

## A Study on the Facilitation of the Humanities and Social Science Based Convergence Research

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### ABSTRACT

In this study, we have attempted to find a way to revitalize the convergence research based on humanities and social science centered around the cases and current status of the humanities and social science based convergence research. To this end, we have investigated cases of the projects that have implemented humanities and social science based convergence research and discussed them with experts related to the convergence research. Through which, in this study, we proposed ways of facilitation such as develop top down agenda for strengthening demand oriented R&D, build a linkage structure of foundation-application-commercialization for the humanities and social science based convergence research, strengthen the foundation for cooperative system for creative research, nurture expert manpower for the humanities and social science based convergence research through systematic education, expand the budget for revitalizing the humanities and social science based research, improve the evaluation system for the performance research results of the humanities and social science based convergence research, and expand the roles for the institutes supporting humanities and social science based convergence research.

## 1. Introduction

Since the beginning of the new millennium, the term of convergence has been actively used in and by various academic fields and research support institutions domestically and internationally. In order to address complicated social problems that can not be solved by a single academic discipline, they are approaching them with a creative and rational solution to complex social problems through various interdisciplinary exchanges and collaborations from the viewpoint of ‘convergence.’ The

fourth industrial revolution based on new technology starts with convergence and is completed by convergence, thereby connecting all elements of society and making it intelligent. As such, the convergence as a key keyword of the fourth industrial revolution, social, national and scholarly demands for convergence research are increasing each day.

Reviewing the convergence researches at the national level, there are various supports extended to expand new convergence models, and the Ministry of Education and Human Resources Development (the current Ministry of Education) announced the basic policy for the development of the national convergence technology in 2007 and defined the concept of the national convergence technology, and in 2008, developed the first basic national convergence technology development plan (2008~2013), considered the implementation plan and current status of the convergence technology for each ministry, domestic science and technology capacity, economic and social interest, etc., and classified the convergence technology into the convergence of new technology and existing academic disciplines, convergence between new technologies, and the convergence of new technologies and the existing industries. In 2014, the related ministries and agencies jointly developed strategies for the development of convergence technologies to realize a creative economy, and based on the five major convergence technology development strategies for the convergence technology project plan, analyzed details of key implementations for each ministry, thereby laying the foundation for the implementation of the convergence technology investment directions, such as promoting technology development and technology commercialization, promoting convergence technology research for solving social problems, expanding the convergence of humanities and sciences, cultivating creative convergence talents, and enhancing the sophistication of convergence infrastructure.

Recently, in order to respond to fast changes of the future society, it has been felt that research and development innovations through convergence are necessary, but there is still a lack of convergence in the research field. Whereas, major countries such as the United States, European Union and Japan have established various convergence innovation policies to focus on securing national growth engines and industrial competitiveness through leading technological innovations, and in order to solve the multi-layered and complex problems, the third basic convergence research and development facilitation plan (2018-2027) was developed (National Science and Technology Advisory Council's deliberation meeting and other multiple ministries' joint technical cooperation special committee, 2018). In the plan, the quantitative development of convergence research has been achieved through the development plan for the first and second convergence researches, but the field is limited to the convergence technology field, and to establish a new paradigm of research revitalization, they have established a basic plan based on a long-term philosophy. This suggests a need for a humanities based foundation for convergence research, yet it can also be confirmed that the focus is still placed on science and technology convergence research as for the implementation tasks and areas are concerned. Therefore, in this study, we intend to propose a facilitation plan for the humanities and social science based convergence research, focusing on the current status of the humanities and social science based convergence research.

## 2. Literature Review

The convergence research which emerged with the founding of the American Society for the Advancement of Science in the 1920s gradually spread from the 1930s around science and technology (Hwang, Kim, & Lee, 2008). The importance of humanities ways of thinking has grown as for the areas where science and technology could not help to resolve, and accordingly, since the 1960s, the convergence of research on holistic viewpoints involving not only science and technology but also humanities and social sciences, arts, and physical sciences have also become increasingly important. (Han, 2010).

As for the studies of the environment for convergence research, Vanderloop (2004) found that researchers' experience, budget size, research period, innovation potential and strength, joint researchers, practicality, stimulation, facility, research focus, researcher's tenacity, time focused on the study, period of study, management support, technical guide, technical necessity, and speed of change in terms of management tools, level of difficulty of technicality, and presence and absence of existing markets based on which 8 types of research types were analyzed for their influential relationship, as a result of which, we found that expert's experience, expertise, tenacity, innovation potential and great ideas, and joint researcher as factors have a highly positive relationship with the research outcomes across all research types. National Research Foundation of Korea (2009) examined the conditions of convergence research, research capacity, research infrastructure, research network, diffusion and utilization of research results, and issue areas, and as a result, arrived at the conclusion that the foundation for convergence research must be strengthened such as by expanding investments, recognizing success and failures of high risk-high return studies, building communication channels and networks between academic disciplines, and open attitude of researchers, among others.

