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# A data-driven approach for discovery of the latest research trends in higher education for business by leveraging advanced technology and big data

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## ABSTRACT

This study aims to examine the latest research trends in higher education for business by grasping the key trends, topics, and interrelationship of each subject. For this study, 304 research articles from four international “top-tier” journals were collected in the field of business education for two years 2018~2019 and analyzed through semantic network analysis. The results show case-centered research for students’ learning and career, performance/results-oriented research, creating programs that emphasize teamwork and leadership are emerging as the main agendas with “student-led or centered.” It helps business educators in higher education have an incredible power to be proactive by reshaping the program or curriculum of business for a future trend-based quality education using advanced technology and big data.

## KEYWORDS



Business education; data-driven approach; higher education; research trends; semantic network analysis

## Introduction

Everything is going fast. In a rapidly changing world, living in anticipation of the future has become very difficult. Nevertheless, to deal with the uncertain future more clearly, we must be careful to predict future trends, particularly under a crisis such as a coronavirus pandemic (Levine, 2019; Kim & SNU Consumer Trend Analysis Center, 2019). Although there is an error in the prediction or forecast, the best-educated guessing would be better than random guessing or nothing. Predicting the future is an exercise, and through this exercise, we can reduce prediction errors even more (Levine, 2019; Park, 2019). Therefore, we need to apply this view to the field of education by reflecting the rapidly changing educational environment (Yun & Park, 2018).

As an area of learning, business education has continually been developed. Mainly, American and German business education, these two schools have contributed significantly to building and educating new business administration (Dias & Shah, 2008). At the same time, business education has grown quantitatively and qualitatively by expanding not only academic foundations but also various areas of business

education through continuous research in higher education. However, it is faced with multiple challenges in terms of quality education, given the rapidly changing trends and many factors such as dynamic environmental issues with much pressure from a variety of stakeholders surrounding education (Nomuoja, 2010). Based on this background, previous studies have focused on measuring the achievement of curriculum reform in business education or measuring the outcomes of the level of business education to meet the highest standards (American Assembly of Collegiate Schools of Business (AACSB), 1996; Angelo & Cross, 1993; Banta et al., 1996; Edwards & Brannen, 1990). Besides, many scholars have studied the latest trends and factors in the global external environments that influence the development and management of business education. Looking at the latest trends of how business education research has been conducted has a significant meaning in reflecting on the present through the past and seeking directions for the development of business education and research in the future (Choi, 2017; Executive Core, 2015; Foster, 2019; Kim, 2015; Maxwell, 2019; Nikitina & Lapina, 2017; Nomuoja, 2010; OECD, 2019). Accordingly, many researchers have shown vast and multifarious

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studies related to this agenda with diversified perspectives. However, most of these studies were analyzed based on somewhat specific contexts or particular educational situations individually rather than approaching business education with a holistic view. Besides, most studies used qualitative research methods such as case study, comparative analysis based on scientific publications reviews or business school's core course reviews, or interviews and online surveys. Despite the enormous implications for understanding the actual educational situations, it should be taken into account that subjective interpretations or biased opinions may be followed depending on the individual research setting situation (Executive Core, 2015; Nikitina & Lapina, 2017; Nomuoja, 2010). They are confined to individual studies independently rather than covering the totality of business education with a holistic view to keep up with the latest trends in higher education.

Under these limitations of existing studies, this study is designed to examine the latest research trends and direction of business education quantitatively and systematically in a more objective sense. Through this work, a large amount of unstructured text in big data is effectively utilized using Semantic Network Analysis, a kind of data (text) mining techniques. Then, it will lead to generating more diverse and succeeding knowledge that can bring about reshape of the business education program by reflecting major trends entirely (Atteveldt, 2008; Doerfel, 1998; Kharlamov, Gradoselskaya, & Dokuka, 2017; Steyvers & Tenenbaum, 2005). Furthermore, it can help educators, researchers, and even academic leaders in higher education are more innovative and proactive by recognizing the trends since they have a magical and marvelous power to acquire the game or rule-changing insights into the uncertain future education.

