded. The reward obtained by a CI is distributed among the agents ICAs that contributed to it, according to the contribution they gave in terms of competences to the successful interpretation. At the beginning of simulation each ICA is endowed with a budget distributed among the frames populating its individual memory. The budget associated to frames will be decreased or increased according to the costs sustained for exploration, interaction and for exploitation activities and to the success of the Collective Interpretation. Only frames with a positive budget will survive and the number of surviving frames for each agent is a proxy of the capability to learn and innovate. The difference between the agents' total budget at the end of simulation and that at the beginning is a measure of the success of RIS.

### **3.2 The calibration of parameters**

The calibration has been selected as a method to externally validate the agent-based model.

The methodological steps adopted to calibrate model's parameters are: i) definition of the measurement model for the CARIS's parameters and data collection; ii) statistical validation of the measurement model through PLS path modeling technique; iii) computation of composite indicators to measure the CARIS's parameters; iv) model calibration.

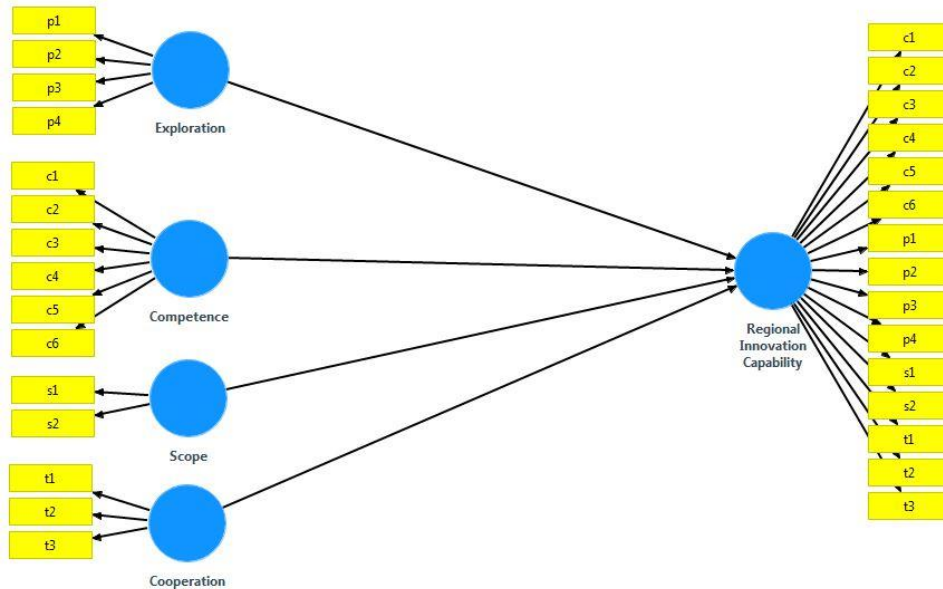
The definition of the measurement model is the identification of suitable constructs and their associated measurements to operationalize and measure the CARIS's parameters. As our focus is on European Regions, we used as metrics mainly indicators of the ProInno Regional Innovation Scoreboards. The validation of the measurement model was performed through Partial Least Square Structural Equation Modeling (PLS-SEM). This soft-modeling technique allows measuring the impact of a set of indicators on the overall latent construct. An important advantage is that SEM allows researchers to assess both the measurement models and structural models at the same time. Using the PLS-SEM, it was also possible to measure the effect of the indicator that passed the reliability and validity test on the model's parameters.

## **4. Results**

In this section we briefly describe main results of calibration of the CARIS model, taking into account that the complete results of the external validation will be presented in the final version of the paper. Furthermore, details about verification are reported in previous research of authors (Ponsiglione et al., 2017).

In order to calibrate input and output parameters of the model, we initially selected 15 indicators of innovation for 91 European Regions available in ProInno Regional Innovation Scoreboards and Eurostat database.

PLS-SEM was adopted to validate the measurement model. The latter specifies the indicators for each construct and enables an assessment of construct validity. Observed variables have been assigned to a latent variable of the model as reported in Figure 3.



**Figure 3: The Global hierarchical latent variable model**

In Figure 3 four latent variables (CARIS's parameters: Exploration (p), Competence (c), Scope (s), and propensity to Cooperation (t)) depend on 15 manifest variables and a fifth latent variable (Regional Innovation Capability – the composite indicator representing global innovation performances) depends on the overall construct. All the performed tests through PLS path modeling allow us to establish the convergent validity, the discriminant validity and the internal consistency of the measurement model.

Using the PLS-SEM, it was possible to measure the effect of the indicators on the model's parameters. Each parameter of the model was calculated as a weighted combination of its connected indicators. Following the classification scheme adopted by the RIS (2009, 2012, 2014), we clustered the calculated parameters in four groups. Tables 1 and 2 report as example the maximum and minimum values, the average and the standard deviation for Innovation Leaders and for Modest Innovators.

