Journal of Korea Trade Vol. 26, No. 3, May 2022, 63-78
https://doi.org/10.35611/jkt.2022.26.3.63
ISSN 1229-828X

Analysis of Competitiveness Factors of Global Innovative Companies*

Jae-Kyung Kim
Department of International Trade, Dankook University, South Korea
Jon-Mo Yoon
College of Liberal Arts, Dankook University, South Korea
Bong-Soo Lee†
Department of International Trade, Dankook University, South Korea

JKT 26(3)
Received 4 February 2022
Revised 22 April 2022
Accepted 6 May 2022

Abstract

Purpose – This study's purpose is to analyze which factors are more important to strengthening the competitiveness of global innovative companies by firstly sampling global 40 enterprises, secondly investigating of study models empirically, thirdly finding out significant implications through research, and finally using this result to help improve global companies' competitive edges.

Design/methodology – Developing three research models of hypothesis and using 5 variables such as technology innovation, knowledge management, human resource development, sustainable management, and corporate life, this study was empirically carried out by reliability and validity testing, correlation analysis of variables, and multiple regression analysis of three research models.

Findings – Through proceeding empirical analysis study, we found out that technology innovation and sustainable management had a significant impact on strengthening competitiveness through the hypothesis test. Those two factors had positive results and a synergy effect through correlation analysis along with process change and human resource development, which are also important areas in global innovative companies.

Originality/value – In line with the fourth industrial revolution era's acceleration and COVID-19's large impact on all industries, global companies are newly developing their business models to cope with external environment change. This study's results would be meaningful for global enterprises and domestic companies to improve their overall competitive edge by reinforcing their innovation strategy, preparing next growth engines, diversifying business portfolios, and setting business milestones.

Keywords: 4IR, Competitiveness, Corporate Life, Human Resource Development, Knowledge Management, Sustainable Management, Technology Innovation
JEL Classifications: F5, F23, M16

1. Introduction

The fourth industrial revolution is creating an era of convergence and collaboration across various fields such as politics, economy, finance, health care, culture, and education along with the technology of artificial intelligence, robotics, self-driving, and life sciences as blurring boundaries between industries. In a whirlwind of big changes across industries with technology development that can replace human resources, the government and businesses need to discuss not only proper countermeasures and future strategies, but also ways in which individuals should move forward. In recent years, the low growth trend across the global

† **Corresponding author:** leebongsoo@dankook.ac.kr

economy has become more pronounced and competition among companies and industries driven by slowing growth in China's economy, neo-trade protectionism, and global value chain changes has become fiercer.

Unlike in the past, it has become a time of infinite competition in which not only companies' performance is undermined, but also even their survival is threatened without a new business strategy that differentiates them from their competitors. The pace of change in the future will be much faster than before and it is necessary to look at the top-tier innovative companies that are driving economic development around the world in preparation for the industrial paradigm shift in the wake of the fourth industrial revolution. Looking at global innovators, we can see that they not only have excellent **technologies** and capable **human resources** to align them with their core competencies and competitive edge assets of the company, but they are also creating a working way for **knowledge and sustainable management** for employees to effectively achieve the innovation that the organization is driving.

This paper's sampling companies are selected by the 100 most innovative companies - The World's Most Innovative Companies, Ranking 100 - among the companies traditionally known as Clarivate Analytics Report (2020), Thompson Reuters (2019), and Forbes Report (2018).

In particular, the interrelationship between independent and control variables was analyzed along with correlation and multiple regression analysis between variables which are the effects of each independent variable and control variable on the competitiveness of global innovators. In addition to laying down a theoretical foundation, this paper hopes to serve as a reference to the need for continuous innovation and the discovery of core competencies, and the establishment of global competition strategies over the next decade based on the empirical research of global innovative enterprises.

2. Theoretical Review

The great feature of the fourth industrial revolution is that it will advance at a dazzling speed across a wider range of areas than any other industrial revolution that mankind has experienced in the past. Therefore, we must anticipate the infinite opportunities and challenges that the fourth industrial revolution will bring before others and prepare wisely. A global business focus, in particular, is expected to bring about five significant changes such as promoting consumer expectations and customer satisfaction, improving product and quality, accelerating convergence and innovation, changing organizations and processes, and shifting paradigms about fostering talent. Under this wave of change, global leaders and innovators are continuing to enhance their competitiveness and seek innovation in technology, human resource, knowledge management, and sustainable management. We would like to carry out the prior study of keywords of this paper with the theoretical background research.