Noh, Lee, and Jeong (2018a) conducted a study on the performance result analysis of the project to support project for the interdisciplinary convergence research based on humanities and social sciences, and the results showed that the results of academic achievement and talent nurturing performance result were high, whereas performance in intellectual property rights and industrial support was very low, whereas they were successful in terms of public participation, public relations, and network of convergence researchers. In addition, quantitative results of academic journals outperformed other R&D support projects, but the mean index of the Impact Factor (IF), which is the quality performance result, was low, and the nurturing of follow-up generations of scholarships were relatively higher than other R&D support projects. Finally, in the case of intellectual property right (patent) performance and industrial support achievement, it showed very low performance compared to other R&D support projects. When reviewing them, first, it is necessary to expand the research support project through the allocation of additional budget, because it generates high quality achievement for the purposes of the interdisciplinary convergence research projects. Second, it is necessary to further expand the research stage to create intellectual property right performance and industrial support performance. Third, they proposed that a model should be developed to create a performance index suitable for the humanities and social sciences based interdisciplinary convergence research projects and model it to analyze the effects of various outcomes generated during the research

process.

As for a study on the humanities and social sciences based success factors of convergence research, Korea Research Foundation (2008) analyzed the researchers who participated in the academic research projects to investigate the influence of academic research projects on the academic effectiveness. As a result of the analysis, it was proven that the research period and the research cost scale have a positive relationship with the academic effect. As a result of analyzing factors affecting the convergence research effect, the systematicity of performance management, propriety of evaluation index, systematicity of project plan, and property of project exchanges were said to have impact on the effect of convergence research. Lee, Park, and Lee (2016) conducted an empirical study on the effects of research group characteristics on convergence research results, and as a result, it was found that the balance of majors of researchers among the study group's interdisciplinary characters and the number of partners of the study group among the collaborative characteristics of study have an impact on the outcome of convergence research. Noh, Lee, and Jeong (2018b) analyzed impact factors of performance in the humanities and social sciences based convergence research, and as for the influencing factors, they found researcher factor, supporting institution factor, and research area (major) among the research environment factors to be influential, through which, in the case of the convergence research based on humanities and social sciences, individual factor of researcher is more important than the factor of research team in the achievement of convergence research, while the supporting institutions can improve convergence research results through continuous management of convergence research results. The researcher's research area (major) also influences the results of the convergence research, so the implication is that the research area (major) should also be considered important in the formation of the convergence research team.

As a study on the obstacles to convergence research, Öberg (2009) selected the level of cooperation between researchers, quality of reference, quality and reliability of information, and quality of information analysis as independent variables, and as a result of analyzing the cases of the program, it was found that the epistemological difference was the determinant of the success or failure of the study. Kim, Lee, and Song (2018) studied the influence of convergence researchers' positive and negative experiences on the intention to retry, satisfaction, intention to persist, and intention to recommend convergence research, and the main advantages of the convergence research are the researchers, and they are able to communicate with researchers who are accredited by other research institutes and improve their understanding of them. Meanwhile, the difficulty of carrying out the convergence research was that the burden of the research supervisor was large, and there was a great pressure that the industrial performance should be achieved as a result of the products such as patent.

### **3. Analysis of the Case Studies on the Humanities and Social Science Based Convergence Research**

#### *3.1 Analysis of the performance achievement of interdisciplinary convergence research project based on humanities and social science*

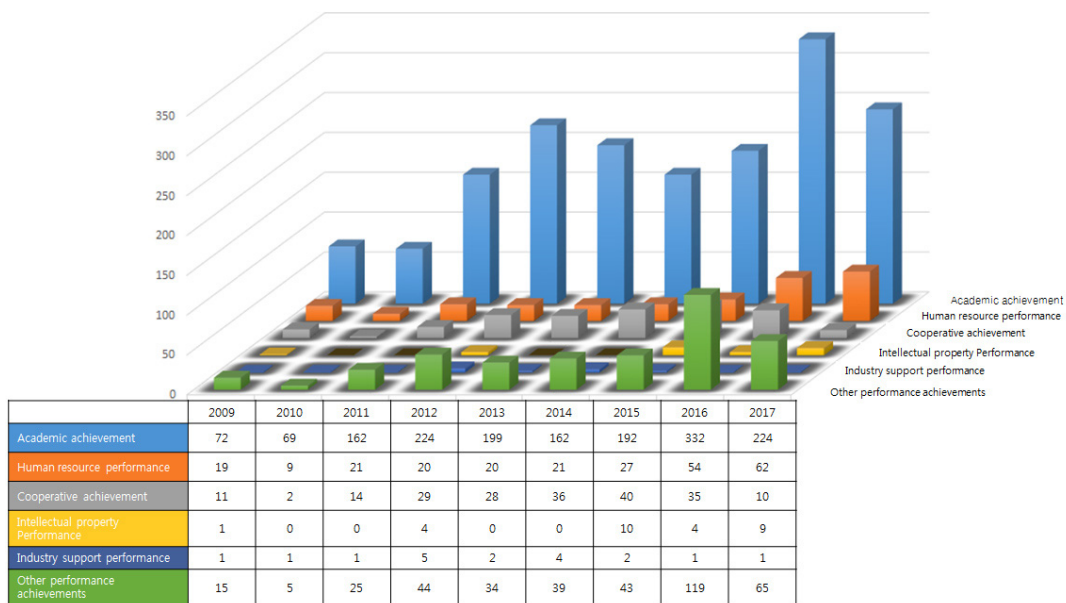
The humanities and social sciences based convergence research began full fledged since the launch of the interdisciplinary convergence research project of the National Research Foundation of Korea in 2009. The interdisciplinary convergence research support project was implemented as a pilot program to help support the interdisciplinary convergence research in 2010 within 5% of the new project budget of the general foundation research support project. In addition, the project was supported by the general collaborative research support project and the midterm researcher support project, and while partial convergence researches were supported from general joint researcher support project and senior researcher support project thereafter, but since 2015, the convergence research support project has been supported and managed by the interdisciplinary convergence research in an integrated manner (Lee, 2016).