	Exploration	Scope	Competence	Cooperation
<b>Min</b>	0,227	0,160	0,442	0,372
<b>Max</b>	0,392	0,560	0,882	0,834
<b>Average</b>	0,307	0,392	0,568	0,591
<b>Dev.std</b>	0,060	0,117	0,098	0,106

**Table 1: Parameter for Innovation Leaders**



	<b>Exploration</b>	<b>Scope</b>	<b>Competence</b>	<b>Cooperation</b>
<b>Min</b>	0,066	0,280	0,182	0,115
<b>Max</b>	0,258	0,440	0,391	0,501
<b>Average</b>	0,153	0,336	0,270	0,222
<b>Dev.std</b>	0,057	0,048	0,060	0,130

**Table 2: Parameter for Modest Innovators**

As can be noticed in Tables 1 and 2, the average values of parameters increase passing from Modest Innovators to Innovation Leaders.

These parameters will be used to perform additional simulation with CARIS laboratory in order to finally assess the capability of the model to represent reality in a reliable way and to identify possible patterns determining the emergence of virtuous or vicious cycles of innovation. Moreover, we expect to better understand the impact of each parameter on the Regional Innovation Capability. In other words, we expect to identify the key resources and competences which could explain the current differences among most innovative regions and the lagging ones. Based on the analysis of data in Table 1 and 2, it is possible to suppose that the cooperation and competence parameters will provides us with useful insights to understand the existence of disparity among EU Regions.

## **5. Research limitations/Implications:**

The aims of the paper are relevant both from a theoretical point of view and from a practical one. On the one hand, the paper contributes in defining and recognizing the RISs as Complex Adaptive Systems (CAS); on the other hand, it contributes to fill the gap about the use of complexity-based tools in the development of innovation policies by proposing an agent-based model, core of the CARIS laboratory, to explore in a systematic way how to develop a Regional Innovation System (RIS) in lagging regions of Europe.

More in depth, Agent-Based Modeling (ABM) is considered as one of most suited methodological approaches to analyze CASs (Heath et al., 2009) and it has been increasingly recognized as a useful tool to support policy making in different fields and at different levels (Brenner and Werker, 2009).

**Keywords:** agent-based modeling, complex adaptive systems, regional innovation systems, self-sustainability

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## 10. An analysis of the effects of investments in transport technologies on the tourism industry

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### 1. Background

The transportation system and the tourism market can be considered dependent on each other. The transportation system is an industry that meets the need for moving passengers and freight as efficiently as possible (Cascetta *et al.*, 2007). Indeed, tourists are a particular category of users who travel for tourism purpose. It is often argued that a country with a good transportation system can be considered a tourist destination (Pagliara *et al.*, 2015).

In this context the role of innovation in favoring the creation of a closer relationship between the transport industry and its users is fundamental (Della Corte *et al.*, 2015; Yun *et al.*, 2016). During the centuries, the means of transport have been changing according to the development of technology. Indeed, there is no doubt that our transportation system is undergoing a dramatic change and traditional transportation industry is keenly interested in understanding this new paradigm. These new mobility innovations are bringing new faces to the transportation sector around the world. The introduction of new transportation innovations has been explosive in recent years, and this growth promises to continue at a rapid rate.

Since the origin of railways in Europe during the Industrial Revolution at the beginning of the 19th century, the speed of passenger trains represented a sign of technological development of the most advanced countries at that time. The 50 km/h reached by the impressive

“Rocket” locomotive from George Stephenson in 1829 represented a true high speed consideration for railways since then.

After some significant speed records in Europe (Germany, Italy, UK and especially France, 331 km/h in 1955), the world was surprised when, on the 1st October 1964, Japanese national railways started the operation of a new 515 km line, the Tokaido-Shinkansen, from Tokyo Central to Shin Osaka. The latter has developed competitiveness performance criteria with respect to alternative transport modes (Ahi and Yildiz, 2018). This line was built to provide capacity to the new transport system necessary for the impressively rapid growth of the Japanese economy.

After the success of the Shinkansen, technical progress in several European countries, France, Germany, Italy and UK, developed new technologies and innovations aimed to establish the

basis for the passenger railway of the future.

Although several other existing or new transport modes intended to compete with the classic railway concept, finally SNCF, the national French railway company, started the operation of

the first high speed line between Paris to Lyons on 27 September 1981, at a maximum speed of 260 km/h. Once again, after the big success of the TGV, each European country looked for the new generation of competitive long and medium distance passenger rail services, in some cases by developing its new technology and in others by importing.

A new dimension and a new perspective for HSR started in China on 1 August 2008.

The 120 km high speed line between Beijing to Tianjin represents just the first step in a huge development to transform the way of travelling for the most populated country in the world. Following the example led by China, new high speed systems are under development around the world: Morocco, Saudi Arabia, USA, etc.

Accordingly with the expectations, and in spite of the development of other transport modes (for example the Maglev, automatic driving cars, improvements in aviation, etc.), by 2030-2035 the extension of the world HSR network could reach more than 80,000 kilometers,

representing an important challenge for operators, industry, authorities, etc (<https://uic.org/High-Speed-History>).