## Literature review

### *Researches on business education in higher education*

Many scholars have conducted various investigations covering the realm of higher education. These studies are generally divided into three scopes according to the main topics although there are somewhat areas that are not distinguishable: first, teaching & learning domain in higher education (Biggs, 2001; Pitan & Muller, 2019; Price & Kirkwood, 2014; Shen & Ho 2020; Yilmaz & Keser, 2016; Zainuddin & Halili, 2016), second, a research area in higher education (Choi, 2017; Executive Core, 2015; Foster, 2019; Kim, 2015; Maxwell, 2019;

Nomuoja, 2010; OECD 2019), then, lastly, the territory of administration, management and leadership in higher education institutions (Bauer & Henkel, 1997; CABS, 2019; Marginson & Considine, 2000; OECD, 2014; World Bank, 2002). Among them, a large number of studies have mainly concentrated on the numerous factors or trends affecting business education development and management (Foster, 2019; Kim, 2015; Maxwell, 2019; Nikitina & Lapina, 2017; Nomuoja, 2010). For instance, Nikitina & Lapina, (2017) argued that modern trends of business education could be grouped into three categories: partnership and networking, a curriculum that meets the needs of society and business, and a flexible and modern teaching method through their research. Nomuoja (2010) also studied the current trends in business education emerging in eight business schools of higher education institutions. As a result, career awareness, risk management and strategic management, people-oriented strategy, and skills-based curriculum, etc. were discussed. Moreover, there were interviews of the global top 5 MBA Schools released annually by Financial Times. The researcher discovered the top 3 MBA Trends, such as the job market, the role of an MBA, and location & mobility (Maxwell, 2019). Furthermore, essay-formatted articles on significant trends in business education were introduced through the MBA Journals with the issues of "rise of double degrees" and "growth of online, technology-based and blended programs," etc. (Iniguez, 2015; Foster, 2019).

### *Semantic network analysis using big data of the unstructured text*

Text mining is a methodology for analyzing unstructured text data written by humans for reading (Lambert, 2017; Wright, 2018). As a text mining technique, semantic network analysis has been developed in a variety of ways by an indefinitely large number of scholars since Rice & Danowski (1991) created a framework for network analysis (Doerfel, 1998; Monge & Eisenberg, 1987; Rice & Danowski, 1991; Stohl, 1993). A semantic network analysis generally refers to a network in which words extracted through morphological analysis from the unstructured text are constructed according to the degree of adjacency. Thus, it is possible to understand the relationship between words or to combine words to see their association for multitudinous interpretations in a given text (Cyram NetMiner, 2019; Nulty, 2017; Rice & Danowski, 1991). With the development of technology, natural language processing is integrated into data mining programs, which can directly input unstructured text data, extract words (nodes) in morphological units,

and generate network data composed of words. It extends the horizon of network analysis with rich unstructured text data (Cyram NetMiner, 2019; Kim, Choi, & Youm, 2017).

The purpose of analyzing text is varied from understanding the main concepts and subtopics included in documents and reading the main trends or shifts through their temporal changes, to identifying the word associations between documents and the similarity of ideas between authors. It is also used as a way to visualize the relationship between objects or people in text and topic modeling (Kharlamov et al., 2017; Nulty, 2017). Through this work, a large amount of information can be efficiently analyzed to generate more comprehensive and subsequent knowledge, which is the ultimate purpose of text analysis (Cyram NetMiner, 2019). Moreover, semantic network analysis is used as a way to visualize the text to illustrate the visual characteristics or to promote knowledge building, analytical investigation, and reasoning, even explorative study (Drieger, 2013). With the advantages of this approach, many scholars have discussed a wide range of topics using big data, including a variety of unstructured text, such as bibliographic information, social media data like Twitter, Facebook, Instagram, and others or online news, speeches, etc. (Doerfel, 1998; Drieger, 2013; Kharlamov et al., 2017; Kim et al., 2017; Nulty, 2017, Park, 2019; Shen & Ho, 2020, Yun & Park, 2018). Besides, several scholars (Lee, Choi, & Kim, 2010; Rice, 2005; Wasserman & Faust, 1994) have found noteworthy, tremendous potentials of semantic network analysis with identifying centrality indicators and sub-network structures between words. Many of these studies show the immense possibilities of continuous development of semantic network analysis as a powerful research method emerging with the big data era.

