The Development and Its Validation of Knowledge
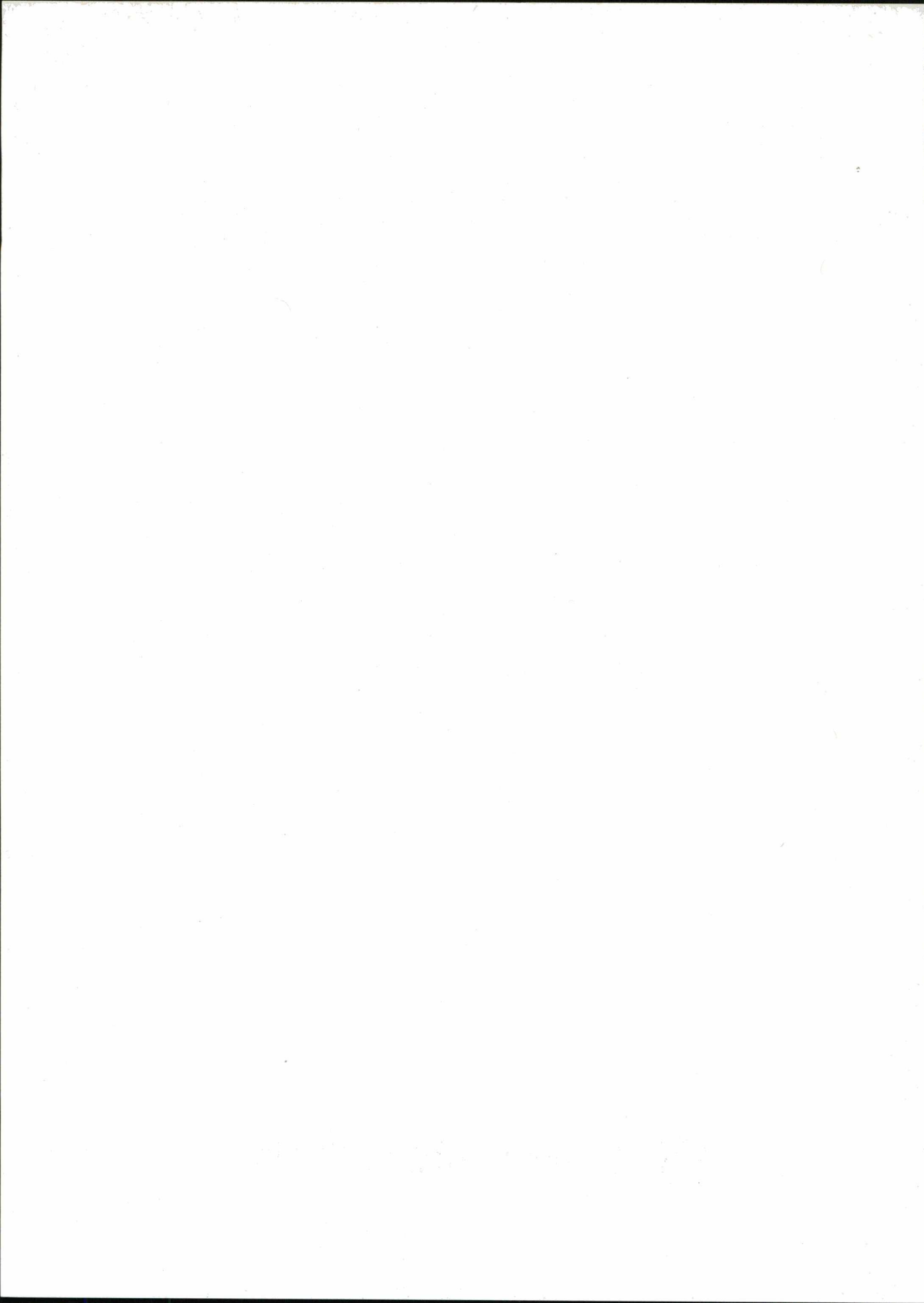Productivity and Value Creation

지식생산성과 가치창조 척도 개발 및 타당성 검증

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The Development and Its Validation of Knowledge Productivity and Value Creation

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Abstract

Knowledge productivity and value creation have changed and progressed significantly in our fast-changing knowledge economy during recent decades, presenting important challenges for managing businesses. Especially, knowledge productivity became the main factor for value creation, which is a priority objective of managing businesses. The purpose of this study is to develop and validate scales for the measurement of knowledge productivity and value creation. First, as a preliminary investigation, we conducted in-depth interviews with 39 executives and senior managers to develop the items for a questionnaire. Second, we conducted formal in-depth group interviews with 72 interviewees and collected completed questionnaires from 387 study participants. To test the convergent validity of the questionnaire items, we conducted an exploratory factor analysis using this sample. The results for the scale measuring knowledge productivity showed that 28 items could be categorized into two factors (KP1: improvement and innovation of products, services, and work processes, and KP2: sustainable development of the future growth engine). The results for the scale measuring value creation also indicated that all 28 items could be categorized into four factors (VC1: corporate reputation, image, and corporate social responsibility, VC2: employee satisfaction with work environment, VC3: employee satisfaction with financial benefits, and VC4: sustainability). The reliability of the measurement instruments, containing two factors related to knowledge productivity and four factors related to value creation, was acceptable. Results of a confirmatory factor analysis to verify the discriminant validity of the instrument items indicated that the two-factor model for knowledge productivity and the four-factor model for knowledge productivity fitted the data significantly better

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than other alternative models for both measures. Finally, as an additional test, the results of the correlation analysis for both knowledge productivity and value creation proved the validity of our study variables for measurement purposes. The results of these validation tests support the usefulness and practicality of these variables for future research.