High Speed Rail (HSR) is not only transportation, but it is also transformation and economic development. Indeed it has many socio-economic impacts. Tourism is among them. In the contribution by Della Corte *et al.* (2010), a tourist destination can be considered a complex integrated product, represented by the "six As": *Access* (i.e. the accessibility to a location); *Attractions* (i.e. the local attractive factors); *Accommodation* (i.e. hotel structures); *Amenities* (i.e. the tourist services); *Assemblage* (i.e. the activity of tour operators) and *Ancillary services* (i.e. agencies, offering services like tours and local institutes and supporting organisations).

In many developing countries travel and tourism sectors contribute a larger share to the total GDP than the world average and also generate a larger than average share of jobs and exports ([www.wttc.org](http://www.wttc.org)). The travel and tourism industry is one of the world's largest industries with a global economic contribution (direct, indirect and induced) of over 7.6 trillion U.S. dollars in 2016. The direct economic impact of the industry, including accommodation, transportation, entertainment and attractions, was approximately 2.3 trillion U.S. dollars in 2016. A number of countries, such as France and the United States, are consistently popular tourism destinations, but other, less well-known countries are quickly emerging in order to reap the economic benefits of the industry (WTTC, 2017).

Worldwide, the tourism industry has experienced steady growth almost every year. International tourist arrivals increased from 528 million in 2005 to 1.19 billion in 2015. Figures were forecasted to exceed 1.8 billion by 2030. Each year, Europe receives the most international tourist arrivals. It also produces the most travellers: with approximately 607 million outbound tourists in 2015, the region had more than double that of the second largest tourist origin, the Asia Pacific region.

In 2015, global international tourism revenue reached approximately 1.26 trillion U.S. dollars, having almost doubled since 2005. That year, China had the largest international tourism expenditure, followed by the United States and Germany.

Kaul (1985) also recognizes the importance transport as an essential component of successful tourism development in that it induces the creation of new attractions and the growth of existing ones.

The objective of this manuscript is to investigate the relationship between HSR systems and local tourism market (Albalade and Fageda, 2016) through the case study of the High Speed/High Capacity (HS/HC) Rail project in Italy. This manuscript is organised as follows: section 2 deals with a review of the contributions present in the literature on the impacts of HSR on tourism. In section 3 the methodology is described. Results are reported in section 4; while conclusions and further perspectives are presented in section 5.

**2. The state-of-the-art on the link between HSR systems and the tourism industry** The premise is that the introduction of new transport alternative modes need the coordination of other factors like destination promotion, image, destination management and marketing on local tourism and community (Pagliara *et al.*, 2015a; Pagliara *et al.*, 2017; Della Corte and Aria, 2014; Della Corte and Aria, 2016).

Many are the contributions in the literature on the link between HSR and the tourism industry (Coronado *et al.*, 2013; Mimeur *et al.*, 2013; Delaplace and Perrin, 2013; Bazin *et al.*, 2013; Wang *et al.*, 2012; Chen, 2013; Bazin and Delaplace, 2013). The link between tourists and accessibility can be modified by a HSR service (Delaplace, 2012) thanks to its power of decreasing distance. As a consequence, HSR can have an impact on the utility of tourists and the competition between different destinations (Masson and Petiot, 2009; Pagliara *et al.*, 2012).

Bazin *et al.* (2011) demonstrated, in the case of France, that urban tourism is generally a short-stay tourism. The choice of HSR avoids the fatigue of driving, congestion and parking difficulties in city centres. Moreover, during given periods of the year, thanks to promotional offers, HSR is cheaper than car when travelling alone or in couple.

The work of Kuriharaa and Wu (2016) estimated the impacts of the Shinkansen network extension on tourism development in Japan. They studied the change of tourism demand and tourist behaviour in Tohoku and Kyushu regions proposing a quantitative analysis. The specified Ordinary Least Square regression analysis showed that that tourism arrivals increased in cities connected by the extended Shinkansen network.

The paper by Chen and Haynes (2012) demonstrated that emerging HSR services (during the period 1999–2010) had significant positive impacts on fostering tourism in China. They proposed a multivariate panel analysis applied to 27 Chinese regions and confirmed that HSR can foster competitiveness in tourism.

Wang *et al.* (2018) examined the characteristics and evolution of spatial patterns of the urban hinterland before and after the introduction of the HSR network in China, through an economic relation model and a spatial analysis in ArcGIS. They showed that HSR strengthened tourism-based economic relationships between cities.

For the case study of Spain, Albalade and Fageda (2016) showed a negative indirect effect of HSR on tourist outcomes, using three different econometric techniques. This result is attributed to the HSR network design which has a substitution effect on air transportation. This result is confirmed in Albalade *et al.* (2017), where, by combining both difference-in-difference and panel data techniques, authors found that the HSR effects on the tourism industry are, in general, weak or restricted to larger cities.