### The proposed framework of this study

This study is data-driven research that does not use theoretical hypotheses or theoretical frameworks. A data-driven approach is a growing and potential area with the advent of big data. Massive and enormous information stored in electronic and digital forms on the internet provides tremendous opportunities and impacts remarkably for knowledge discovery, information extraction, and analytical reasoning in the diverse fields using large-scale human-machine generated data (Doerfel, 1998; Monge & Eisenberg, 1987; Wright, 2018; Zaki & Meira, 2014). Big data can be collected through various sources such as news media channels, social media, search engines, financial reports, etc. (Park, 2019). In this study, abstracts of journals on business education were collected for research and analysis through search engines. Figure 1 shows the proposed framework of this study in a holistic view.

This study attempts to identify the latest research trends of the world's leading business education journals in 2018 and 2019 using semantic network analysis based on the previous reviews discussed above. As the global trend is changing very rapidly, this study focuses on the most recent trends and agendas of business education in the last two years. For this purpose, the following specific research questions were established.

#### Research Questions 1.

What are the main research keywords and topics of global business education in the last two years?

#### Research Question 2.

What are the significant characteristics of global business education?

#### Research Question 3.

How are the specific subdomains of business education in the world categorized, furthermore,

What are the implications of modeling these topics?

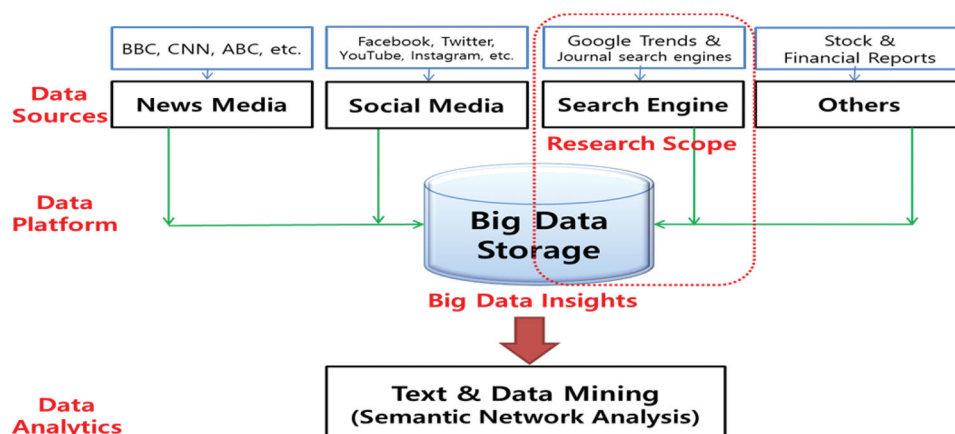


Figure 1. The proposed framework of this study.

**Table 1.** The list of journals selected with selection criteria.

No	Journal name	Journal quartile	Publisher	ISI/SCOPUS	Reputed publishers /Open-access journals	International peer-reviewed
1	Academy of Management Learning and Education	Q1	Academy of Management	✓	✓	✓
2	Journal of Management Education	Q2	Sage Publications	✓	✓	✓
3	Journal of Education for Business	Q2	Taylor & Francis	✓	✓	✓
4	International Journal of Management Education	Q2	Elsevier BV	✓	✓	✓

Source: Scimago ([www.scimagojr.com](http://www.scimagojr.com).) and each journal website.

## Methods

This study aims to identify and predict future research trends of business education in Higher education. For that, semantic network analysis, a kind of data mining technique that is an overwhelming and powerful tool in the process of knowledge discovery in big data, was used to extract patterns or future directions for capturing data-empowered insights. The data in this study were collected from four international “top-tier” journals selected in this field for the past two years, from 2018 to 2019. The selection of journals was made using the following criteria fulfillment among journals, which are ranked as ISI/SCOPUS Q1 and Q2, reputed publishers & open access, and international peer-reviewed. As a result, 629 unique keywords, 1655 sentences, and 297 paragraphs and documents were identified in 304 abstracts of research articles through NetMiner4's semantic network analysis; a text mining program provided Cyram Company (Table 1).