Ⅰ. Introduction

In the 21st century knowledge economy, rapid advances in science and technology have had a significant impact on business environments. Today's leading business managers recognize the importance of knowledge productivity for value creation. Successful leaders are those who make continuous efforts to keep up with the fast-changing business environment of today's knowledge society. They prioritize the building of a knowledge-productive organizational culture to achieve high value creation and sustainable company growth. Such efforts require willingness to make changes and support ongoing development of leadership styles and organizational culture. In recent decades, business leaders and organizational cultures have become more people-oriented and less bureaucratic. The focus has shifted from profitability at all costs to knowledge productivity and value creation.

The new term "knowledge productivity", which was first introduced by Kessels (1996), refers to the capability of an organization to gather relevant knowledge and information, transform that knowledge and information into new capabilities, and apply these capabilities for the gradual improvement and radical innovation of work processes, products, and services. Knowledge productivity is positive factor for high value creation, which is the main objective of today's business managers.

Value creation enables sustainable growth of the company and allows the company to contribute to society by fulfilling its corporate social responsibility (Husted and Allen, 2007). Today's business leaders understand that value creation is not only a matter of revenue, net profit growth and market value increase; it also relates to broad concepts, such as corporate reputation and image, customer and employee satisfaction corporate social responsibility, and sustainability. In the context of this study, value creation encompasses the following goals related to these concepts: (a) revenue and net profit growth, (b) increased company market value and non-financial factors, (c) corporate reputation and image, (d) corporate social responsibility, (e) employee and customer satisfaction, and (f) sustainable capability for growth. Among the value creation concepts, financial factors are determined by the financial performance reports of the companies and the data from stock market. Therefore, this study focuses on measuring value creation concepts related to the above non-financial factors; (c) corporate reputation and image, (d) corporate social responsibility, (e) employee and customer satisfaction, and (f) sustainable capability for growth.

There is a need for academic research on the relationship between knowledge productivity and value creation in successful companies. The findings of such studies can then be applied

in practical business situations to aid in achieving high value creation in the companies. Previous academic research on knowledge productivity has mostly consisted of qualitative analysis of interview data. However, a comprehensive tool for measurement of knowledge productivity is needed for use in future academic research on knowledge productivity that incorporates quantitative analysis of survey data.

In this study, we develop new scales for measurement of knowledge productivity and value creation and test the validity of these scales in various ways. In order to achieve these objectives, we conducted in-depth group interviews as part of a preliminary investigation, after which formal in-depth group interviews were conducted and questionnaires distributed to study participants. To verify the validity of the scales measuring knowledge productivity and value creation, we conducted a series of statistical analyses: exploratory factor analysis (EFA) to verify convergent validity, confirmatory factor analysis (CFA) to test discriminant validity, and a correlation analysis for knowledge productivity and value creation to ensure validity of the measurement instrument. Drawing upon the findings in previous literature and our own research findings, we discuss the implications of the results of this study and suggest directions for future research.

II. Literature Review

2.1 Knowledge Productivity

Drucker (1969) claimed that modern society would become a knowledge society in which knowledge would become the core resource, and knowledge workers would become the leading group of workers. Drucker (1993) also stressed the importance of the development of a new economic theory that puts knowledge at the center of the wealth creation process. Drucker (1999) elaborated on this new economic theory and described a set of management guidelines for improving knowledge-worker productivity. He claimed that knowledge-worker productivity is the biggest challenge facing management in the 21st century. The ability to learn internally, within firms, stimulates knowledge workers' ability and strength (Drucker, 1999).

The term "knowledge productivity" refers to the capability of a team or organization to gather relevant information, transform this information into new capabilities, and apply these capabilities for the gradual improvement and radical innovation of work processes, products, and services (Kessels, 1996). Since Kessels (1996), inspired by Drucker (1993), first introduced the term, academic research related to this new concept has flourished (e.g. De Jong, 2011; Stam, 2007;

Van Lakerveld, 2005). In this study, we use the term "knowledge productivity" to describe future-oriented knowledge creation, knowledge sharing, knowledge improvement, and knowledge application for the purpose of achieving high value creation in companies, industries, and economies of countries.

The concept of "knowledge productivity" is closely related to the widely used term "knowledge management". However, these concepts differ in that knowledge productivity should be regarded as an organizational learning process, and that knowledge cannot be managed in the same ways as other resources in an organization. Creating knowledge and applying it to business operations are accomplished by empowering people, not by controlling and managing knowledge. Thus, leadership styles and organizational cultures have changed substantially in recent decades, becoming more people-oriented and non-bureaucratic, respecting people and knowledge and ideas of the people with increased delegation and freedom within the organization. These changes in organizational culture have vitalized knowledge creation and application in organizations. Therefore, this research uses the term "knowledge productivity" to describe future-oriented knowledge creation, knowledge sharing, knowledge improvement and knowledge application for achieving the goals of high value creation by companies, industries, and economies of countries. Because literatures on knowledge management and knowledge productivity address many common aspects, this review touches on both domains.