Delaplace *et al.* (2016) specified regression models for analysing the link between HSR and destination choice of theme parks, (i.e. Disneyland Paris and Futuroscope Parks), served by a HSR station. Revealed preference surveys were carried out and in the case study of Disneyland, tourists declared that the presence of HSR was fundamental in the choice of the destination; the opposite for the case study of Futuroscope.

Tourists' intention to revisit a given destination is another interesting aspect treated in the literature. Seddighi and Theocharous (2002) and Barros and Assaf (2012) concluded that the probability of revisiting a destination, in the case of Cyprus and Lisbon respectively, increased significantly with accommodation range, events, food quality, expected weather, beach, overall quality, nightlife, reputation, and safety. Delaplace *et al.* (2014) and Pagliara *et al.* (2014; 2015b) analysed the factors influencing destination choice for tourism purpose and the role of HSR systems in affecting this choice to revisit Rome, Paris and Madrid.

There are also contributions in the literature concerning the competition of HSR systems with other transport modes, such as car (Cascetta *et al.*, 2011) and air transportation (Pagliara *et al.*, 2012), highlighting that the mode shares are in favour of the new transport technologies.

### 3. Methodology

An empirical analysis has been carried out with the help of a dataset containing information both on tourism and transport for 77 Italian municipalities, during the 2006-2013 period (Pagliara *et al.*, 2017). The dataset is composed by 615 observations (77 cities x 8 years). The number of municipalities considered are the main cities of the Italian regions excluding Basilicata, Puglia, Calabria, Sicilia and Sardinia regions, which did not experience any investment in HSR. The variables chosen are:

Four dependent variables:

1. *IT\_Tourists*: number of Italian Tourists;
2. *FOREIGN\_Tourists*: number of Foreign Tourists;
3. *IT\_Overnights*: nights spent by Italian visitors in tourist installations;
4. *FOREIGN\_Overnights*: nights spent by foreign visitors in tourist installations.

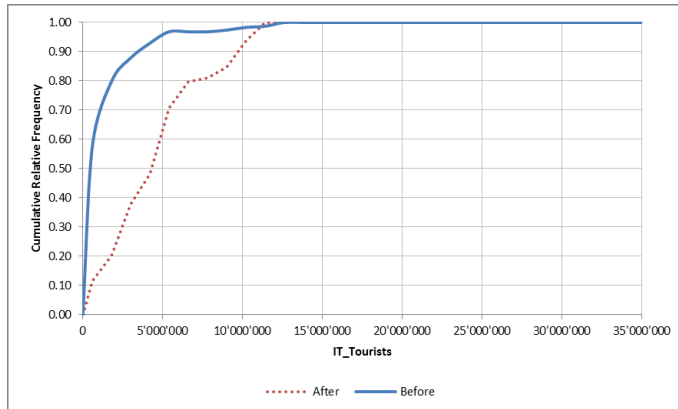
Seven independent variables have been defined:

1.  $D^{HSR}$ : binary variable taking value 1 if HSR is available, 0 otherwise;
2. POP: inhabitants;
3. *Low-Cost*: number of operating bases of low-cost airlines;
4.  $D^{HUB}$ : binary variable taking value 1 if the airport is a hub of a network carrier; 0 otherwise;
5. GDP: Gross Domestic Product;
6. Unemployment: percentage of unemployed in the province;
7. Attract: number of museums in a city.

Two steps characterizes the proposed methodology, i.e. the pre-processed testing and the multivariate analysis. In the first step, the impact of  $D^{HSR}$  (i.e. presence of HSR) on the four dependent variables has been studied, starting with the trend of their distribution functions.

In order to evaluate the difference between the distribution functions, i.e. one for the *Before HSR* and the other for the *After HSR* scenarios, for each of the four dependent variables, two inference tests, i.e. the Kolmogorov–Smirnov and Mann–Whitney ones, were performed. For both of them, the null hypothesis is rejected when the  $p$ -value is lower than  $\alpha = 0,05$ , meaning that between the two distribution functions there is a statistically significant difference (Montella *et al.*, 2015).

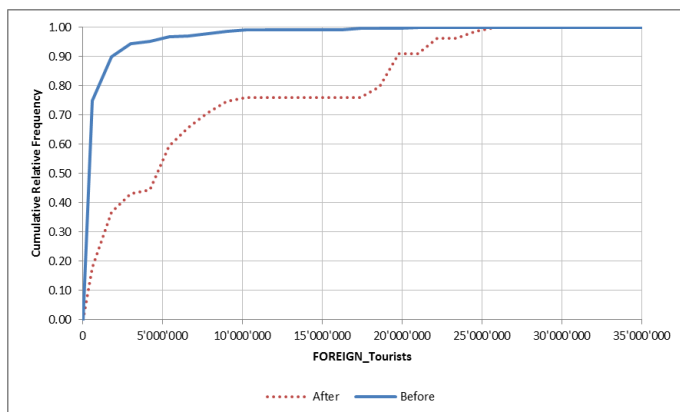
The analysis of the distribution function for the case of the number of Italian Tourists ( $IT\_Tourists$ ) is reported in the following (see Fig. 1).