## Results and discussion

The first primary purpose of this study is to identify the most studied topics in global business education over the past two years. For this, firstly, the top 20 keywords were chosen through the final keyword selection process of semantic network analysis among 629 keywords appearing in 304 abstracts of research papers in four top-tier international journals on business education in 2018~2019. This result is as follows (Table 2).

The word “student” accounted for 5.68%, with a total 638 times as a first keyword, showing the highest frequency, and it is followed by business, learning, study, management, research, and education. They were 3.06, 1.80, 1.64, 1.63, 1.58, and 1.43%, respectively. These results suggest that the significant research trends of global business education are “student-led” or “student-centered,” “learning,” and “research,” and besides that, it is also confirmed that other important research agendas are skill

**Table 2.** Top 20 keywords' frequency.

Rank	Word	Frequency (%)	Rank	Word	Frequency (%)
1	Student	638 (5.68%)	11	Skill	125 (1.11%)
2	Business	344 (3.06%)	12	Program	113 (1.01%)
3	Learning	202 (1.80%)	13	Result	102 (0.91%)
4	Study	184 (1.64%)	14	Approach	90 (0.80%)
5	Management	183 (1.63%)	15	Teaching	90 (0.80%)
6	Research	178 (1.58%)	16	Model	83 (0.74%)
7	Education	161 (1.43%)	17	Practice	83 (0.74%)
8	Course	153 (1.36%)	18	Analysis	80 (0.71%)
9	Author	145 (1.29%)	19	Case	79 (0.70%)
10	School	133 (1.18%)	20	Process	79 (0.70%)

**Figure 2.** Word Cloud of top 100 keywords.

development, result-oriented teaching, and case analysis-based learning. Although this frequency shows only the top 20 rankings, additionally, the terms of leadership, MBA, problem-solving, simulation, feedback, career, improvement, performance, partnership, and women were observed as very significant words in global business education.

Word Cloud is a visualization method that shows the size of letters according to the importance of keywords so that we can see relatively essential terms at a glance. The result is as follows. (Figure 2).

Meanwhile, the word-to-word network can be visualized with a network map to understand the data analysis results intuitively according to the program of



**Table 3.** Top 20-word network.

Rank	Source	Target	TF-IDF (weight)	# of Sentences/ Paragraphs/Documents	Gini coefficient
1	Business	School	100	55	0.97
2	Management	Education	51	41	0.97
3	Business	Student	41	33	0.9
4	Business	Education	24	19	0.9
5	Student	Business	19	18	0.9
6	Case	Study	29	18	1
7	Business	Course	17	14	1
8	Student	Learning	17	14	1
9	Management	Course	14	13	1
10	Student	Performance	16	13	1
11	Business	Management	13	12	1
12	Student	Experience	14	12	1
13	Student	Engagement	18	11	1
14	Business	Administration	15	11	1
15	Management	Student	13	11	1
16	Business	Program	14	11	1
17	Study	Student	11	11	1
18	Teaching	Learning	13	11	1
19	Student	Course	10	10	1
20	Student	Perception	13	9	1

the layout algorithm. A layout algorithm is a method of calculating where to place nodes to visualize network data. Based on this layout, the top 20-word network was selected as follows (Table 3).

In the program, a 1-mode network can be generated by using word-to-word distance information. In this study, the closeness of two words was calculated and, based on this, used a method of generating links between words located close together. The two linked words are displayed as Source and Target, respectively. Weight or TF-IDF (Term Frequency-Inverse Document Frequency) is the link frequency of generated word pairs, meaning that the words of “business” and “school” weight 100, and the word pair appears 100 times in the entire text with a weight of 51 and # of documents of 41. Gini Coefficient is an indicator of how concentrated the word pair is intensely in a few sentences, paragraphs, and documents, and how evenly it appears in multiple sentences, paragraphs, and documents. A value closer to 1 indicates that the more focused it is on a few sentences, paragraphs, and documents, the more important the word pair is. In this case, the criterion for sentences, paragraphs, and documents is a co-occurrence unit selected when creating a 1-mode network.

Lastly, the method of LDA (Latent Dirichlet Allocation, hereafter LDA), which is a machine learning algorithm, was used to extract subtopics embedded in the text (Blei, Ng, & Jordan, 2003; Steyvers & Griffiths, 2007). LDA is the most popular and influential topic model, which is a method for the discovery of hidden phrase patterns in a broad set of unstructured documents (Table 4).