In the 21st century, rapid transformation of economies into knowledge-based economies, in which the development and application of knowledge becomes more important than traditional assets such as capital, material, and physical labor (Kessels and Keursten, 2002). The two main factors of knowledge productivity are human resources and their learning capability. Woo and Park (2001) insisted that individuals' knowledge assets are critical for the success and sustainable growth of firms. Knowledge management strategy also has positive effects on business performance (Kim, 2013; Yoon and Heo, 2011). Therefore, companies should invest greater efforts for effective utilization of such knowledge assets. Keursten, Verdonschot, Kessels, and Kwakman (2006) argued that productive utilization of knowledge in organizations leads to greater productivity when knowledge creation and application are part of day-to-day management practice. Kessels, Verdonschot, and De Jong (2011) asserted that knowledge productivity combines two main processes: the factual improvement and innovation of products, services, and work processes (KP1), and the capability of being knowledge-productive in the future (KP2) (Kessels et al., 2011). KP2 follows from KP1 and these two processes interact with each other. KP2 is similar to the process of continuous radical innovation and improvement leading to, which in Korea is called "sustainable future growth

engine development".

For systematic development of a desirable organizational learning culture, Kessels (1996) and Kessels and Keursten (2002) recommended a "corporate curriculum" that supports the seven learning functions: subject matter expertise, problem solving, reflective skill and meta-cognition, communication skills, self-regulation of motivation and affection, peace and stability, and creative turmoil. On the basis of their research, Kessels et al. (2011) came to the conclusion that the process of knowledge productivity should be considered as inherently a learning process that includes information collecting, problem analysis, competency development, and the creative application of these competencies in new, previously unknown situations. An organizational learning culture is essential for improving and maintaining a knowledge-productive organization. Therefore, supporting competency development is at the heart of knowledge productivity.

In this study, knowledge productivity combines two main processes, KP1 (improvement and innovation of productivity, services, and work processes), KP2 (sustainable development of the future growth engine) (Kessels et al., 2011).

2.2 Value Creation

Value creation is widely considered to be one of the most important objectives for leaders of businesses, institutions and nation's economy development. Value creation enables sustainable growth of a company and allows it to fulfilling its corporate social responsibility (Husted and Allen, 2007). Value creation is not only a matter of revenue, profit growth, and market value; it is also related to corporate reputation, image, and employee satisfaction (Weiss, Dawis, England, and Lofquist, 1967) and sustainability. Intangible assets, such as reputation, credibility of the corporation and its CEO, and customer relations affect customer satisfaction and loyalty. Employee satisfaction is an important factor for measuring value creation. Hart and Quinn (1991) assessed employee satisfaction using a scale of perceived organizational performance. Corporate sustainability strongly depends on successful value creation in terms of revenue and profit growth, increased market value, corporate reputation, and image. Therefore, value creation should be considered the main responsibility of managers and leaders in the business world (Rho, Lim, and Hwang, 2000).

The concept of value creation in most previous business management research was mainly linked to financial performance and company market value. However, in businesses today, value creation encompasses all the tangible (revenue and net profit growth and increased company

market value) and intangible factors (corporate reputation and image, corporate social responsibility, employee and customer satisfaction, and sustainable capability) mentioned earlier. Among these concepts, revenue and net profit growth and increased company market value are determined based on financial performance reports and stock market data. The intangible concepts related to value creation (corporate reputation and image, corporate social responsibility, employee satisfaction, and sustainable capability) are measured in this study using four variables specifically designed to assess value creation in companies: In this study, value creation encompasses the concepts of VC1 (corporate reputation, image, and corporate social responsibility), VC2 (employee satisfaction with work environment), VC3 (employee satisfaction with financial benefits), and VC4 (sustainability).

Ⅲ. Methodology

3.1 Sample and Procedure

To deeply investigate business practices, we conducted both qualitative and quantitative analyses with a series of interviews as well as collecting a survey questionnaire in this study. Further, we needed a sample of companies, which have a well established system of knowledge productivity and value creation as a successful leading Korean company. Thus, the participants in this study were four leading Korean companies; Samsung Electronics, LG Electronics, Shinhan Banks, and Woongjin Group. As a preliminary investigation, we conducted in-depth interviews with 39 executives and senior managers of various ranks in order to examine knowledge productivity and value creation in their companies. To investigate further the characteristics of knowledge productivity and value creation, we conducted formal in-depth interviews with 72 interviewees and distributed survey questionnaires to 460 executives, managers and employees of the four companies. We asked the same questions as used for the preliminary investigations of knowledge productivity and value creation to these new interviewees.

Following the interview guidelines we developed, several key questions were asked to interviewees on each of the subjects knowledge productivity and value creation. About knowledge productivity, we asked several questions, such as, "What is your opinion about the levels of knowledge development and successful implementation of knowledge in your company?" and "How does knowledge relate to the productivity of your company?" About the value creation of the companies, we

posed several questions, such as, "Does your company create value successfully?" and "How does your company achieve its goals for value creation?" Their answers on knowledge productivity and value creation are best represented by the selected responses in <Table 1>.