Source: authors' elaborations

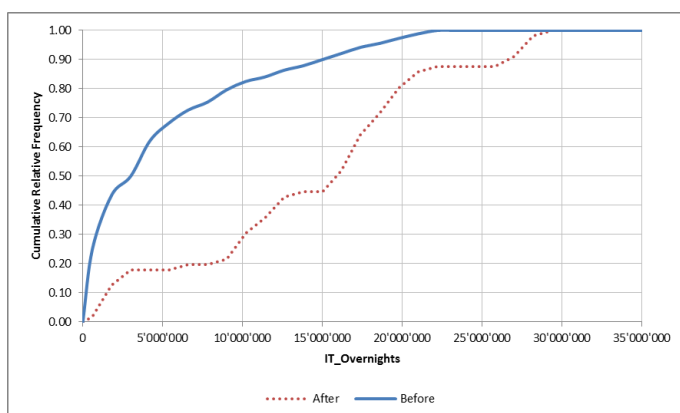
**Fig. 1: Italian Tourists: distribution functions**

It is possible to observe that the two distribution functions are different. Specifically, the trend of the *After HSR scenario* distribution function is right oriented, meaning that there is an increase of tourists after the HSR introduction. The same behaviour characterises the remaining dependent variables (see Figg. 2, 3 and 4).



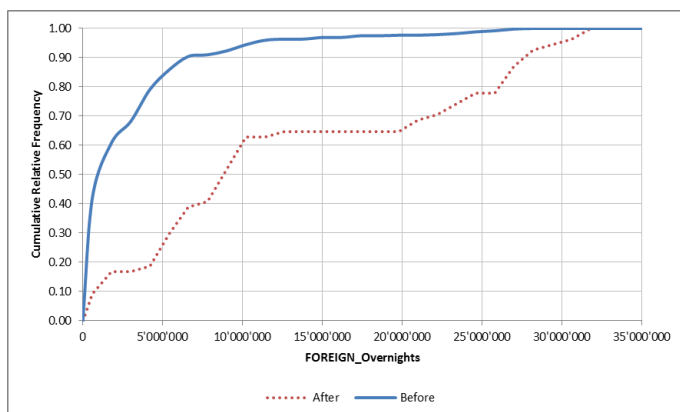
Source: authors 'elaborations

**Fig. 2: Foreign Tourists: distribution functions**



Source: authors 'elaborations

**Fig. 3: IT\_Overnights: distribution functions**



Source: authors 'elaborations

**Fig. 4: Foreign\_Overnights: distribution functions**

In Table 1 the results of the tests have been carried out. As the computed  $p$ -value is lower than  $\alpha = 0,05$ , the null hypothesis is rejected, otherwise the alternative hypothesis is accepted, this means that there is a difference and therefore the increase of tourists (both Italians and Foreigners) and the number of nights (spent both by Italians and Foreigners) has been affected by the presence of HSR.

Variable/Test	Mann-Whitney	Kolmogorov-Smirnov
IT_Tourists	< 0.0001	< 0.0001

<b>FOREIGN_Tourists</b>	< 0.0001	< 0.0001
<b>IT_Overnights</b>	< 0.0001	< 0.0001
<b>FOREIGN_Overnights</b>	< 0.0001	< 0.0001

**Table 1 - Tests results**

The second step of the methodology concerns the multivariate analysis, which strengthens the preliminary statistical results.

In this analysis count data have been modeled through a Poisson distribution, where the probability of a given city  $i$  having  $y_{it}$  number of tourist per year is given by (Washington *et al.*, 2010; Montella and Imbriani, 2015; Pagliara *et al.*, 2017):

$$P(y_i) = \frac{\lambda_i^{y_i} e^{-\lambda_i}}{y_i!} \quad (1)$$

where  $P(y_i)$  is the probability of city  $i$  having  $y_i$  tourist per year and  $\lambda_i$  is the Poisson parameter for city  $i$ . Generalized Linear Models (GLMs) have been considered for determining the relationship between count data and the dependent variables (Agresti, 2002). The data consider measurements over time for the same cities, and to avoid the serial correlation, the panel data regression models have been specified.