According to Articles 3 and 5 of the Academic Promotion Act, the interdisciplinary convergence research project has the purpose of preparing creative and rational solutions to complex social problems by combining scientific rationality, imagination and insight of humanities and social sciences, as well as artistic creativity. In addition, the purpose is to train and nurture mid- to long-term interdisciplinary professionals by providing research opportunities to future generations in connection with education. The main direction of the interdisciplinary convergence research projects is to promote the interdisciplinary convergence research between the humanities and social sciences, culture, the arts and science and technology, and to this end, convergence research must be systematically supported and achieved along with sharing and performance outcomes of interdisciplinary convergence researches and facilitating networks. Reviewing the type of support for interdisciplinary convergence research support projects, they are divided into the seed type, which is the planned project focused on agenda discovery, and the sprout type, which is the project to support the convergence research between mid- and long-term interdisciplines (Noh, Lee, & Jeong, 2018a).

Reviewing the main contents of the interdisciplinary convergence research support programs, as for the support budget, 27 projects are selected with annual grant of 5 billion won starting with 2 billion in 2009. The selection of new tasks is based on the type of support plan, yet adjustments are made flexibly considering the number of tasks and the selection rate. The subject of support is a combination of the fields of humanities and social sciences, including the arts and physical education, and science and engineering fields including natural science, engineering, medicine, agriculture and oceanography. The interdisciplinary convergence research support projects are divided into seed type and sprout type depending on the type of support, and in case of seed type, support is provided focusing on the agenda discovery, and in the case of sprout type, they are implemented targeting mid- to long-term interdisciplinary convergence research. From 2009 to 2017, 710 project units applied and 181 project units were selected, whereas the selection rate was 25.6%. and a total of 356 new seed types applied, of which 47 were selected, and the selection rate was 18.5%. By 2017, a total

of 1,085 project teams applied, of which 232 project teams, and the selection rate was 23.1%. In 2018, 8 teams of new seed type and 2 teams of sprout type were selected additionally.

The results of interdisciplinary convergence research support projects were the most with 1,651 cases of academic achievements, followed by the cases of other achievements including media reports (385 cases), and human resources development achievements (253 cases). Meanwhile, the intellectual property rights registration (28 cases) and industry support achievements (18 cases) are shown to be relatively low due to the special characteristics of humanities and social sciences based convergence research (Noh, Lee, & Jeong 2018a).



**Fig. 1.** Current status of performance achievement by the area of interdisciplinary convergence research support project

### 3.2 Analysis of the performance achievement of major case studies of interdisciplinary convergence research based on humanities and social science

A total of 26 research teams conducted the humanities and social sciences based interdisciplinary convergence research in 2017, of which 18 teams are conducting research with sprout type (3+2 years). In this study, we will focus on the representative performance achievements by dividing the research area into three areas.

#### 3.2.1 Research for improving quality of life of the citizens

As for the convergence research for improving quality of life of the citizens, Professor Kim Kwang-Hwan of Konyang University supervised the research of “Development of a Complete Death

Education Program based on Medical Humanities for Improving the Quality of Life of Koreans” since 2014, for which researchers across humanities and social sciences, public health and medical areas are leading the way to develop national death education programs such as death related education, manpower development, educational system, and social system construction, publishing academic papers, publishing lectures, holding seminars and workshops while carrying out various research activities. The first objective of the research is to establish the foundation of convergence research around death and well-dying and to establish related research network. The second is the development of well-dying education programs and educational materials, a survey of the current status, and the fostering of human resources. Finally, it is the establishment of a center for education related to death and well-dying research, run a death education program, and establish a research network base. The results of these studies are two-folded. First, a customized death education program for each subject is developed. To this end, the review of domestic and international references, analysis and questionnaires of existing death education programs, need for of death education by each subject, and validity of education were studied and death education materials were developed. This death education program and educational textbooks are meant to be a convergence education program which is a multidisciplinary approach where humanities, social sciences, and health and medical care are integrated.

Second, he established a death education center, which is a convergence research and education base for death, and operated the program. Advisory groups on humanities, sociology, and health and medical care were organized, and the center established a public relations and research networks domestic and overseas, hosted academic conferences, and published research performance achievements. Through the results of the Phase 1 project, he expanded and developed the local research into a project to help improve the quality of life for all citizens.

The most important performance achievement of his research is the development of customized death education programs for each subject. To this end, the review of domestic and foreign references, analysis and questionnaires of existing death education programs, need for death education for each subject, and the feasibility of education were investigated and studied, and death education textbooks were developed. Death education programs and educational textbooks are meaningful in that they attempted to integrate humanities, social sciences, and health and medical care into a multidisciplinary approach to study death, economic analysis, death of the meaning of humanities and health care. It is an educational program analyzed. The textbooks and reports based on the developed death education program were a total of 4 volumes applied to the education by specializing in a total of 4 subjects including ‘general person’, ‘student’, ‘medical specialist’, and ‘social worker’. In addition, in order to expand the base of well-dying, he published 3 books on death related essay books, such as “Death and My Life”, the English translated “What Decides Happiness” and the French translated “How to Inform Children on Death”, of which the essay book has been selected as one of the Sejong Book Cultural Section in the second half of 2017. He publicized (59 press releases) around the Well-Dying Convergence Research Educational Center of Konyang University and built domestic and international research networks (JALMALV of the French death preparation alliance, Korea Academic Industrial Cooperation Society, Hana Hospital of Nonsan, Vulaka University of the Philippines, NIPITIC University of Cambodia, and ICT University, etc.), and presented perform-

ance achievements at all types of academic conferences and researches (published 12 scholarly international papers at SCI level, 21 international and international academic conference presentations, 12 death education related symposiums, and 8 excellent papers).