〈Table 1〉 Interview Summary

	Interview response
Knowledge productivity	"Our company implemented TDR (teardown and redesign) program for significant changes of products and processes, which accelerated new product development in our company and provided solutions and new approaches to major company issues.", "Our CEO initiated a new program for best work practices intended to improve the efficiency of work processes. and operating practices. This program involves improvement and innovation of work processes by sharing knowledge, experience, and best practices across business divisions in our company." "Our company management places high priority on life−long learning programs for human resources development, especially for 'learning by doing'." "Our company implemented 6−sigma program to improve management quality of all operation systems, including work processes, quality of products and customer services."
Value creation	*Corporate reputation, image, and corporate social responsibility:* "Our company is well−recognized and respected for its high−quality products and services." "Our company has maintained customer−oriented management principles and prioritized customer value", "Our company produces the best products and services with the best people and technology." "Our company operates a scholarship foundation to help education of students from low−income families.", "Our company has continuously supported social programs, such as, major culture and sports programs." *Employee satisfaction with work environment:* "We believe that our company is one of the best places to work, as the leadership style and organizational culture are people−oriented and humanitarian respecting opinions and ideas of organization members. Our company has a work environment in which people have a strong ownership spirit, and do their best by bringing out their best abilities. They feel a strong responsibility for the company." "Employees are proud of working for our company as the organizational culture respects employees and gives them equal opportunities. Thus, they are able to concentrate on their work without concerns about working conditions." *Employee satisfaction with financial benefits:* "Our company provides a comparatively high level of compensation, benefits, and a special incentive system related to performance and achievement of the company goals." "Our company strongly motivates people with high−level financial benefits and compensation based on performance." *Sustainability:* "Our management considers sustainable development of the future growth engine to be its most important priority; thus, the company invests 5% of total company sales into R&D and new product development. Approximately 10,000 people are involved in R&D and product development in the company." "Our company has demonstrated sustainable high growth over a period of 20 years, diversifying business into 15 affiliated companies in various industries."

Drawing upon the responses from the interviews, we found that the knowledge productivity of the companies involved improvement and innovation of products, services, and work processes and sustainable development of the future growth engine. And we figured out that value creation of the companies included corporate reputation and image, corporate social responsibility, employee and customer satisfaction, and sustainable growth capability in addition to the financial performances.

To test the validity of our measurement instruments for knowledge productivity and value creation empirically, we distributed survey questionnaires to employees. managers and executives

in the same companies. The cover letter of the survey questionnaire explained the purpose of the study and provided assurance of confidentiality. In total, 399 questionnaires were initially collected. However, 12 out of the 399 questionnaires were eliminated due to missing data; this resulted in 387 usable questionnaires. As shown in <Table 2>, 85.8% of the sample was male, 79.2% was between 31 and 50 years old, and 88.6% occupied ranks higher than middle manager. The percentage of employees who had worked at their companies for more than six years was 70.8%. The percentage of employees who had received undergraduate degrees was 74.1%.

Overall, most respondents were highly educated, experienced male managers in middle management positions or higher. This sample is appropriate because employees at these levels are well equipped to answer questions about the knowledge productivity and value creation of their companies. Responses from senior- or higher-level managers are especially well suited to answering these questions and considering matters related to measuring knowledge productivity and value creation. The fact that the gender ratio of the sample was skewed (i.e., most respondents were male) reflects the social structure of most Korean companies, which are still dominated by male employees at management levels.

〈Table 2〉 Sample Characteristics (N = 387)

	Number	Percentage (%)
Gender		
Male	332	85.8
Female	55	14.2
Age		
Below 30 years old	54	14.0
31~40 years old	150	38.7
41~50 years old	157	40.5
Over 50 years old	26	6.8
Rank		
Employee	45	11.6
Assistant manager	38	9.8
Middle manager	123	31.8
Senior manager	94	24.3
Executive	87	22.5
Tenure		
Below 5 years	113	29.2
6~10 years	94	24.3
Over 11 years	180	46.5
Education level		
College or less	16	4.2
Undergraduate	287	74.1
Graduate or higher	84	21.7

3.2 Measure

We used a five-point Likert scale with responses ranging from "strongly disagree" (1) to "strongly agree" (5) to measure both knowledge productivity and value creation. As mentioned earlier, questionnaire items were adapted from various original items in previous studies through a keyword extraction process (see <Appendix 1> and <Appendix 2>).

IV. Results

4.1 Exploratory Factor Analysis

Using data from usable questionnaires collected form 387 employees, managers, and executives of the companies, we conducted exploratory factor analysis (EFA) for 29 items on knowledge productivity and 28 items on value creation to determine the factorial structure. <Table 3> shows factor loadings for each item for knowledge productivity and value creation.

The results of the EFA for knowledge productivity indicated that 28 items could be categorized into two factors: KP1: Improvement and innovation of products, services, and work processes and KP2: Sustainable development of the future growth engine. Most factor loadings for the items were acceptable (i.e., > 0.500). One of the knowledge productivity items was excluded due to a low factor loading (item No. 2). The results of the EFA for value creation indicated that the 28 items could be categorized into four factors: VC1: Corporate reputation, image, and corporate social responsibility, VC2: Employee satisfaction with work environment, VC3: Employee satisfaction with financial benefits, and VC4: Sustainability. Most factor loadings for these items were acceptable (i.e., > 0.500). These results support the convergent validity of the items for each factor.