Specifically, an extension of the GLMs has been considered, i.e. Generalized Estimating Equations (GEEs) (Fitzmaurice *et al.*, 2012). The significance of each variable has been tested with the  $t$ -student statistic, therefore a coefficient is significant when  $t$  is greater than 1.96. The model goodness of fit has been measured by a simple extension of  $R^2$  statistics for GEE models, namely  $R^2_{\text{marginal}}$  (Zheng, 2000) :

$$R^2_{\text{marginal}} = 1 - \frac{\sum_{i=1}^T \sum_{t=1}^n (y_{it} - \hat{y}_{it})^2}{\sum_{i=1}^T \sum_{t=1}^n (y_{it} - \bar{y})^2} \quad (2)$$

where  $\bar{y}$  is the marginal mean across all the time periods  $\frac{1}{nT} \sum_{i=1}^T \sum_{t=1}^n y_{it}$  while  $\hat{y}_{it}$  is the predicted value. It has almost the same properties of  $R^2$  used in regression models, with the exception that it can take negative values, when the estimated model predicting capability is not very good w.r.t. the intercept-only model. Moreover it reduces to an  $R^2$  measure when there is one measurement per panel with  $T = 1$  (Ballinger, 2004).

#### 4. Results

From the analysis of the estimates obtained, it is possible to observe that the variable representing the presence of a HSR station, i.e.  $D^{HSR}$ , has a positive impact on the number of Italian tourists. The *Low-Cost* variable, indicating the easy access to the plane alternative mode, with its positive and significant coefficient, affect Italian tourists choices. The *Attract* variable is positive and significant having an impact on Italian tourists' destination choice. The *Unemployment* variable is negative and significant, representing, as expected, a negative impact on the number of Italian tourists (see Table 2).

The variable  $D^{HSR}$  has also a positive impact on the number of foreign tourists as well as the *Attract* variable. Moreover foreigners are attracted by cities with a high *GDP*, which is connected with the services provided by a given municipality (see Table 3).

The results, in the case of the number of overnights spent both by Italians and Foreigners, show that the main variables having an impact are the  $D^{HSR}$  and *Attract* ones. The socioeconomic *POP* and *GDP* variables have a positive effect only on the number of overnights spent by the Italian tourists. On the other hand, it is not surprising if the *Low-Cost* variable has a positive effect on the number of overnights spent by Foreigners (see Tables 4 and 5).

<b>Variable</b>	<b>Coefficient (t- student)</b>
Low Cost	0.735 (4.22)
$D^{HSR}$	0.15 (1.98)
Unemployment	-0.103 (4.12)
Attract	0.513 (2.06)
Constant	2.94 (10.21)



No. of observations	615
R <sup>2</sup>	0.2

Source: Authors 'elaborations based on STATA

**Table 2 - Italian Tourists**

Variable	Coefficient (t- student)
D <sup>HSR</sup>	0.017 (2.42)
Attract	0.777 (6.26)
GDP	0.006 (4.38)
Constant	1.604 (5.68)
No. of observations	615
R <sup>2</sup>	0.58

Source: Authors 'elaborations based on STATA

**Table 3 - Foreign Tourists**

Variable	Coefficient (t- student)
D <sup>HSR</sup>	0.015 (2.15)
POP	0.017 (3.05)
GDP	0.007 (3.59)
Attract	0.651 (7.91)
Constant	3.664 (13.56)
No. of observations	615
R <sup>2</sup>	0.74

Source: Authors 'elaborations based on STATA

**Table 4 - Overnights spent by Italians**

Variable	Coefficient (t- student)
D <sup>HSR</sup>	0.027 (4.99)
Attract	0.953 (8.68)
Low-Cost	0.022 (3.02)
Constant	2.798 (10.32)
No. of observations	615
R <sup>2</sup>	0.72

Source: Authors 'elaborations based on STATA

**Table 5 - Overnights spent by Foreigners**

## 5. Policy implications

Investments in new transport technologies, such as HSR systems, are commonly believed to have positive impacts on the tourist areas they serve, thanks to the increased accessibility (Pagliara *et al.*, 2014). This behavior is confirmed by the HS/HC Rail project in Italy.

Further research is required on the use of HSR variables, which should describe the connectivity and territorial distribution of the HSR network, and the service conditions offered by the operating companies, such as fares, timetables and frequency. Moreover the database should be further enriched by extending the analysis to the regions, and therefore to the cities, excluded from this analysis. Specifically, the main cities of Calabria, Basilicata,

Puglia, Sicilia and Sardinia regions should be part of future investigation. Data should be updated also from a temporal perspective, i.e. information should be at least collected till 2016, the last available year for which ISTAT (i.e. the Italian Census) provides information on tourism.

For many countries, tourism can be considered as a source of income, and the results reported in this manuscript can provide policymakers and local administrators with good tools to estimate the contribution to tourism development of a new or existing HSR line.

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# **11. The effects of customer capital on customer response speed and innovativeness: the mediating role of marketing capability**

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## **Purpose of research**

In this paper, we investigated the effects of customer capital on firm innovativeness (i.e. the ability to generate new ideas and actions within firms) and customer response speed (i.e. the ability to respond to the customers' needs immediately). Furthermore, it is analyzed how firms' marketing capability mediates these relationships.