2.1. The Fourth Industrial Revolution

The World Economic Forum (WEF) in Davos in 2016 introduced several technologies driving the fourth industrial revolution. These technology trends mentioned ripple effects in the economic, social, and political sectors. Klaus (2016), president of the WEF, defined this as a new era that has never been experienced by a human being whose technologies converge

as the boundaries of digital, physical, and biological domains are removed. In particular, it went so far as to say that the fourth industrial revolution is not a linear change but a completely different level of perceptual variation, compared with the existing industrial revolutions. Moreover, unlike the last industrial revolution, the new industrial revolution takes place in all countries and industries in the end and its influence on the economy, society, and culture is very different. According to the WEEKLY KDB report (2017), the scientific field that studies how to make software, machine intelligence, computer SW, and computer that can perform intelligent functions was reported. The OECD report (2018) claimed that in the era of the fourth industrial revolution, new industrial areas such as Artificial Intelligence, Internet of Things, Big Data, Robot Technology, Autonomous Driving, and Information Communication Technology convergence industries will be actively developed, making new industries such as convergence between industries, network-to-network, and digital contents. Boon-Do and Mi-Seon (2018) suggested governments should have aggressive involvement and strategy deployment for the fourth industrial revolution activation, while Kolovou and Raimund (2019) emphasized that in an era of rapid economic, social, cultural, and technical changes by the fourth industrial revolution, paradigm changes in educational ecosystems should be made and convergence knowledge of human resources is necessary.

What global innovators have in common in the era of the fourth industrial revolution is that they are 'first movers' not 'fast followers' who led the next generation of industries through continuous innovation. In addition, innovative companies are responding with priority not only to reform organizational culture, improve organizational structure, strengthen organizational members' knowledge capabilities, and establish sustainable systems but also to respond to external social and environmental changes according to Gyun-Hee (2019).

2.2. Competitiveness

Competitiveness generally means the power to stay ahead or overcome the competition to have what you want or you must compete in a situation where money or resources are limited. Michael (1987, 1991, and 2008) emphasized that companies must develop products that will be selected by consumers, and they are fiercely competing to develop superior products in quality, price, design, process, service, and function. Michael has also had numerous books on competition, including competition strategies and competitive advantage, particularly claiming that cost advantage, differentiation, and concentration are important for a company to be competitive. Through the research of an industrial structure analysis model, the competitiveness and profitability appeal of a particular industry are affected by five different factors depending on the structural characteristics of the industry. Fortune has annually announced the world's top 500 companies on a sales basis since 2012, becoming a barometer for measuring changes in the growth and competitiveness of global companies. What companies with sustained growth had in common was the transformation of corporate organizations and innovative companies attempting new management strategies. Jae-Kyung (2020) mentioned that it is necessary to find core competencies first and to focus on the priorities and capabilities of distribution of internal resources by selecting one or two products, services, and business sectors, which can be a shortcut to an ultra-high-capacity company.

In the traditional concept of comparing products and services, sales and supply capabilities, and sales and revenue growth, which have been the basis of corporate competitiveness,

competitiveness is compared with the accumulated sum of innovation in organizational culture and technology, performance of knowledge management, retention of core competencies, and strategic human resource development capabilities, while this trend of competitiveness is recently being changed to cope with fourth industrial revolution era.

2.3. Technology Innovation

The general definition of innovation is the transformation of the economic and social structure resulting from the epochal development of new production technologies, the introduction of new products, the exploration of new resources, and the introduction of new management organizations. Joseph (2014) used the term 'innovation' for the first time as an acronym for 'Neuerung' and defined it as an entity, university, and research institution that leads to industrial innovation as the main players of innovation and argued that it led a series of processes to create new added value by commercializing the product. In addition, he argued that the innovation entity carries out activities that include product innovation by planning, designing, developing, and upgrading products using innovative resources and processes, management, and related equipment to streamline product production. The OECD report (2018) argued that creative destruction was necessary for companies to continue to grow, explore markets and create new profits. Sang-Don et al (2018) analyzed that for globalized markets and technologies, the strategic direction can be adjusted to the firm's structured technology capabilities and that the process can expect higher innovation performance when reflecting the convergence capabilities required to innovate. Jae-Kyung (2020) mentioned the importance of innovation in the absolute advantage + ONE strategy and argued that an excellent innovator with an absolute advantage would have to prepare next-generation products just after maturity (the inflection point) right before the growth periods of the product life cycle.

Traditionally, the invention or development of new products, introducing new methods of production or developing new technologies, exploring new markets, finding, using, or supplying new materials or components, and creating new organizations to increase productivity was seen as major types of innovation. However, in the global low-growth era and fierce competition, entrepreneurs should consider creative destruction by breaking out old products, production methods, and distribution structures through technological innovation.