Further, we confirmed Cronbach's alpha in order to verify the reliability of each factor. The Cronbach's alpha values for KP1 and KP2 were 0.959 and 0.813, respectively. The Cronbach's alpha values for VC1, VC2, VC3, and VC4 were 0.937, 0.932, 0.804, and 0.658, respectively. Overall, the Cronbach's alpha values for the two factors related to knowledge productivity and the four factors related to value creation were acceptable (i.e., > 0.600). According to Nunnally (1978), values above 0.700 indicate appropriate reliability, and values between 0.500 and 0.600 are acceptable for empirical studies.

〈Table 3〉 Factor Analysis for Knowledge Productivity and Value Creation

Item	KP1	KP2	Item	VC1	VC2	VC3	VC4
22	0.792		14	0.739			
19	0.755		17	0.713			
18	0.752		13	0.703			
16	0.742		4	0.700			
4	0.730		5	0.688			
27	0.722		18	0.678			
25	0.715		2	0.671			
17	0.702		10	0.670			
20	0.701		11	0.663			
21	0.683		15	0.630			
29	0.666		1	0.560			
24	0.640		8	0.548			
28	0.638		26		0.772		
5	0.633		27		0.769		
26	0.624		28		0.762		
6	0.573		25		0.665		
15	0.568		24		0.643		
23	0.556		22		0.640		
10		0.738	20		0.640		
12		0.711	19		0.629		
7		0.654	9		0.546		
14		0.622	21			0.754	
11		0.614	23			0.740	
13		0.596	3			0.637	
3		0.580	6				0.780
1		0.558	12				0.713
8		0.555	7				0.561
9		0.550	16				0.521
Eigenvalue	10.132	6.341	Eigenvalue	6.806	5.427	3.581	2.127
Variance explained(%)	34.938	21.866	Variance explained(%)	24.307	19.384	12.789	7.596
Cumulative variance explained(%)	34.938	56.804	Cumulative variance explained(%)	24.307	43.690	56.480	64.076

Note) KP1 (Improvement and innovation of products, services, and work processes), KP2 (Sustainable development of the future growth engine), VC1 (Corporate reputation, image, and corporate social responsibility), VC2 (Employee satisfaction with work environment), VC3 (Employee satisfaction with financial benefits), VC4 (Sustainability).

4.2 Confirmatory Factor Analysis

<Table 4> provides the overall fit indexes for the various knowledge productivity and value creation models. As one progresses from the most restricted model (one-factor) to the least restricted model (two- or four-factor), all of the indexes showed incremental improvements in overall fit. Both the two-factor model for knowledge productivity and the four-factor model for value creation indicated low χ^2 values and χ^2/df ratios. Also, the two-factor model for knowledge productivity ($\chi^2(df)$ = 914.781 (349), NFI = 0.886, CFI = 0.926, TLI = 0.919, IFI = 0.926, RMR= 0.021, RMSEA = 0.065) and the four-factor model for value creation ($\chi^2(df)$ = 1178.687 (344), NFI = 0.846, CFI = 0.885, TLI = 0.874, IFI = 0.886, RMR= 0.036, RMSEA = 0.079) fitted the data significantly better than the one-factor model for knowledge productivity ($\chi^2(df)$ = 1034.286 (350), NFI = 0.871, CFI = 0.910, TLI = 0.903, IFI = 0.910, RMR= 0.023, RMSEA = 0.071) and value creation ($\chi^2(df)$ = 1939.947 (350), NFI = 0.746, CFI = 0.781, TLI = 0.764, IFI = 0.782, RMR= 0.046, RMSEA = 0.108). A good model fit requires that the values of the CFI and TLI must exceed 0.900, and that the value of the RMSEA should be lower than 0.080 (Lance and Vandenberg, 2002). Also, the values of NFI and IFI over 0.900 and the value of RMR below 0.050 indicate a good fit of the research model.

〈Table 4〉 Overall Fit Indexes for Knowledge Productivity and Value Creation

Model	χ^2	df	χ^2/df	NFI	CFI	TLI	IFI	RMR	RMSEA
Knowledge productivity									
Null	7989.929	378	21.137	N/A	N/A	N/A	N/A	0.290	0.228
One-factor	1034.286	350	2.955	0.871	0.910	0.903	0.910	0.023	0.071
Two-factor	914.781	349	2.621	0.886	0.926	0.919	0.926	0.021	0.065
Value creation									
Null	7644.314	378	20.223	N/A	N/A	N/A	N/A	0.277	0.223
One-factor	1939.947	350	5.543	0.746	0.781	0.764	0.782	0.046	0.108
Two-factor	1455.982	349	4.172	0.810	0.848	0.835	0.848	0.042	0.091
Four-factor	1178.687	344	3.426	0.846	0.885	0.874	0.886	0.036	0.079

Note) Knowledge productivity: One-factor model (KP1 + KP2), Two-factor model (KP1, KP2).
  Value creation: One-factor model (VC1 + VC2 + VC3 + VC4), Two-factor model (VC1 + VC4, VC2 + VC3), Four-factor model (VC1, VC2, VC3, VC4).
  NFI (Normed Fit Index), CFI (Comparative Fit Index), TLI (Turker-Lewis Index), IFI (Incremental Fit Index), RMR (Root Mean Square Residual), RMSEA (Root Mean Square Error of Approximation).