## **Literature review**

According to the Resource-Based View (Wernerfelt 1984; Barney 1991), customers are the firms' external factors that are crucial for creating organizational wealth (Stewart and Ruckdeschel 1998). Consequently, a successful firm should create and manage durable customer relationships (Yang and Kang, 2008). Having an effective and constant relationship with customers over time has been framed as customer capital (Yang and Kang 2008; Kannan and Aulbur 2004). Customer capital enables firms to predict the customers' needs and preferences more effectively (Duffy 2000). Even though customer capital is the primary driver of firms strategic and financial performance (Luo et al. 2004), its role in the Resource-Based View has been partially neglected by strategic management and marketing scholars (Zander and Zander 2005).

## **Importance of innovation**

Firm innovativeness, as an aspect of a firm's culture, refers to the level of upper management openness to new ideas (Hult, Hurley, and Knight 2004). Previous studies showed that several factors contribute to the acceleration of organizational innovativeness, such as human and social capital (Selvarajan et al. 2007; Dakhli and De Clercq 2004), increasing competition (Teece 1992), environmental changes (Jansen, Van Den Bosch, and Volberda 2006), and having superior technological capabilities (Renko, Carsrud, and Brännback 2009). In this context, scholars have also paid attention to the important role of customers in making firms more innovative (Deshpandé et al. 1993; Rhee, Park, and Lee 2010; Hult, Hurley, and Knight 2004), e.g. with the concept of lead users (Urban and von Hippel 1988).

## **Customer capital and firm innovativeness**

An important factor for the success and survival of a firm is the provision of effective and quick responses to the upcoming needs and demands (Day 1994) on the constant change of the customers' buying behavior in the marketplace (Mithas, Krishnan, and Fornell 2005). In the current hypercompetitive environment, most firms are shifting from the traditional make-and-sell strategies to the sense-and-respond strategies (Bradley and Nolan 1998; Jayachandran, Hewett, and Kaufman 2004; H.Haackel 2004). So, they need to keep a close relationship with customers in order to discover exactly what each customer demands; sometimes even anticipating unspecified demands, and then fulfilling those demands quicker than competitors (Jayachandran, Hewett, and Kaufman 2004), e.g. through innovative approaches like lead user innovation with ethnography or crowdsourcing (Brem and Bilgram 2015). Consequently, customer capital not only enhances the firms' marketing capabilities (Nath, Nachiappan, and Ramanathan 2010; Weerawardena 2003), but it also enables firms to respond to customer needs in a speedy manner. Moreover, customer capital plays an increasingly vital role in a firm's productivity, growth and financial performance (Lim and Dallimore 2004). From an information processing perspective, customer capital has the potential to enhance the innovativeness of firms due to the acceleration of information processing within organizations (Daft, Sormunen, and Parks 1988; Harabi 1998). Through customer capital, firms keep a constant relationship with the surrounding environment, such as their customers (Onge, 1996). It enables firms to know better about their customers' perspectives, expectations, beliefs, and values (Harabi 1998). This information is crucial to

recognize the customers' needs and demands faster than competitors (Tseng and Goo 2005). All of these provide an opportunity for firms to ascertain the customers' new demands by presenting innovative products and services (Huggins, Johnston, and Thompson 2012). In this line of research, our paper examines the direct and indirect effects of customer capital on firm innovativeness.

### **Customer capital and customer response speed**

Customers act as the engine of the companies' development and growth (Duffy 2000). The construct of customer capital provides opportunities for firms to connect with such customers (Rudež and Mihalič 2007). Hence, not surprisingly, establishing a long and lifetime relationships with customers is the key objective considered by the most successful companies around the world (Mende, Bolton, and Bitner 2013), because it gives a valuable opportunity to know them and to predict their likely needs and demands ahead of the competition. This valuable source of information and knowledge obtained from customers has a great effect on all aspects of the organization activities (Matsuo 2006). In the second hypothesis, we predicted that customer capital enables firms to respond to its customers quicker than the competitors.

### **Mediating role of the marketing capability**

Marketing capability is considered as one of the firm's functional capabilities (Nath, Nachiappan, and Ramanathan 2010), which is the key determinant for firms to achieve competitive advantages (Tzokas and Saren 2004). Marketing capability refers to the ability of firms to understand the perceived needs, wants and preferences of customers (Theodosiou, Kehagias, and Katsikea 2012) and to offer them a unique value proposition, better than the one offered by the competition (Nath, Nachiappan, and Ramanathan 2010). We proposed that the marketing capability mediates the relationship between customer capital and firm innovativeness as well as between customer capital and customer response speed.

The changing market conditions frequently require companies to increase their attention to the customers (Hult and Ketchen 2001; Lagrosen 2005). Firms need to refine their knowledge about the customers' requests and needs to survive (Sandberg 2007). The closer a given organization is to its customers (Duffy 2000), the more willing the customer will be to share information about their wants and preferences (Kam Sing Wong and Tong 2012). Those firms with a high ability to build long-term relationships with the customers are expected to improve their marketing capability. By keeping a constant relationship with customers, the organization can encourage them to provide useful suggestions for improving the current products and services (Lin, Chen, and Kuan-Shun Chiu 2010), which eventually improves the knowledge assets of the organization. Consequently, those firms with higher awareness about the customers' changes in tastes and preferences, and thus with higher marketing capability, are in better position to behave innovatively (Weerawardena 2003). The polls of information provided by customers are highly important for generating new ideas and actions.

