

Research Trend Case Study: For Understanding Interdisciplinary Keywords in South Korea

Jihye Lee* Geon Hur** Yongkyun Lee*** Yerin Ga§ Leekyung Hong† Kyungwon Lee¶

* Life-Media Interdisciplinary Program, Ajou University
, *, §, † Department of Digital Media, Ajou University

ABSTRACT

Given that staying informed about the trends within a field and analyzing them is critical to researchers, related prior researches centered on statistical analyses of the cumulative body of theses on specific topics have existed before. This research takes a step further, collating and visualizing topic words from papers published in Korea during the designated years to find interdisciplinary research topics dealt with by major disciplines. The outcome of this research will prove useful to researchers in Korea allowing them to discover the extent to which their own research topic is studied in other disciplines. Keyword data from two years, 2010 and 2012 has been visualized and select keywords have been extracted from the data pool to be analyzed in greater detail through our case study.

Keywords: Research Trend, Interdisciplinary Trend, Visualization Case Study

Index Terms: D.2.4 [Software Engineering]: Software/Program verification—Validation

1 INTRODUCTION

Clinical psychologist F.G Brown once said, “A professional of scholarly field, like an individual, should step back from time to time and take a look at itself -where it has been, where it is now, and where it is going.” As the quote suggests, reviewing the history of research leads to taking note of the current trends and simultaneously sheds light on the future direction of the research endeavor. In Korea, meta-analyses have been undertaken on papers covering research topics studied over an extended period of time, albeit constrained to a single discipline. This research attempts to address this gap by way of data visualization, taking a wider perspective to spot trends in various scholarly fields and confirm whether interdisciplinary topic words exist.

2 INFORMATION VISUALIZATION PROGRESS

To collect the relevant data, 78,053 units of information on theses published in 2010 and 2012 were crawled from the KISS(Korean studies Information Service System) as shown in Figure 1. All thesis data is embodied as individual nodes located in circles,

and each keyword is linked to keywords from other disciplines, forming a keyword network.

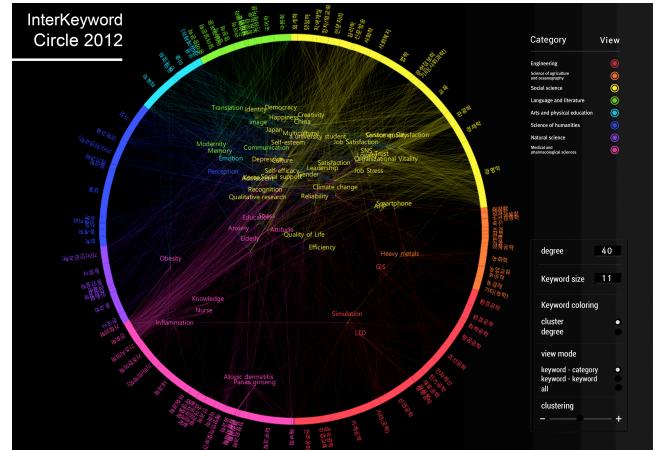


Figure 1: Information visualization based on published theses in 2012

The location of the theses keywords within the visualization is determined by the strength of the pull among the connected keywords. For instance, the more a particular keyword is mentioned within a specific disciplinary field, the closer it will be placed towards the edge within the circle, which constitutes a classification system. On the contrary, if a certain keyword is frequently mentioned across various disciplines, the keyword will be located in the circle’s center. The different colors around the edge of the circle indicate varying disciplinary fields, a result of allotting one color per discipline through clustering the K-medoids algorithm.

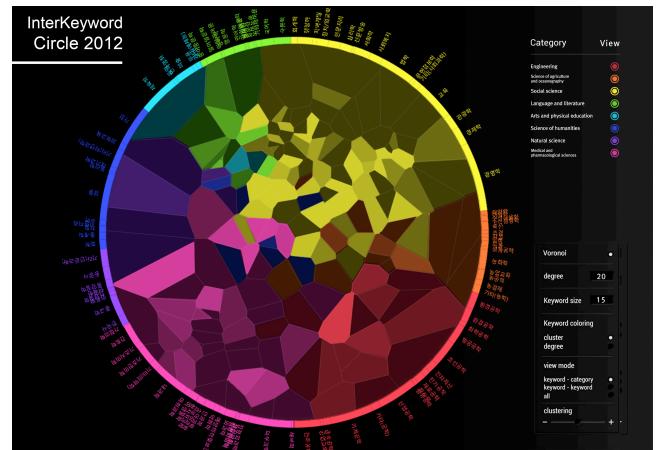


Figure 2: Voronoi Visualization based on published theses data in 2012

* alice0428@ajou.ac.kr

** danaggu2@gmail.com

*** pechia@ajou.ac.kr

§ vividlovely@naver.com

† hong20@ajou.ac.kr

¶ kwlee@ajou.ac.kr

Second, Figure 2 below is the visual rendering of Figure 1 into a Voronoi diagram. Each Voronoi cell within the circle accounts for one keyword. Each keyword area is determined by weighted Voronoi in accordance with its relative proportion. Consequently, we can intuitively grasp the degree of overlap between disciplines and the importance of keywords within the circle. Interdisciplinary keywords are placed at the center if their utilization frequency is similar in each discipline, because these visual arrangements are shaped by the similarity of each classification.