### 3.2.2 *Research for national safety*

Research on national safety began with attention paid to the contagion phenomenon by the research of Professor Park Gil-Sung of Korea University who studied “A Study of the Integrated Infectious Diseases: From the Paradigm Construction to Application.” Contagion is, first, said to be a universal phenomenon of the human history. Second, the development of information and communication technology and transportation means is further accelerating at the global level. And third, Korea’s society is also facing a pressing challenge as a key task. The purpose of research is to provide a detailed and concrete solution to the Korean reality related to the epidemic, and create a map to understand the global topography of the global contagion phenomenon.

The research team is studying the phenomenon of contagion as a system by establishing categories such as biological transmission, social transmission, cultural transmission, digital network transmission, and emotional transmission for an integrated understanding of the transmission system. The research on infectious phenomena is to break away from the existing medical research framework and to establish a super interdisciplinary and comprehensive base of the epidemic phenomenon from the natural phenomenon to the digital network to the financial and consumer marketing. To this end, he composed his team with researchers with diverse majors covering medicine (epidemiology, physiology), social science (sociology, business administration), humanities (linguistics, semiology, visual culture), and natural sciences (physics and complex systems). In proceeding with the research, we confirmed the gap between the medical terminology and socio-cultural terms and the possibility of interchange. In order to communicate mutually with the special areas of the joint researchers, they held an internal seminar once a month and a new researcher forum. They actively made their time for introducing individual research trends and specialty areas of the researchers. In this study, they tried to take a multifaceted approach from the point of view of humanity and social contagion away from medical transmission. What was most encouraging was that they held an academic symposium on the topic of “transcendental research in contagious research”, reaffirmed the possibility of contagious research as a socio-cultural phenomenon transcending medical sciences.

This study periodically conducted internal seminars for academic communication and accumulation of the researchers. In addition, they invited prestigious domestic experts to enrich research topics. As a result, they held a total of 8 workshops and 2 invited lectures by overseas scholars by 2017. In addition, the program has been carried out through 25 new researcher forums composed of graduate students of doctoral and postgraduate programs of future generations, and they also operated an open Lab targeting undergraduates and graduate students who are interested in interdisciplinary convergence research. The joint researchers who are participating in this study nurtured professional manpower in each field. In particular, Dr. Kim Min-Hyung, a joint researcher participating in this study, was appointed as a full-time faculty member of the department of knowledge and digital contents at Hankuk University of Foreign Studies in March 2016 in recognition of



his ingenious and active academic achievements. Until 2017, a total of 4 master's and 5 PhD's were produced.

Joint researchers of this study contributed or published a total of 43 papers (31 international journals, 10 domestic papers, and 2 candidate papers) and 6 papers in domestic and international journals until 2017. In addition, they participated in academic seminar conferences domestic and abroad and presented a total of 74 researches for each field. In particular, the most meaningful research results are that "Imagination of Contagion" (Nanam Publishing, 2017) was published through researches on interdisciplinary application of each expertise of joint researchers, and that, amidst the main themes, they were able to publish the translation of "Rereading Tard" (Hankookmunhwasa, 2017) as a result of the enriching research seminars among new researchers. Along with which, the researchers confirmed the international network of integrated infectious diseases through overseas trips and executed an MOU to strengthen cooperation. They have secured a bridge for academic exchanges between the two universities for continued international exchange and cooperation with Dean Gholam-hosseini of College of Liberal Arts of Tarbiat Modares University.

### *3.2.3 Research for creative education*

As a research for creative education, Professor Yoon Jeong-Jin of Tongmyung University conducted "A Study on the Development of Educational Contents for Promoting Image Based Creativity and Personality Using Digital Curation System."

This study intended to construct a system of creativity and personality enhancement education using video for college students, and to apply them to actual majors and liberal arts classes, and in particular, through the convergence of educational contents using digital images and humanity curation, he developed a new teaching method different from the existing teaching methods. This ensured the benefits of information exchange and use and access, and helped to ensure that the various media (movies, animations, documentaries, cartoons, advertisements) and ego identity topics (occupation, religion, politics, philosophical lifestyle, friendship, and recreational activities), leading to a new horizon of creativity and personality education. Through this study, he has developed a unique teaching model and system that can foster convergence type talents with creative problem solving capability and appropriate personality and judgment for tasks in the area of occupation and future social life required by this age.

This study aims to integrate education, culture, art, design, and ICT technology through interdisciplinary convergence research, and first, digital curation assures the advantages of interactive information exchange and utilization, differentiated from existing teaching methods, education, and technological convergence by developing a creativity and personality enhancement education model that utilizes various visual media and various devices, and second, education based on research extends the creative idea in the virtual world in which a learner lends a visual image to a major field, and third, the communication within a small group, which is achieved by the learner expressing one's own in online and offline spaces and sharing then with others, is extended to one's daily life area, leading to the establishment of the right values, and the establishment of a firm sense of self identity, and fourth, the educational content, which is a major product of this study, can present educational

content that transcends the major and the system, and utilize it as a liberal arts subject focused on creativity and personality enhancement education.