Using the method of LDA, we can see that the more similar the values of the response variables are, the

more likely they are to contain the same subjects. In contrast, the higher the differences between variables, the more likely they are to include different themes. The results of the top 3 topics combining related five keywords can be interpreted as follows. The main issue of topic 1 can be converted as the case-centered research for students’ learning and career. In the case of topic 2, performance/results-oriented research articles are emerging as the main direction. In topic 3, it can be rephrased that business schools are creating programs that emphasize teamwork and leadership.

### Implication and conclusion

This study focused on analyzing the latest research trends through the keywords of influential journals related to business education. It contributed greatly to extracting topics that discover remarkable and noticeable future research trends. Based on that, business educators, researchers, and even academic leaders can be inspired by trends-based research, teaching, and learning as well in Higher education. In this regard, the implications of this study can be summarized as follows.

First, traditionally, “teacher-led” business education was the central theme of higher education in the past. However, in this study, it can be seen that “student-oriented” or “student-centered” learning in business education is promising by considering student’s careers beyond just learning itself. This study objectively proved the current paradigm and educational direction of higher education through quantitative research. Also, case study-oriented business learning, team-based learning and leadership training, and

**Table 4.** Topic modeling using LDA (Latent Dirichlet Allocation model).

	1st Keyword	2nd Keyword	3rd Keyword	4th Keyword	5th Keyword	# of documents
Topic-1	Study	Student	Case	Career	Factor	156
Topic-2	Result	Performance	Way	Article	Research	159
Topic-3	Business	School	Team	Leadership	Program	186
Topic-4	Education	Management	Practice	Implication	Student	198
Topic-5	Research	Program	Study	Article	Challenge	143
Topic-6	Student	Author	University	Time	Class	136
Topic-7	Datum	Analysis	Project	Value	Author	146
Topic-8	Course	Skill	Student	Knowledge	Communication	177
Topic-9	Learning	Student	Experience	Teaching	Strategy	186
Topic-10	Development	Theory	Student	Group	Satisfaction	168

performance-based learning, which train students to make decisions about real-world situations rather than traditional text-based learning, are enterprising as pivotal issues of business education. This study shows that these subjects are still valid and exert tremendous power in business education. Those significant trends will play an essential role in reshaping critical perspectives on future business education. Second, the world is changing speedier than ever, but most institutions in higher education are not adapting as quickly.

Moreover, most of them don't have their world-class trends master at keeping them up-to-date in the double loop, not a single circuit. Given that the latest trends are changing very rapidly, this study used big data over a short period rather than 10 or 20 years of the long-term panel. Then, it shows meaningful results as it is in line with the opinions of experts studying trends. Finally, the method of the machine learning algorithm through semantic network analysis shows that it is a handy and powerful tool for finding the recognizable trends and subjects to be studied together. Those outcomes of educational issues with advanced technology and big data can help us to discover data-driven insights lurking in data to make predictions or proactive decisions without being explicitly processed or configured. Furthermore, it can also allow us to conduct a secondary and tertiary in-depth analysis of quality future trend-based education. Therefore, this study has contributed dramatically to showing those various potential possibilities.

On the other hand, despite abundant and significant implications were found, there are some limitations of this study as follows. It will be addressed in future research. First, the limit of the data can be mentioned. In this study, Although this study was intended to see only recent data, however, it is still true that studies using a lot of data improve the research results in general, including the validity and reliability of the study despite the error problem of large data samples. Therefore, future research is needed to aggregate the vastly larger research data by increasing the number of related research papers.

Next, comparing the research trends in various education fields such as engineering or computer science, law, or any other studies as well as business education in higher education is worth trying for future research with holistic perspectives. Lastly, traditional network analysis has simply analyzed physical world relationships based on direction, strength, distance, etc. However, recent network analysis continues to expand as large as 1: N relationships for real-time online. Therefore, it should be recognized that recent network analysis is very complicated based on the vast amount of data flowing. Accordingly, it is necessary to extract and analyze sub-networks to reflect those characteristics of the extensive network into various sectors.

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