2.4. Knowledge Management

The term 'knowledge management' became popular after the 1990s, when business scholars closely observed the world's top innovative companies and found that behind their high performance compared to other companies, there was an effective knowledge management system. R. M. (1996) and J. C. (1996) mentioned that knowledge is a fundamental resource for businesses to simultaneously generate and maintain competence which can help them stay superior in competition as divided into two categories, depending on the way people use knowledge. First, it stipulates that it is related to establishing an MIS (Management Information System) and groupware. This method is now showing very rapid progress on the back of the development of information technology. Second, it focuses on the relationship between knowledge and people, and it is educationally based on the related studies of psychology, philosophy, sociology, and so on. Michael (2008) argued that knowledge man-

agement is in which the entire process of acquiring, introducing, creating, and transferring knowledge assets of the organization, including businesses, is made into a database, creating value-added for businesses and organizations based on which knowledge consumers produce knowledge and create value-added based on knowledge. The purpose of knowledge management is to effectively operate the process of acquiring, sharing, creating, and utilizing knowledge, and to secure profit and competitive advantage. Nonaka et al (2014) aim to institutionalize the active creation and sharing of knowledge within the organization. Here, 'knowledge' is a much broader concept that collectively refers to intelligence and ideas, including technology and information. It argued that the organization's knowledge can be used to enhance the efficiency of business processing by sharing all available knowledge of the organization, including intangible knowledge that is not expressed and to make the organization more competitive by developing new products and increasing market responsiveness. Jae-Kyung (2020) regarded knowledge management as the most important item for improving the competitiveness of organizations and management and argued that it was an effective management technique for analyzing, utilizing, specifying, and protecting 'technology and knowledge asset' held by the company.

The purpose of knowledge management is to effectively database all processes of acquiring, storing, sharing, and creating knowledge assets held by the organization or its members within the innovative entity and eventually secure profit and competitive advantage by improving the competitiveness of the entire core company. Recently, global innovators have also made great efforts to establish a systematic basis for intangible assets such as market assets, human assets, intellectual property, infrastructure assets, and so on.

2.5. Human Resource Development

Karl (1997) and Richard (2011) understood the concept of human resources primarily from an asset and investment perspective and argued that human resource development should be integrated psychologically, economically, and systemically to operate. Yon-Joo (2003) studied technology innovators and human resource development strategies, saying that organizations should be oriented toward a combination of incremental innovations which both benefit and advantage in the future, and argued that the leadership of the executive management is badly needed for an organization that requires the coexistence of two conflicting organizational structures and organizational cultures. Thomas (2007) strategically understood human resource development in the 1980s, arguing that as people entered a knowledge-based society, qualitative factors such as knowledge and creativity were valued, and the view of people as resources rather than costs began to be achieved. Germano (2014) explained that enhancing human ability or creativity, which cannot be replaced by machines and technology, is a prerequisite for human beings to live like humans in a future society and that countries or companies that manage and invest human resources in many ways can have an economic edge. Ho-Gun (2018) surveyed that the education paradigm and educational system reform by the fourth industrial revolution are taking place, and there is a difference between the capabilities of trade professionals required by trade-related businesses and institutions and students nurtured by universities. The detailed major courses in trade science were reorganized to present alternatives to the training of conventional trade personnel to meet the needs of businesses as trade experts. Latukha et al (2019) are growing to the extent that human resources contribute to the performance of the organization compared to other resources of the organization due to the improvement of the level of economy and social

culture and rapid environmental changes in the fourth industrial revolution. In this environment, human resources are claimed to play a critical role in organizations adapting to the environment and gaining a competitive edge in sustained growth. Jae-Kyung (2020) mentioned the three main directions of human resources development are sharing core values, training next-generation leaders, and establishing a performance-generating human resources development system, and the competitiveness of companies with absolute advantage is the sum of business judgment based on the accumulated knowledge of these organization members, and further, it depends on how effectively this knowledge is managed, reused, and the knowledge remains as the company's assets.

Concerning human resource development, most global innovators have recently adopted a strategic HRD (Human Resource Development) system to introduce and implement systems aligned with their organization's goals, rather than simply human resource development. Innovators can secure the quality of human resources to increase market competitiveness and productivity, and employees can manage both their capacity development and career path.

2.6. Sustainable Management

Andy and Paul (2010) argued that sustainable management plays a positive role in the value and competitiveness of companies through crisis management, deployment of intangible assets, society's failure to meet expectations, crisis management, investment inducement, and contribution to the sustainable development of society. Timothy and Tanya (2011) reemphasized that sustainable management is generally a three-dimensional performance encompassing social contributions and eco-friendly corporate objectives, as well as the economic performance of the enterprise. In particular, it was defined as activities to accumulate sustainable long-term growth engines for businesses based on innovative and creative processes within the enterprise. Lozano (2012) argued that sustainable management is a management strategy that aims to grow an entity into a 'sustainable company' and that an entity can strategically utilize its social and environmental responsibilities to become an ongoing entity over the long term through sustainable management to create competitive advantage and fulfill its economic responsibilities. According to a survey by Hyun-Boc (2019), the market capitalization of a company that practices sustainable management was higher than that of a non-practicing company. This was interpreted as a reason for the negative impact on a company's long-term competitiveness by undermining its corporate reputation and market value, and in particular, the disclosure of a sustainable management report induced a rise in the value of the company and reduced the degree of short-term risk for the company. Keun-Hyo (2019) conducted a case study on innovative companies in Korea, Japan, and the United States to analyze the operational status of the SMCS (Sustainability Management Control System) and the common result is that adopting the criteria for measuring sustainability or CSR for performance evaluation increases both corporate value and social and environmental performance.