For developing marketing capability, organizations need to create and retain a strong bond with customers and channel members (Nath, Nachiappan, and Ramanathan 2010). On the other hand, these durable connections with customers help the organization to know the current preferences and wants of the customer and to predict the upcoming changes in their preferences quicker than competitors. Customer capital assists the firms to recognize their high-value customer segments (Sudarsanam, Sorwar, and Marr 2006). Identifying high-value customer segments makes marketing activities more effective through not wasting resources on low-value customer segments. Therefore, we predicted that customer capital enhances marketing capability and provides an opportunity for firms to know the newly emerged customers' needs before the competitors.

## **Methodology**

### **Sample and Data Collection**

In this study, we obtained the list of SMEs operating in south-east of Iran (Khuzestan, Fars and Kerman provinces) from the Ministry of Industry, Mining and Trade. We identified 321 firms with fewer than 50 employees. There is no well accepted definition for SMEs in Iran. However, according to the Ministry of Industry and Mines and Trade and the Ministry of Agriculture in Iran, firms with fewer than 50 employees are usually referred to as SMEs (Jahanshahi and Brem 2017). Following Back Translation Method, we undertook different steps to translate our measurement items into Persian (Brislin 1970). Before launching the questionnaire, we conducted in-depth interviews with five top-level managers, wherein we asked them to identify ambiguity and wording format in order to confirm the appropriateness of our measurement items. The questionnaires were personally dispatched to, and collected from each respondent after the scheduled time period (almost a week). In order to increase the response rate, after two weeks of initial distribution, telephone appointments were made with the participants. Out of 321 SMEs, 175 have received our survey (we identified the products and brand managers by asking the HR department of each firm). The respondents were guaranteed absolute anonymity in order to avoid socially desirable responses in the questionnaire. Among 175 product and brand managers, 107 of them fully completed all the items resulting in a response rate of 61%.

## **Results**

The general purpose of the paper is to highlight the usefulness of building a close relationship with customers to become a more innovative organization. In doing so, the paper examined the direct effect of customer capital on two firm level outcomes, namely firm innovativeness and customer response speed. Then we tested the indirect effects of customer capital to firm innovativeness and customer response speed through marketing capability. First of all, we found a positive relationship between customer capital and firm innovativeness. It is important to identify the influential factors to firm innovativeness because generating more novel ideas gives organizations a new lease of life (Huggins, Johnston, and Thompson 2012) and promotes the organizational performance in the long term (Roos,



Pike, and Fernström 2005). Accordingly, we can consider customers as an essential capital to enhance the firms innovative capabilities and to drive traditional organizations toward innovative organizations in later stages.

In the second step, we found that customer capital enhances the speed of customer responses. The capability-based theory of competitive advantage argues that each specific firm has a set of distinctive capabilities which can help firms to achieve competitive advantage (Grant 1996; Weerawardena 2003). It is important to know which factors enhance the customer response speed, because Day (1994) considered the firms' capability to respond effectively and quickly to changes in customer needs as one of major sources to obtain a sustainable competitive advantage.

Marketing capability depends on firms' ability to understand the customers' needs perfectly and then offer them a unique value proposition (Nath, Nachiappan, and Ramanathan 2010; Yu, Ramanathan, and Nath 2014). In this study, we found that the firms' marketing capability mediates the relationship between customer capital with firm innovativeness and customer response speed. Emphasizing on customer capital improves the firms' marketing capability because it provides an opportunity for firms to build a close relationship with customers. As a result, we can expect a higher level of information sharing and acquiring from the customers (McEvily and Marcus 2005), which enhances the awareness of firms about the changes of the customers' preferences. Such firms will change the product and services to match better with the current customers' preferences. Therefore, the firms which build a close relationship with the customers develop better marketing capabilities. In turn, this enhances customer response speed and makes firms more innovative.

### **Limitation and future research**

Like other researches, our paper suffers from several limitations. The first set of research limitations is connected to the size of our sample. In this study, we could only reach the SMEs firms operating in the south-east provinces in Iran. Due to the concentration on a specific context and region, we could not reach a high number of samples. This, in turn, may decrease the generalizability of our results. Future research may examine such relationships in bigger firms using a large number of samples. It is advisable that future works test the ideas developed in our paper across different settings and samples. We used single informant for measuring both independent and dependent variables. This may increase the bias. We empirically addressed it earlier in the paper, but it would be better to use two informants per each firm in future research. Finally, our data is a cross-sectional which restricts the ability to draw causal conclusions. Results of this study provide the foundation to form and test specific causal relationships. In doing so, a longitudinal design would be beneficial.

**Keywords:** firm innovativeness, customer response speed, customer capital, marketing capability, SMEs