Each one-factor model included all two or four components (knowledge productivity: KP1 and KP2; value creation: VC1, VC2, VC3, and VC4). The two-factor model of value creation was divided as follows: two components (VC1+VC4, i.e., corporate reputation, image, and corporate social responsibility and sustainability) were combined, and the other two components (VC2+VC3, i.e., employee satisfaction with work environment and employee satisfaction with financial benefits) were also combined. Overall, the two-factor model for knowledge productivity and the four-factor model for value creation showed the best fit compared to the other alternative models (the one- or two-factor models). These results verified the discriminant validity of the two dimensions of knowledge productivity and the four dimensions of value creation adopted in this study. In addition, we conducted exploratory factor analysis and confirmatory factor analysis for each of the four company samples to check the generalizability for the factor distinction among the companies. The results showed similar patterns to the whole sample.

4.3 Additional Test: Correlation Analysis

The knowledge economy and knowledge revolution forecasted and described by Drucker (1993, 1999) have developed amazingly rapidly in the 21st century. Knowledge has therefore become the most important asset in most companies today. Knowledge productivity involves the development of new knowledge in the workplace that can generate continuous improvement and radical innovations of products, services, and operating processes (Kessels, 2004). Thus, knowledge productivity has become one of the critical elements in the process of value creation. As value creation is the main objective and responsibility of leaders of business enterprises and institutions, it is vital to understand not only ways to improve knowledge productivity, but also how to implement and apply knowledge productivity in the day-to-day practices of field business operations.

To examine the relationships among our study variables further, we conducted a correlation analysis (see <Table 5>). The results of the analysis indicated that both knowledge productivity factors (improvement and innovation of products, services, and work processes = KP1 and sustainable development of the future growth engine = KP2) (Kessels et al., 2011) were found to be significantly and positively correlated with the main value creation factors: corporate reputation, image, and corporate social responsibility (VC1), employee satisfaction with work environment (VC2), employee satisfaction with financial benefits (VC3), and sustainability (VC4). These statistically significant results indicate the measurement validity of our study variables. Further, the results of the correlation analysis might support the argument of Kessels (2004) that knowledge productivity can affect gradual improvement and radical innovation in companies.

〈Table 5〉 Means, Standard Deviations, and Correlations for Study Variables

Variable	Mean	s.d.	1	2	3	4	5
1. KP1	3.99	0.59					
2. KP2	4.03	0.57	0.818**				
3. VC1	4.27	0.56	0.789**	0.731**			
4. VC2	4.08	0.66	0.811**	0.701**	0.769**		
5. VC3	3.75	0.80	0.619**	0.603**	0.651**	0.672**	
6. VC4	3.93	0.56	0.476**	0.531**	0.493**	0.360**	0.428**

Note) * P $\langle$ 0.05, ** P $\langle$ 0.01.

V. Discussion

In this study, scales for measuring knowledge productivity and value creation were developed and validated. This research introduces measurement instruments and may reduce the gap between academic theories and management practice in the areas of knowledge productivity and value creation. Academic research on knowledge productivity has been mostly based on theories involving qualitative analysis of interview. Therefore, in this study, we developed instruments for measurement of knowledge productivity and value creation involving quantitative analysis of survey data in addition to qualitative analysis based on in-depth interviews. Examination of the financial factors and intangible factors related to value creation makes this study unique. In this study, value creation concepts is defined in combination of tangible financial factors; (a) revenue and net profit growth, (b) company market value increase and intangible factors, (c) corporate reputation and image, (d) fulfilling corporate social responsibility, (e) employee and customer satisfaction, and (f) sustainable capability.

Most previous academic research on value creation focused on tangible financial performance factors. In this study, we introduced and developed a measurement scale that integrates all factors, including tangible and intangible factors, related to value creation. This new measurement scale is based on data obtained from formal in-depth group interviews and a series of statistical analyses using data obtained from a survey questionnaire of study participants. In addition, our findings were reviewed by respected senior business leaders in Korea, and their opinions and comments were consolidated.

The findings of this study provide several academic contributions and practical implications

for business leaders. First, because we used a two-way approach involving in-depth interviews with company executives and senior managers in a preliminary investigation, and then combined the findings with responses from formal in-depth group interviews and survey questionnaires, we were able to develop comprehensive measures of knowledge productivity and value creation. The responses from interviewees accorded with the results of the statistical analyses of survey data.

By using both qualitative and quantitative methods and developing new measurement scales based on the findings of prior academic studies and newly identified concepts on knowledge productivity and value creation, we were able to integrate the findings of these studies with new information obtained through our research. Future academic researchers on knowledge productivity and value creation will benefit from our study, as they will be able to use our measurement instruments. These findings support our argument that, we have alleviated to some extent the difficulty of measuring knowledge productivity and value creation in fast-changing, real-time management scenarios in the modern business world.

Second, we conducted a series of statistical analyses in order to verify the validity of the new measurement scales. The results of the exploratory factor analysis (EFA) showed that the items for knowledge productivity and value creation could be categorized into two and four factors, respectively, and that factor loadings for all items were acceptable. In addition, Cronbach's alpha values for all of the factors were acceptable. These results support the convergent validity and reliability of the items included in these new measurement scales. The results of the confirmatory factor analysis (CFA) showed that the two-factor model for knowledge productivity and the four-factor model for value creation fitted the data significantly better than the alternative models for both measures. Thus, the discriminant validity among the factors was verified.