The trend of forward-looking research in sustainable management has a more emphasis on environmental sociality at the economic and financial center, and most innovative companies operate sustainable management systems while clarifying and applying social responsibility standards, which are international standards, by requiring an increasing interest in corporate social responsibility.

2.7. Corporate Life

Benoit (1982) first developed a Lindi-effect model that predicts future activity periods for the current period of activity, and where is the objective 1) for maintaining the life of the enterprise alive? 2) Is it changing? 3) Is the organization maintaining its sensitivity? According to the McKinsey report (2011), the average life expectancy of a company is decreasing from 90 years as of 1935 to 30 years in 1975 and 15 years in 2015. The Gartner report (2012) analyzed U.S. S&P 500 companies. The company's life expectancy was 15 years as of 2010 and is forecast to decrease to less than 10 years by 2030. According to the annual report of the Fortune 500 companies, the average life expectancy is about 40 years, and the latest Japanese newspaper Nihon Keizai reported that the average life expectancy of the top 100 Japanese companies is about 30 years. In Korea, the recent announcement by the KCCI (Korea Chamber of Commerce and Industry) was 23.8 years as the average life expectancy. Ja-Youn and Sang-Lyul (2016) told that the company's life expectancy was decided by differentiation strategy and cost advantage capability as the important factors. In a study on the long-term demand and organizational life cycle patterns, Oi-Seuk (2019) presented management ideologies that took credit, customer preference, technology, and talent first principles as their core values, an organizational culture that embraces change while focusing on tradition, and management strategies that put more emphasis on stability and dependence than growth and expansion.

The general commonality of prior research is that corporate life is on the decline, while innovation is absolute to prolong the life of the company and innovative transformation comes from reforming the employees in the organization.

3. Methodology

3.1. Study Model & Hypothesis

This study selected a method to incorporate in-depth statistical analysis, which is often conducted in the field of social science. Through initially contacting local subsidiaries or branch offices of global innovators, we were able to collect a lot of information and data of 40 innovative companies based in the U.S. mostly by monitoring information obtained through face-to-face interviews, e-mails, and telephone consultations and surveying related information through primary internet and books, and analyzing data with professors, experts, and consulting firms in detail.

As shown in Fig. 1, three research models were constructed and five hypotheses were set for each model finally after carrying out a prior study and survey related to the subject of this study.

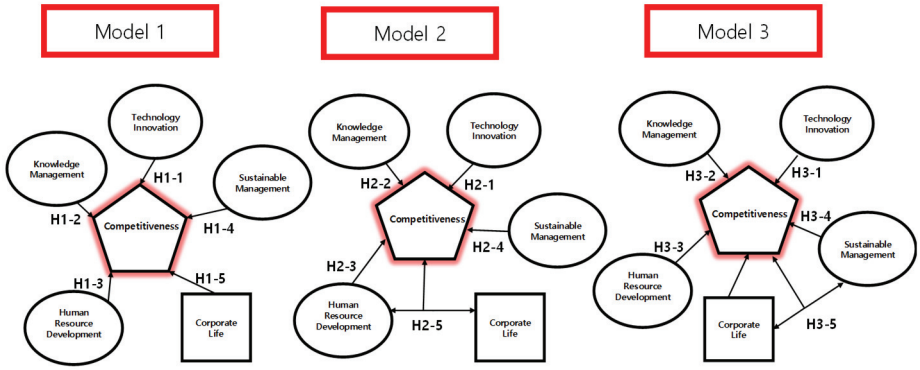
[Model 1 Hypothesis]

Hypothesis 1: Will the factors have a positive impact on the competitiveness of innovative companies?

Hypothesis 1 (H1-1): Will the technology innovation ability have a positive impact on the competitiveness of innovative companies?

Hypothesis 2 (H1-2): Will knowledge management skills have a positive impact on the competitiveness of innovative companies?

Fig. 1. Study Models



Hypothesis 3 (H1-3): Will the ability to nurture talent have a positive impact on the competitiveness of innovative companies?

Hypothesis 4 (H1-4): Will sustainability management skills have a positive impact on the competitiveness of innovative companies?

Hypothesis 5 (H1-5): Will corporate life have a positive impact on the competitiveness of innovative companies?

[Model 2 Hypothesis]

Hypothesis 1: Will each factor and the interaction between corporate life and human resource development have a positive impact on competitiveness of innovative companies?

Hypothesis 1 (H2-1): Will the technology innovation ability have a positive impact on the competitiveness of innovative companies?