Through which, reviewing the performance result of research, he has constructed a creativity and humanity digital curation system for creativity and personality enhancement education using video for university students of various majors by cooperative research in education / ICT / image design field. and also developed the advanced teaching method through the convergence of educational contents development using video and creative and humanity digital curation system, so that it can be used as educational data for creativity and personality enhancement of major classes and liberal arts classes. In addition, he has laid the foundation for creative talents that have the ability to discover and solve creative problems in their everyday lives and their major fields beyond imaginative imagination in visual space. The curation site (<http://www.cpcu.kr>) was constructed and applied to the basic subjects such as broadcasting and video department, visual design department, and media engineering department to enhance educational effectiveness through interdisciplinary verification of the educational model, and the video contents were enlarged to films, animations, documentaries, cartoons and advertisements, and the selection of 40 videos, and lectures related to creativity and personality are expanded and operated in 6 subjects to conduct interdisciplinary convergence cooperative cross lectures, and creativity and character related textbooks were authored, and the sophistication and application of the digital creation system and the mobile digital creation system have been developed.

#### *3.2.4 Center for Convergence Research's performance result analysis*

The National Foundation for Research of Korea has been operating the Center for Convergence Research since 2011 to promote interdisciplinary convergence research between the humanities and social sciences, science and technology, culture and the arts in the promotion of interdisciplinary convergence research projects. Currently, the Center for Convergence Research has been consigned for operation by Konkuk University as part of the interdisciplinary convergence research project for interdisciplinary convergence research in 2017, and is continuing to manage the convergence research and expanding the base of convergence research, diffusion of convergence research results, agenda presentation, etc. To this end, the Center is supporting the convergence research team such as seminars, forums and colloquium, and is making efforts to promote communication and convergence research among the convergence research teams. The Center aims to create opportunities to exchange interdisciplinary convergence research achievements and methods in order to foster convergence research based on humanities and societies. In order to promote interdisciplinary convergence research, for the National Research Foundation of Korea's task research team, they host forum organization and advisory meetings and continuously promoted the results and news of convergence research. In addition, the website of the Center for Convergence Research, which enables researchers to exchange information for promoting convergence research between the humanities and social sciences and science and technology, is operated. The website provides performance information and seminar information on individual research projects. In addition, through the exchange of convergence research experts and diffusion of convergence research through the media, they share know-how of research

performance achievements, present new agendas to mature existing convergence research, and make efforts to lower the barriers to entry into convergence research. Table 1 illustrates the projects conducted by the Center for Convergence Research.

**Table 1.** Operation of the Center for Convergence Research

Implementation Plan		Detailed Work	
Expansion of performance achievements	Organization of convergence research forum (council)	Organization of committee Operation of forum	
	Research performance presentation and publication of performance data	Convening of research performance presentation Performance data collection	
	Analysis of trends in convergence research and publication of reports	Publication of trend analysis report	
	Humanities based convergence research type classification	Classification of types of convergence research Classification for each type of task analysis	
	Promotion	Article distribution Newsletter	
One-stop online services	Construction of website	Construction of website Establishment and operation of SNS Website satisfaction survey	
		Seminar	Seminar 2018 hubcon conference
			Symposium
Publication and contribution of academic journal	Publication of academic journals	Publication of academic journals Contribution of academic journals	
Collection of performance achievement and discovery of excellent cases	Performance piling	DB construction Discovery of excellent cases and presentation of performance result know-how	
Convergence research networking	MOU	MOU	
Others	Convergence research association	Founding ceremony of academic association	
	News of launch	Opening ceremony of the Center for Convergence Research	

## 4. Discussion

### 4.1 Experts' discussion

In this study, 7 experts of heads of research institutes and college professors related to convergence research participated in the discussion of the Plan for the Facilitation of Convergence Research, through which activation plans related to the convergence research based on humanities and social sciences were prepared. The following are the details of the activation plans related.

The president of K university, who presented opinions on the relationship between the convergence research and the university education, claimed that convergence research should be in contact with various majors at the university and also presented the need for preparing measures for the future generations.

As for the convergence research, interest in convergence is increasing in line with the demand of the times in the social and educational curricula, where only the existing single major is studied. However, the characteristics of Korean universities and curriculum are still rigid and dependent and it is difficult to proceed with the opportunity to positively provide convergence research. Nonetheless, in this time, talented people are in demand – those who have converged and cooperative thinking and talents. In response to such demand, K university offers flexibility in choosing and changing majors until the student graduates (senior), lowering major credits and increasing other credits. In addition, the E-campus (online lectures) for all lectures are also available to help students take advantage of various majors. As for the researcher side, we are providing a space for communication between humanities and researchers and contributing to foster the next generations of convergence research studies by creating convergence courses in graduate courses with fluidity in the creation of lectures. (President of K University)

A professor of H University pointed towards the phenomenon of human alienation due to the development of the current technology while proposing the activation plan from the institutional viewpoint of the human society based convergence research and the development of the technology without the moral and legal consensus based on humanities, further to pointing out that social sympathy can not be obtained, and also emphasized that humanities and social sciences should develop with technology.

In the “Fourth Industrial Revolution” by Klaus Schubert, which reflects humanities values and for studying (social) system and convergence, it is said, “Technology will intensify the inequality and alienation of human society.” He also noted that it is also actually happening in our society. Humidifier disinfectant case, etc., shows that there was still no equipment available to protect people from against the technology. When humanities scholars and sociologists put forth such values and ideologies, they should be reflected and realized in the society, however, reality is not like that. In all studies, humanities scholars and sociologists should delve and see if the research can be socially, morally and legally agreed upon, and whether social empathy can be achieved. (Professor of H University)

In the case of the head of S research institute, the opinions of the humanities approach were presented from the viewpoint of science and technology. In the aspect of science and technology, the problem can be addressed only by the combination of science and human sociology, and so, it was that claimed that future science and technology based convergence research must definitely be converged to solve problems with humanities and social sciences.