Finally, we ran a correlation analysis as an additional test. The results showed significantly positive relationships for all six factors: knowledge productivity (KP1 and KP2) and value creation (VC1, VC2, VC3, and VC4). These statistically significant results indicate the validity of our study variables for measurement of knowledge productivity and value creation. From a theoretical perspective, the results of the correlation analysis support the argument of Kessels (2004) that knowledge productivity and continuous improvement and innovation are directly connected. The factors related to knowledge productivity help to achieve high value creation, which is the main objective of business managers.

This study has some limitations, as follows. First, in this study, only successful leading Korean companies were used for the empirical research to enable scales to be developed for measurement

of knowledge productivity and value creation. Therefore, the results may not necessarily be generalized to companies of other countries or to all level Korean companies. Second, the sample size was modest. In future empirical research with the objective of developing more generalized and globalized conclusions, a broad sample should be used including companies exhibiting high-, medium-, and low-level performance and also companies from many different regions and countries. Third, there is a need to develop a comprehensive model investigating the relationships among knowledge productivity, value creation, and other factors that might influence them such as leadership style and organizational culture. Further, future research can examine causal relationships between those variables. For example, it would be meaningful to look into which leadership style is most effective for creating a knowledge-productive organizational culture and achieving sustainable high value creation (Kang et al., 2014).

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⟨Appendix 1⟩ Study Items, Keywords, and Original Sources for Knowledge Productivity

No.	Question	Keyword	Source
1	In our company, all the subject matter expertise we need now and in the near future is available within our organization.	Subject matter expertise	Kessels and Keursten (2002)
2	We know what problems we are good at solving and those we are not.	Problem-solving	Kessels and Keursten (2002)
3	We try hard to increase our level of expertise and broaden the areas of knowledge within our company.	Reflective skill and meta-cognition	Kessels and Keursten (2002)
4	Our open communication contributes to sharing experience, exchange of learning, and knowledge development.	Communication skills	Kessels and Keursten (2002)
5	In our company, people know what work is meaningful for them and how to perform such work.	Self-regulation of motivation and affection	Kessels and Keursten (2002)
6	We take sufficient time to think how to apply to our actual work what we have learned from the past.	Peace and stability	Kessels and Keursten (2002)
7	Our company management and employees have the ability to create opportunity from turmoil.	Creative turmoil	Kessels and Keursten (2002)
8	We try to develop the knowledge and expertise our firm needs.	Subject matter expertise	Kessels and Keursten (2002)
9	Our company tries to stimulate people to experiment with new approaches to solve defined problems.	Problem-solving	Kessels and Keursten (2002)
10	We know the intelligence level of our company in the industry.	Reflective skills and meta-cognition	Kessels and Keursten (2002)
11	We are well aware of the preferred ways to develop and share knowledge.	Reflective skills and meta-cognition	Kessels and Keursten (2002)
12	We analyze the reasons why we make progress or lag behind in various fields of expertise.	Reflective skills and meta-cognition	Kessels and Keursten (2002)
13	We apply to our actual work what we have learned from the past.	Peace and stability	Kessels and Keursten (2002)
14	Our company focuses on finding new ways to deal with critical issues.	Creative turmoil	Kessels and Keursten (2002)
15	Our new knowledge and ideas lead to business growth.	Intelligent organization	Koski (2001)
16	Our company is an organization that values and highlights intelligence, information, and ideas.	Intelligent organization	Koski (2001)
17	The market value of our company increases as a result of our creative knowledge and ideas.	Hybrid thinking	Kilroy (1999)
18	The creative ideas of employees are respected and well accepted for implementation.	Organizational creativity	Woodman et al. (1993)
19	In our company, creativity and new ideas are formed by employees working together.	Organizational creativity	Woodman et al. (1993)
20	Our company considers developing and learning new knowledge as the most important priority.	Knowledge development	New
21	In our company, we share knowledge and best practices effectively without boundaries.	Knowledge /bestpracticessharing	New
22	We always try to think creatively for developing new knowledge and improving knowledge productivity.	Creativity	New
23	In our company, we always try to create ideas to develop new products and services.	Creative idea development	New
24	In our company, innovative thinking is encouraged in order to improve operating systems and productivity.	Innovation	New
25	Our company respects the creative ideas of management and employees that come from their expertise and intuition.	Intuition/inspiration	New
26	Our company continuously innovates our businesses with creative new ideas to develop Blue Ocean businesses.	Innovation to Blue Ocean	Kim and Mauborgne (2005)
27	Our company is very open to learning and accepting best practices and new knowledge from inside and outside the business.	Learning	New
28	Our company utilizes knowledge in each business unit productively to achieve goals.	Pro-active knowledge utilization	New
29	Our company emphasizes developing new ideas to improve operation processes continuously.	Improving operation process	New