Hypothesis 2 (H2-2): Will knowledge management skills have a positive impact on the competitiveness of innovative companies?

Hypothesis 3 (H2-3): Will the ability to nurture talent have a positive impact on the competitiveness of innovative companies?

Hypothesis 4 (H2-4): Will sustainability management skills have a positive impact on the competitiveness of innovative companies?

Hypothesis 5 (H2-5): Will the interaction between corporate life and human resource development have a positive impact on the competitiveness of innovative companies?

[Model 3 Hypothesis]

Hypothesis 3: Will each factor and the interaction between corporate life and sustainable management have a positive impact on competitiveness of innovative companies?

Hypothesis 1 (H3-1): Will the ability to innovate technology have a positive impact on the competitiveness of innovative companies?

Hypothesis 2 (H3-2): Will knowledge management skills have a positive impact on the competitiveness of innovative companies?

Hypothesis 3 (H3-3): Will the ability to nurture talent have a positive impact on the competitiveness of innovative companies?

Hypothesis 4 (H3-4): Will sustainability management skills have a positive impact on the competitiveness of innovative companies?

Hypothesis 5 (H3-5): Will the interaction between corporate life and sustainable management have a positive impact on the competitiveness of innovative companies?

3.2. Operational Definition of Variable

The main variables for verifying the contents of the hypotheses presented in this study were reviewed and extracted by reviewing existing literature and prior research and verified the reliability and validity of the content through several reviews with relevant professors and survey experts who have experience in investigating domestic innovative companies.

In addition, this study was intended to enhance objectivity in data collection by targeting various levels including executives, managers, and practitioners of the company, and increase the ability to differentiate data by organizing it on a seven-point scale, not a five-point scale. The operational definition of a variable is summarized in Table 1.

Table 1. Operational Definition of Variables

Category	Variable	Measurement Item
Dependent Variable	Competitiveness of Innovative Companies	Uplift in Sales Making a Profit Increase in the Number of Employees Intellectual Property Registration
Independent Variable	Technology Innovation	New Product Development Design Innovation Quality/Process Control
	Knowledge Management	Business/Organizational Change Employee Innovation Mindset
	Human resource Development	CXO Leadership Nurturing Successors Activation of Employee Training
	Sustainability Management	Financial Ability Social/Governance Skills Environmental Ability
Control Variable	Corporate Life	Life Expectancy

Note: Writer's reconstruction for operational definition of variables based on pre-study results and global innovative company survey.

4. Empirical Results

4.1. Reliability & Validation

Data collected for research analysis were computerized using the Statistical Package for Social Science (SPSS) V25.0 Statistical Package Program. Reliability verification and

exploratory factor analysis were conducted first to verify the reliability and validity of each measurement item. The Cronbach's α factor was used as a reliability factor to determine the reliability of each item collected through the survey. However, because social science does not have an exact criterion for reliability, it generally admits that 0.6 or higher is not a major problem with the reliability of the metric, so this study also assessed reliability on a basis of 0.6 or higher. It was decided to verify the validity of the variables by identifying common factors of multiple questions used in the study and performing exploratory factor analysis that combines many variables into homogeneity factors while minimizing the loss of information. Factor extraction used the main component analysis method for factor analysis and the Varimax rotation method, which is useful for verifying the interdependence of factors in factor rotation.

The number of extractors was selected based on Eigen Value 1, while the Kaiser-Meyer-Olkin (KMO) measure was based on 0.6 known as a strict level. The Communality was based on 0.4 being used universally and the Factor Loadings was based on 0.5. All of Bartlett's spherical tests are P<0.001. Reliability was also assessed in this study on a basis of 0.6 or higher. The results of the reliability and validity analysis of each parameter in this study are acceptable and shown in Table 2.

Table 2. Analysis of Reliability and Validity

Items		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Technology Innovation	New product Development	0.892				
	Design Innovation	0.886				
	Quality/Process Control	0.900				
Knowledge Management	Business/Organizational Change		0.883			
	Employee Innovation Mindset		0.849			
Human resource Development	CXO Leadership			0.930		
	Nurturing Successors			0.963		
	Activation of Employee Training			0.908		
Sustainable Management	Financial Ability				0.897	
	Social/Governance Contribution				0.923	
	Environmental Contribution				0.866	
Competitiveness	Contribution to Uplift in Sales					0.788
	Contribution to Making a Profit					0.886
	Contribution to the Increase in the Number of Employees					0.876
	Contribution to Intellectual Property Registration					0.843
Eigen Values		2.506	1.588	2.717	2.528	3.014
% of Variance		16.707	10.588	18.116	16.854	20.094
Cumulative %		16.707	27.294	45.410	62.265	82.359
Cronbach's α		0.890	0.704	0.931	0.899	0.883

4.2. Analysis of Variables

Table 3 is the result of correlation analysis to determine the relevance between variables before hypothesis verification. The analysis shows that each technology innovation (r=0.235, p<0.05) and sustainable management (r=0.266, p<0.01) has a significant (+) correlation to enhancing the competitiveness of the innovator.