Many convergence tasks are interlinked with science and technology, and the possibility of solving science and technology in terms of humanities is being discussed. @ research institute S focuses on solving all problems related to science and technology. S research institute's researchers are composed of 25% of economics, 25% of business administration, 25% of engineering, and 20% of the others. In the reorganization of future tasks, it will be necessary to converge each discipline because it is composed of research projects centered on researches and national issues that people can meet together centered around team. Humanities are applied to science and technology, including science and technology and quality of life, aging and science and technology, science and technology for people's happiness, psychological safety and science and technology. Through these tasks, we feel that we could not resolve the problem solely by S research institute's researchers alone, or with a single major. (Head of S research institute)

Director of K research institute has felt the need for research combined with the humanities and social sciences at the center of existing science based convergence research, and it is necessary to construct a sustainable research system through continuous community formation. In the short-term research system, it is proposed that mid-term and long-term research should be carried out beyond the commercialization of technologies for research results and for the realization of policies.

K Research Institute emphasizes connection and convergence as an institution focused on knowledge infrastructure, and is trying to achieve changes based on people, customers, and the community. The existing convergence researches were considered as technology, technology, and science and technology, and the budget for the task is centered around science and technology. However, in order to realize value depending on what the problem is, we have felt that convergence was desperately needed. Researchers across various fields need to establish a community to build a sustainable research system, and active cooperation is needed to distinguish between goals and assists. The humanities and social sciences based convergence research needs to change to long term endeavor rather than research on short term endeavor. It is necessary to have a virtuous cycle in which evaluation of whether they are applied not only to the commercialization part of technology but also whether the humanities and social sciences base is practically applied to the policies. (Head of K Research Institute)

Head of T Research Institute proposed a plan for the budget aspect of humanities and social sciences based convergence research, and in general, if a researcher proposed a research, a selection rate of 20% to 30% would be appropriate. But it was noted that in the case of the current humanities and social sciences based convergence research, it may be selected if applied 20 times at 5%, and it was noted that such rate of selection will be distant from the attention of researchers, and

it is necessary to revitalize the research by expanding the budget. In addition, it was claimed that it is necessary to revitalize research for solving social problems through the top down method in the existing bottom up method.

The Ministry of Science and Technology's 'The 2016 Research and Development Activities Survey Result' shows that the amount of research to GDP is the second highest in the world in terms of investment in research and development (R&D). However, he pointed out that they pursue technology that makes profits, business model, and socially necessary technologies that are acceptable, and the seed type selection rate of interdisciplinary convergence research support projects is less than 5% and the appropriate selection rate for the research is 20 to 30%, for which the budget needs to be expanded. In order to increase the budget, the efforts of the National Research Foundation of Korea and the efforts of the National Assembly should be concurrently conducted. In addition, it is necessary to encourage effective performance by presenting and implementing the issues that are being discussed in a top down manner, and to provide a separate research period for suggesting a top-down agenda, and to this end, a participatory researcher organization and network must be provided. (Head of T Research Institute)

An advisory member of E committee of the National Assembly pointed out the problem of the evaluation system of humanities and social sciences based convergence research. In the case of the humanities and social sciences based convergence research, he pointed out that evaluation through simple evaluation scale could hardly clearly measure performance, and that evaluation factors of various aspects leading to policies must be developed.

There are various limitations and problems in the humanities and social sciences based convergence research. In particular, problems can be pointed out in the performance evaluation system, institutional problems, performance based management, and annual evaluation. In the case of convergence research, it is necessary to evaluate the intrinsic part, not the simple performance evaluation. The evaluation of intrinsic achievement should be carried out in depth to evaluate how the convergence research based on humanities and social sciences is reflected in the policies. However, it is impossible to make such a measurement in the present performance evaluation system. (Advisory member K the Education Committee of the National Assembly)

Chair professor of P University hosted a discussion of the period of convergence research. In the case of convergence research, he pointed out that the convergence research should be carried out from a long-term point of view because it can not be achieved over a short period of time.

Cooperative research and convergence research are different. Cooperative research presents answers from several disciplines with a single theme, and convergence research studies a single research together. Since each field has a different data set (data from social science, psychology, etc., are different), the research questions must be different so as to enable the convergence research. In addition, due

to the nature of convergence research, some patience and investment are required because it can not be achieved in the short term. For example, how will Willis design be achieved? Isn't it the reality of convergence research that can be thought in a short period of time that pursues the value of a new life like a space where recreation, treatment, and medical treatment can be performed simultaneously through a humanities discussion? I hope that the younger generations will reach new horizons for those who are deeply involved in a discipline at the stage where the need for convergence research is growing tremendously. (Chair professor of P University)

#### *4.2 Implications*

The limitations and implications of the humanities and social sciences based convergence research reviewed in this study through the expert discussions are as follows.