⟨Appendix 2⟩ Study Items, Keywords, and Original Sources for Value Creation

No.	Question	Keyword	Source
1	The top management team of our firm is esteemed for its outstanding management capability.	Management quality	Rho, Lim, and Hwang (2004)
2	Our company is known for its efforts for transparent management.	Corporate reputation	Rho et al. (2004)
3	Our company is respected for its high profitability and stability.	Corporate reputation	Rho et al. (2004)
4	Our company gives back to society from what is earned and has a strong sense of social responsibility.	Social responsibility	Rho et al. (2004)
5	Our company is doing business in a fair and honest way with competitors and suppliers.	Corporate reputation	Rho et al. (2004)
6	Our company is reputed for its advanced technology compared to our competitors.	Advanced technology	Rho et al. (2004)
7	Our company is renowned for its high-quality products and services.	High quality/ sustainable capability	Rho et al. (2004)
8	The employees are satisfied with the way our company contributes to society.	Corporate reputation	Rho et al. (2004)
9	Our company is known for its focus on radical innovation.	Corporate reputation	Rho et al. (2004)
10	We are customer-oriented and always try to do our best to fulfill customer needs.	Customer satisfaction	Rho et al. (2004)
11	Our company takes responsibility for protection of the environment.	Corporate reputation	Rho et al. (2004)
12	Our company manages globally-oriented businesses.	Globally oriented/ sustainable capability	Rho et al. (2004)
13	Our company is appreciated for its active role in corporate social responsibility.	Social responsibility	Kessels (2004)
14	Our company promotes sustainable management and social values.	Corporate reputation	Kessels (2004)
15	Our company is fairly well managed by top management.	Management quality	Weiss, Dawis, England, and Lofquist (1967)
16	Our company is focusing on fast moneymaking.	Profit-oriented	Weiss et al. (1967)
17	Our company is strongly involved in the community and has a strong sense of social responsibility.	Corporate image /social responsibility	Weiss et al. (1967)
18	Our company focuses on customer needs and customer satisfaction.	Customer satisfaction	Weiss et al. (1967)
19	Our company is a good place to work and I am satisfied with my job.	Employee satisfaction	Weiss et al. (1967)
20	I can grow when I work hard in our company.	Employee satisfaction	Weiss et al. (1967)
21	Our company payment level is similar to that of competitors.	Employee satisfaction	Weiss et al. (1967)
22	Promotion and evaluation are fairly executed in our company.	Employee satisfaction	Weiss et al. (1967)
23	Our company offers considerable benefits and bonuses.	Employee satisfaction	Weiss et al. (1967)
24	My work brings out my best abilities.	Employee satisfaction	Weiss et al. (1967)
25	My job is challenging and creative.	Employee satisfaction	Weiss et al. (1967)
26	I respect and trust my boss.	Employee satisfaction	Weiss et al. (1967)
27	In our work environment, I feel free to make recommendations for the company.	Employee satisfaction	Weiss et al. (1967)
28	I know what my company and superiors expect from me.	Employee satisfaction	Weiss et al. (1967)

지식생산성과 가치창조 척도 개발 및 타당성 검증

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요약

지난 몇 십 년 동안 급변해 온 지식기반 경제하에서 경영에서의 지식생산성과 가치창조는 많은 변화와 진보가 이루어져왔다. 따라서 오늘날의 현실경영을 반영한 지식생산성과 가치창조의 특성들을 재정의 할 필요성이 재고된다. 본 연구는 지식생산성과 가치창조 유형에 대한 척도를 개발하고 그 타당성을 실증적으로 검증하고자 한다. 척도개발을 위하여 예비조사로서 39명의 기업임원 및 고위간부들을 대상으로 사전 그룹 심층인터뷰를 실시하였다. 이후, 72명의 기업임원 및 고위간부들을 대상으로 공식적인 심층인터뷰를 실시하고 387명의 임직원들을 대상으로 설문조사를 실시하였다. 지식생산성과 가치창조 유형 척도의 타당성을 검증하기 위하여 몇 가지 통계분석을 실시하였다. 첫째, 탐색적 요인분석 결과 28개 지식생산성 문항들은 2개의 요인으로 구분되었으며, 28개의 가치창조 문항들은 4개의 요인으로 구분되었다. 지식생산성의 2가지 유형은 제품, 서비스, 업무프로세스의 개선과 혁신(KP1), 미래 성장동력의 지속적 개발(KP2)로 나타났다. 가치창조의 4가지 유형은 기업의 평판, 이미지, 사회적 책임활동(VC1), 업무환경에 대한 직원만족도(VC2), 재무적보상에 대한 직원만족도(VC3), 지속가능성(VC4)으로 나타났다. 모든 문항들의 요인적재값과 각 요인들의 신뢰도는 적합한 수준을 나타내며 척도의 수렴타당성을 증명하였다. 둘째, 확인적 요인분석 결과 지식생산성 2개 요인과 가치창조 4개 요인 구조가 각각의 다른 대안적 요인 모형들보다 더 높은 수준의 모형적합도를 나타내며 척도의 판별타당성을 증명하였다. 셋째, 지식생산성과 가치창조 척도에 대한 추가적인 상관관계 분석 결과는 변수들 간 통계적으로 유의한 관계를 나타내며 측정타당성을 증명하였다. 본 연구에서 제시하는 척도에 대한 이러한 타당성 검증 결과들은 향후 연구에 척도의 유용성과 실용성을 제공할 것으로 기대된다.

주제어   지식생산성, 가치창조, 수렴타당성, 판별타당성, 측정타당성