Table 3. The Results of Correlation Analysis

Variable	1	2	3	4	5
1. Technology Innovation	1				
2. Knowledge Management	-0.001	1			
3. Human Resource Development	-0.027	-0.190	1		
4. Sustainable Management	0.257**	-0.013	0.018	1	
5. Competitiveness of Innovative Companies	0.235*	0.137	0.006	0.266**	1

Notes: *p<0.05, **p<0.01.

4.3. Hypothesis Results

Multiple regression analysis was conducted as follows to analyze how important factors such as technology innovation, knowledge management, human resources development, and sustainable management capabilities affect the activation of global innovative companies, namely, not only survival but also sustainable growth.

Y (Competitiveness of innovative companies) = α +β1X1 (Technology innovation) + β2X2 (Knowledge management skills) + β3X3 (Human resource development) + β4X4 (Sustainable management) + ε

Table 4 is the result of a multiple regression analysis to examine the impact of independent variables such as technology innovation, knowledge management, human resources development, and sustainable management by using the competitiveness of innovative companies as subordinate variables. The VIF (Variance Inflation Factors) values were considered not to be significant because the VIF values are not all greater than 10. The R-squared values were measured at 16.3%, 15.8%, and 16.2%, respectively as obtaining over 15% which has some effect normally on variable determinants in social studies.

For Model 1, the entity's training was used as a modulator. The model's explanatory power was 12.1% (Adj. =0.121), statistically significant at a significant 1% of the model's fitness level (F=3.866, p<0.01), and technology innovative capabilities (p<0.05) and sustainability management skills (p<0.05) were shown to be statistically significant as factors affecting the innovator's competitiveness. It can be interpreted that innovators whose lifespan, which is a modulator, is significant, but with a positive effect, are making greater efforts to increase their competitiveness.

For Model 2, the entity's life and innovation capabilities were used as an interaction variable. The model's explanatory power was 11.6% (Adj. =0.116), statistically significant at a significant 1% of the model's fitness level (F=3.726, p<0.01), and technology innovative capabilities (p<0.05) and sustainability capabilities (p<0.05) were shown to be statistically

significant as factors affecting the innovator's survival and growth. The adjustment variables for business life and human resource development were significant, but also the positive effects. In other words, traditional survival years do not mean that the ability to cultivate human resources increases.

For Model 3, the life cycle and knowledge management skills of the company were used as interaction variables. The model's explanatory power was 11.9% (Adj. =0.119) and statistically significant at 1% of the model's significant level of conformity (F=3.822, p<0.01), but none of the factors affecting the competitiveness of the innovator were significant. The adjustment variables, survival age, and sustainability management ability were shown to be significant, but also to have a positive effect. Thus, a traditional company cannot be construed as being superior in financial ability, good social reputation, or eco-friendly.

Table 4. The Result of Multiple Regression Analysis

Variable		Model 1		Model 2		Model 3	
		β	t-value	β	t-value	β	t-value
Intercept			3.525**		2.634*		3.467**
Independent Variable	Technology Innovation	0.204	2.129*	0.194	2.024*	0.150	1.560
	Knowledge Management	0.170	1.802	0.163	1.732	0.141	1.499
	Human resource Development	0.027	0.289	0.090	0.921	0.074	0.771
	Sustainable Management	0.209	2.197*	0.241	2.512*	0.188	1.947
Moderator Variable	Life Expectancy	-0.208	-2.230*				
Interaction Variable	Life Expectancy × Human Resource Development			-0.202	-2.087*		
	Life expectancy × Sustainable Management					-0.211	-2.185*
R-Square		0.163		0.158		0.162	
Adj. R-Square		0.121		0.116		0.119	
F-Value		3.866**		3.726**		3.822**	

Notes: 1.Dependent Variable: Competitiveness of innovative companies
2.*p<0.05, **p<0.01.

Table 5 shows the results of the theory of study in this paper. For Model 1 and Model 2, Hypothesis 1 and Hypothesis 4 were adopted, and both for Model 3 were rejected. This can be interpreted as having a positive impact on the competitiveness of technology innovative companies and their ability to maintain sustainable management.