First, it is difficult to connect with humanities and social sciences and science and technology if in a part of dual structure. As can be seen in the current discussion, science and technology among researchers are generally recognized and defined as being separate from the humanities and social sciences. In the national research and development projects, there is a concern that they are recognized as a mutually exclusive relationship without exchanging between two fields, considering that it manages with a binary classification system such as 'humanities and social science areas' and 'science and technology areas.' Such a dualized structure is difficult to agree across all aspects such as the mutual role's ambiguity in the study of humanities and convergence of science and technology field, selection method of research supervisor and leading field, design of research method, and preception of products and research period, etc. Accordingly, rather than distinguishing between humanities and social sciences, and science and technology, it is necessary to make changes in the future in terms of convergence.

Second, unlike researches in the fields of science and technology, in the case of convergence research based on humanities and social sciences, and convergence research based on humanities and technology is focused on basic research that attempts to combine humanities and technology, and so the level of convergence is tried at a very low level. As a result, many of the researches based on humanities and social sciences have been left behind only the performance achievements based on the papers, and they are often unable to proceed to the application and commercialization stages. This implies that it is not related to the lack of budget for the convergence research based on humanities and social sciences. In the case of the convergence research project based on humanities and social sciences were supported starting from 2 billion won in 2009 to 5 billion won in 2018, but as experts pointed out, the budget is extremely short as the rate of selection has been below 5% since 2015. In order to prepare for the fourth industrial revolution, it is necessary to expand and support the budget that enables convergence researchers based on humanities and social sciences to be more actively engaged in the undertaking of convergence research.

Third, the lack of budget for humanities and social sciences based convergence research and the result of research based on basic research may be a result of natural course of events. However, the results of research projects supporting humanities and social sciences based interdisciplinary convergence research are performed effectively and systematically in accordance with the direction

of creative social problem solving and training of future generations of scholars and professional convergence researchers. Therefore, it is necessary to recognize the research result of humanities and to provide continuous support.

Fourth, there is still a shortage of research network among the convergence researchers based on humanities and social sciences. Convergence research is a very important part of the research network in proceeding with researches and presenting research results through new perspectives and research methods. Nonetheless, due to the lack of a network of researchers based on humanities and social sciences, there are many cases where the humanities and social sciences work together in a simple and integrated structure. Therefore, it is essential to establish a network in which substantive collaborative research can be conducted rather than a simple integrated structure.

## **5. Plan for the Facilitation of Convergence Research**

In this study, we have investigated cases of humanities and social sciences based convergence research and underwent expert discussions with a view to establish ways of facilitating humanities and social sciences based convergence research. Through this, we intend to propose the following ways of facilitation.

First, it is the pursuit of a top down agenda for strengthening a demand oriented R&D. In order to successfully conduct humanities and social sciences based convergence research, it is necessary to expand the top down agenda to achieve policy goals. Currently, in the case of interdisciplinary convergence researches based on humanities and social sciences, the bottom up method for both seed type and sprout type methods may have a sense of divergence from the policy goals required for the present society. There are many cases in which the emphasis is placed on the basic or original tasks rather than on site demand type policy tasks. Hence, it is necessary to diversify the research support methods and redesign the agenda based convergence research support while diversifying the routes. In this study, we propose to continue to search for research topics through the bottom up method for the seed type projects currently under way in the case of the humanities and social sciences based interdisciplinary convergence research projects, and in the case of sprout type projects, we propose to build a long-term convergence research system by presenting research topics of a top down method of the social issue resolving type.

Second, it is the construction of a linkage structure of base-application-commercialization of the humanities and social sciences based convergence research. In the case of humanities and social sciences based convergence research, it is necessary to construct an organic linkage structure by supporting step specific flexible operation, and in the case of the humanities and social sciences based convergence research, the seed type and sprout type are separately operated, and the sprout type also needs additional support in order to yield the technical commercialization for solving the substantive social problems. Therefore, it is necessary to construct a portfolio that meets the base-application-commercialization stage. In this study, we proposed that the agenda are developed in the seed type stage, the research problems are expanded in the sprout type stage and the manpower nurturing stage, and that a new fruit type stage is established to suggest a linkage structure that



can advance to the commercialization stage.

Third, it is the strengthening of the base for cooperative system for conducting creative research. In order to do so, it is necessary to establish a foundation for building a research network linking the humanities and social sciences with the science and technology. There is still a gap between the humanities and social sciences based and the science and technology based convergence researches, and mutual networks are still insufficient. Therefore, in order to create effective results across the fields of convergence research, establishment of research cooperation network for interdisciplinary collaboration should be prioritized. In particular, it is necessary to develop a standardized convergence research methodology for effective research among heterogeneous fields, for the apparent differences noted between interdisciplinary methodologies such as interdisciplinary approaches and methodologies. It is necessary to develop standardized convergence research methodology which can be a reference point of problem solving by reflecting characteristics of heterogeneous convergence research process among the disciplines.

Fourth, it is to nurture human resources specialized in the humanities and social sciences based convergence research via a systematic education. The core subject of humanities and social sciences based convergence research is eventually 'people.' Convergence research provides a basis for solving social problems by combining intangible humanities ways of thinking with science and technology. Finally, the performance of convergence research depends on the competence of researchers. Accordingly, it can be effectively achieved through continuous investments in terms of the human resources development. In order to cultivate such talents of convergence type creativity, it is necessary to cultivate talented human resources based on humanities and social sciences through the linkage from elementary education to college education. To this end, a long-term convergence type talent development plan that can enable integrative thinking based on humanities and social sciences should be established in connection with the STEAM in the elementary school's curriculum. In addition, it is necessary to develop curriculum for cultivating higher manpower based on humanities and social sciences that can link with undergraduate and graduate courses.