3 CASE STUDY

The purpose of the case study is to determine how accurate the visualization is in representing the research outcome. Among the 8 disciplines explored, medical and pharmacological sciences, social science and engineering were chosen. These three disciplines were considered apt for this case study, since their common ground is increasingly expanding through the emerging fields of cognitive science and psycho-immunology. Psycho-immunology started to understand psychology and immunology. It aims to know correlation of stress with immunological change. Also, cognitive science started by a group who wants to understand human information processing system (sometimes it named IPS) and artificial intelligence of computer. So we guess it will be good case to understand scholarly relationship among 3 disciplines.

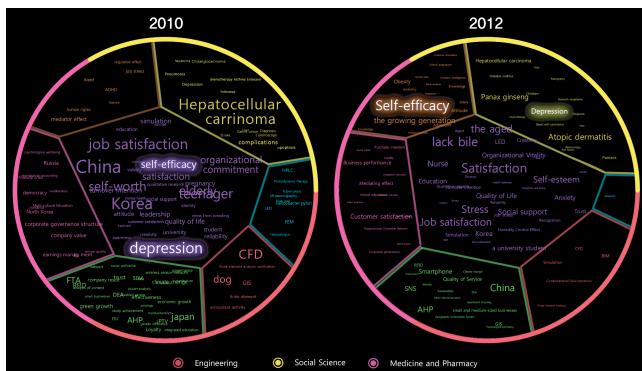


Figure 3: Voronoi Visualization of Keyword based on 2010 and 2012 theses data

Figure 3 is derived from the Voronoi visualization with the left one showing the 2010 data and the right one capturing the data for 2012. Interpreting the image is identical to the method used in Figure 1. We analyzed specific keywords whose location or size changed over time. ‘Self-efficacy’ and ‘depression,’ were chosen for the case study, two keywords that have been considered topical interests in the Korean society over the recent several years.

With respect to the related theses published in 2010 for the first keyword ‘self-efficacy,’ 15% were from the medical and pharmacological sciences and the field of engineering, while 70% were from social science. In 2012, although not a single thesis was published from engineering on this topic, social science produced 68.4%, and medical and pharmacological sciences 31.6% of related research papers. In conclusion, the location and scope of ‘self-efficacy’ changed from the center area in 2010 to the area overlapping social science and medical and pharmacological sciences in 2012.

As for the second keyword ‘depression, the size of the word shrinks from the left visualization to the right one. This reveals that as the years elapsed, the overall ratio and the number of published research papers both decreased in regards to this particular topic. In 2010, out of the total 109 research papers related with depression printed from the three disciplines, 10.1% came from engineering, 22.9% belonged to medical and pharmacological sciences and social sciences produced 67% of the papers. However, in 2012, 74 papers with the same topic were published, a drop of 35 pieces from 2010. The publication ratio was 2.7%, 31.1% and 66.2% from engineering, medical and pharmacological sciences and social sciences respectively.

4 CONCLUSION

This research set out to find interdisciplinary research keywords through data visualization and a case study. Through the case study, we discovered that although relatively small in proportion, ‘self-efficacy’ and ‘depression’ were adopted as research topics in engineering, implying that the field of technology has recognized the need for a more human-centered approach. Second, social science and medical and pharmacological sciences both had considerable share of its research in ‘self-efficacy’ and ‘depression,’ reflecting the two disciplines’ strong common interests in these keywords. Third, in spite of the rarity of collaboration among medical and pharmacological sciences, engineering and the social science in Korea, the possibility of interdisciplinary research initiative exists, since these disciplines have been revealed to share certain research topics. Furthermore, to conduct an in-depth analysis on the scholarly efforts devoted to interdisciplinary research in Korea, our subsequent research will add an analysis on the authors of theses with interdisciplinary topics. Moreover, the number of years for data collection and review will be expanded to carry out a long-term detailed research.

Additional researches may include first, a parallel analysis on the thesis data from other countries to shed light on the differences among the countries' research trends and interests. Second, we can also track a specific keyword as it is taken up as a research topic across varying disciplines over the course of time to illustrate the trajectory of specific research keywords. Through this method, we expect to know each country's academic interest and compare country to country. It will be helpful researcher to know similarity and difference of scholarly field.

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