Table 5. The Result of Hypothesis Test

Hypothesis		Contents	Result
Model 1	H1-1	Technology innovation abilities have a positive impact on the competitiveness of innovative companies	Accept
	H1-2	Knowledge management skills have a positive impact on the competitiveness of innovative companies	Reject
	H1-3	The ability to nurture talent has a positive impact on the competitiveness of innovative companies	Reject
	H1-4	Sustainability management skills have a positive impact on the competitiveness of innovative companies	Accept
	H1-5	Corporate life has a positive impact on the competitiveness of innovative companies	Accept
Model 2	H2-1	Technology innovation abilities have a positive impact on the competitiveness of innovative companies	Accept
	H2-2	Knowledge management skills have a positive impact on the competitiveness of innovative companies	Reject
	H2-3	The ability to nurture talent has a positive impact on the competitiveness of innovative companies	Reject
	H2-4	Sustainability management skills have a positive impact on the competitiveness of innovative companies	Accept
	H2-5	The interaction between corporate life and human resource development has a positive impact on the competitiveness of innovative companies	Accept
Model 3	H3-1	The ability to innovate technology has a positive impact on the competitiveness of innovative companies	Reject
	H3-2	Knowledge management skills have a positive impact on the competitiveness of innovative companies	Reject
	H3-3	The ability to nurture talent has a positive impact on the competitiveness of innovative companies	Reject
	H3-4	Sustainability management skills have a positive impact on the competitiveness of innovative companies	Reject
	H3-5	The interaction between corporate life and sustainable management has a positive impact on the competitiveness of innovative companies	Accept

5. Conclusion

In the era of the fourth industrial revolution and the paradigm shift in the global economy, global innovative companies are rapidly accelerating their new strategies for creating their competitive advantage and driving customer satisfaction globally and also highly focusing on innovating technology, accumulating knowledge, nurturing talent, and pursuing sustainable management which will be key factors to overcome the weakening of profitability caused by low growth and the deepening competition globally.

This paper has drawn countermeasures and directions for the enhancement of competitiveness of global innovative companies. The strategy and milestones of these innovative companies will continue for the time being and it would be meaningful for Korean companies to study global innovative companies' direction and strategies to be global leaders in the end.

Here are the results and implications of the empirical analysis of this paper.

First, it was understood that technology innovation and sustainable management have a positive effect on strengthening the competitiveness of innovative companies through hypothesis testing. In addition, the analysis of the study model has shown that the innovators which have fewer surviving years and more advantages are to enhance their competitiveness.

Second, the results of the correlation analysis to determine the relevance between variables showed that technology innovation and sustainable management also had a significant correlation for enhancing the competitiveness of the innovator. In other words, it can be interpreted that fostering financial, social, and environmental capabilities through technology innovation in products and services has a great synergy effect and a positive effect on strengthening overall competitiveness.

Third, to strengthen the competitiveness of global innovative companies, the results of the demonstration should be allocated and strategized as a priority for financial, social, and environmental sustainability by innovating technologies, including new product development, design innovation, quality, and process innovation, within a short period after the establishment of the company.

Fourth, the commonality of global super-luxury innovative companies is that internal organization changes processes and systems for fostering human resources. That is, it shows that the quality of the organization's internal systems overwhelms competitors, and is driven by key personnel armed with knowledge or creativity.

The analysis of the empirical results of this paper is an important issue not only from an academic point of view but also from a practical point of view. If these factors can be systematically identified, they will be able to contribute in their own way to the promotion of competitiveness and strategic establishment of innovative companies in our country. In addition, through this research, we intend to become a touchstone for promoting the research of global innovative companies that have not yet been activated in Korea.

However, in this study, in order to conduct a more accurate and effective empirical analysis, hundreds of companies should be sampled, but there were also restrictions on the inability to survey and face-to-face contact with innovative companies that were distributed around the world, even though there were no hundreds of global innovators. In addition, it was statistically analyzed through a handful of face-to-face interview techniques and advice from experts for 40 major innovative companies based in the U.S. mainly but failed to present different management strategies and alternative countermeasures in various industries. We want to present alternatives differentiated by expanding the number of companies surveyed and developing advanced research models and frameworks for analysis in future research.

References

Cho, Yon-Joo (2003), "The HRD Strategies for Innovation Management in Technology-Based Corporations", *The Journal of Training and Development*, 9(9), 19-33.

Garavan, Thomas N. (2007), "A Strategic Perspective on Human Resource Development", *Advanced Human Resources*, 9(1), 11-30.

Gartner (2012), "High-Tech Tuesday Webinar: Big Data Opportunities in Vertical Industries", Big Data Analytics

Grant, Robert M. (1996), "Toward a Knowledge-based Theory of the Firm", *Strategic Management Journal*, 17, 109-122.

Hwang, Gyun-Hee (2019), "Challenge for Innovative HRD in the Era of the 4th Industrial Revolution", *Asian Journal of Innovation and Policy*, 8(2), 288-301.

Hwang, Sang-Don, Lee, Seong-Hwan, and Lee, Woon-Seek (2018), "An Empirical Study on the Effect of Market and Technology Orientation on the Innovation Performance of Global Firm", *Journal of International Area Studies*, 22(4), 145-167.

Nonaka, Ikujiro, Kodama, Mitsuru, Hirose, Ayano, and Kohlbacher, Florian (2014), "Dynamic fractal organization for promoting knowledge-based transformation – A new paradigm for organizational theory", *European Management Journal*, 32(1), 137-146.