Fifth, expansion of the budget for revitalization of the humanities and social sciences based convergence research. Currently, there are insufficient budgets for performance relative to the humanities and social sciences based convergence research. In particular, it is necessary to expand the budget for the humanities and social sciences based convergence research, which is insufficient compared to science and technology based convergence research. In 2018, 62 project units applied for the sprout type support projects for the humanities and social sciences based convergence research, and only 2 project teams (3,2%) were selected. Despite the steady growth of interest in the humanities and social sciences based convergence research, the actual benefits are insufficient. In order to effectively promote and revitalize the humanities and social sciences based convergence research, expansion of the budget must be achieved. It is necessary to expand the budget for the Center for Convergence Research to strengthen the support for the facilitation of the convergence research as well as the budget for the establishment of the current fruit type stage of the commercialization proposed in advance.

Sixth, it is necessary to improve the performance evaluation system for the humanities and social sciences based convergence research. In the case of the humanities and social sciences based con-

vergence research, it is a new field that is different from existing researches, and it can have problems in various aspects such as securing expertise, securing results, and winning research projects. When the current research performance evaluation system is applied, the efficiency of the convergence research result is low, so it may be less interesting in the importance of the research. To this end, it is necessary to improve the evaluation system of the research result based on the humanities and social sciences. In other words, it is necessary to prepare an internal organization evaluation system appropriate for the humanities and social sciences based convergence research. In the evaluation of government projects, it is necessary to establish criteria for qualitative evaluation such as linkage to policies beyond merely quantitative indicators such as thesis paper, patent, and technological transfer, among others.

Seventh, it is necessary to expand the roles of the supporting institutions for the humanities and social sciences based convergence research. To this end, the role of the National Research Foundation of Korea, which is a supporting institution for the humanities and social sciences based convergence research, is important. In addition, it is necessary to expand and reinforce the role of the Center for Convergence Research, which is supporting the humanities and social sciences based interdisciplinary convergence research project teams. The need for a thorough management and support for the convergence research results was confirmed as a factor affecting the performance achievement of the humanities and social sciences based convergence research. Through the expansion of the role of the supporting institution, we will be able to discover sustainable convergence research agenda, present directions for the convergence research, and build a foundation for the dissemination of convergence research such as discussions, forums, seminars, performance result exchanges and networks for the convergence researchers and research teams, thereby enabling playing the role of facilitating the convergence research based on humanities and social sciences.

Lastly, in order for the humanities and social sciences based convergence research to facilitate, it is necessary to work together by and among government agencies and research supporting institutions centered around the state. In the case of government agencies, it is necessary to continuously expand the support for convergence research in order to create an ecosystem for the humanities and social sciences based convergence research and present directions of development for the humanities and social sciences based convergence research policies. In the case of research supporting institutions, it is necessary to improve the system and the funding aspects of the humanities and social sciences based convergence research, and it is necessary to support the convergence research through the development of the agenda and standard convergence research methodologies. In addition, it is necessary to lay a foundation to continue the humanities and social sciences based convergence research through the evaluation of convergence research and systematization of performance achievement management. As for the aspect of researchers, it is also necessary to develop a methodology for discovering research problems of the humanities and social sciences based convergence research and find ways to achieve commercialization and industrialization. Furthermore, it is necessary to formalize the tacit knowledge so that the humanities and social sciences based convergence research may be handed over to the future generations.

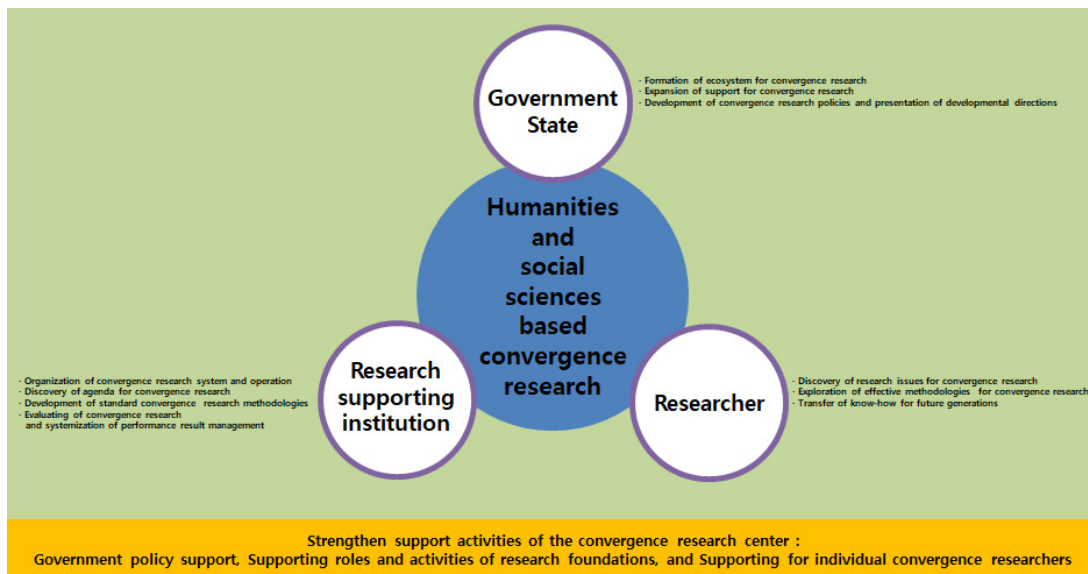


Fig. 2. Humanities and social sciences based convergence research

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