Jeong, Boon-Do and Hong, Mi-Seon (2018), "A Study on the Activation Plan of the 4th Industrial Revolution by comparing the Present State of Major Countries", *The e-Business Studies*, 19(3), 117-131.

Kolovou, Lamprini and Broechler, Raimund (2019), "How Collaborative Innovation and Technology in Education Ecosystem Can Meet the Challenge Raised by the 4th Industrial Revolution", *World Technopolis Review*, 7(1).

Kim, Jae-Kyung (2020), "Absolute + ONE Strategy", HIVISON.

Lee, Ho-Gun (2018), "A Study on the Confrontation Plan of Trade Education in Universities against Paradigm Shift by the 4th Industrial Revolution", *The e-Business Studies*, 19(1), 187-202.

Lee, Hyun-Boc (2019), "The Influence of Corporate Sustainability Management on Social Capital Formation", *K-Business Management Journal*, 84, 31-54.

Lim, Oi-Seuk (2019), "The Study on Longevity Factors and the Organizational Life-Cycle Pattern of Japanese Longevity Companies", *The Journal of Eurasian Studies*, 16(4), 241-261.

Mandelbrot, Benoit B. (1982), "The Fractal Geometry of Nature"

Latukha, Marina O., Lisina, PolinaI, and Panibratov, Yury (2019), "Developing sustainable competitive advantage of a firm through human resource management practices: a competence-based approach", *Global Business and Economic Review*, 95-119.

Mckinsey Global Institute (2011), "The next frontier for innovation, competition, and productivity"

Porter, Michael E. (1987), "From Competitive Advantage to Corporate Strategy", *Harvard Business Review*, 43-59

Porter, Michael E. (1991), "Toward a Dynamic Theory of Strategy", *Strategic Management Journal*, 95-117

Porter, Michael E. (2008), "The Five Competitive Forces that Shape Strategy", *Harvard Business Review*, 79-93, *Strategic Management Review*, 95-117.

Lozano, Rodrigo (2012), "Toward better embedding sustainability into companies' system: an analysis of voluntary corporate initiative", *Journal of Cleaner Production*, 25, 14-26.

Reis, Germano Glufke (2014), "Drivers of human resource management competence development in Brazilian multinational subsidiaries: a multilevel research", *Revista de Administracao da Universidade de Sao Paulo*, 49(3), 519-533.

Scerri, Andy and Paul, James A. (2010), "Accounting for sustainability: combining qualitative and quantitative research in developing indicators of sustainability", *International Journal of Social Research Methodology*, 13(1), 41-53.

Schumpeter, Joseph Alois (2014), "Digital Disruption on the Farm", *The Economist*, 24, 64-67.

Schwab, Klaus (2016), "The Fourth Industrial Revolution", World Economic Forum.

Slaper, Timothy F. and Hall, Tanya J. (2011), "The Triple Bottom Line: What Is It and How Does It Works", *Indiana Business Review*, 86(1).

Spender, J. C. (1996), "Making Knowledge the Basis of a Dynamic Theory of the Firm", *Strategic Management Journal*, 17, 45-62.

Swanson, Richard A. (2011), "Human resource development and its underlying theory", *Human Resource Development International*, 4(3), 299-312.

Sveiby, Karl-Erik (1997), "The Intangible Assets Monitor", *Journal of Human Resource Costing and*

Accounting, 2(1), 73-97.

Won, Ja-Youn and Ryu, Sang-Lyul (2016), "The Effect Life-cycle and Competitive Strategy on Performance Persistence", *Korea Accounting Journal*, 25(5), 33-65.

Yook, Keun-Hyo (2019), "Relationship between Sustainability Management Control System and Corporate Performance – International Competitive Study –", *Journal of the Japanese modern Association of Korea*, 63, 319-338.

Clarivate Analytics Report, 2020, www.clarivate.co.kr

Forbes Report, 2017-2018. www.forbes.org

Fortune Report, 2012-2018, www.fortune.org

McKinsey Global Institute, 2011.www.mckinsey.com

OECD Report, 2016-2019, www.oecd.org

Thompson Reuters, 2019. www.thompson.org

WEEKIY KDB Report, 2017. www.weekiy.org

WEF Report, 2016. www.wef.org

Appendix

Global Innovation Company	
Adobe System	Marriott International
Align Technology	Monster Beverage
Amazon.com	MS
AMD	Netflix
AmerisourceBergen	NVIDIA
Apple	Pixar
Boston Scientific	P&G
Booking Holding	Red Hat
Expedia	Regeneron Pharmaceuticals
Facebook	Salesforce
GE	ServiceNow
Google	Sisco
HP	Starbucks
IBM	Teslar
Illumina	Texas Instruments
Incyte	Qualcomm
Intel	Vertex Pharmaceuticals
Intuit	VISA
Kellogg	Workday
Linkedin	3M