

Curriculum development for the liberal arts university to nurture human resources incorporating data science in the DX era

Zhihua ZHANG[†] Toshiyuki YAMAMOTO[‡]

School of Sociology, Kansai University of International Studies (KUISs)^{†,‡}

Abstract

The shortage of human resources in data science is becoming more serious in current Japan, and there is an urgent need to train it. In order to compensate such situation, the KUISs has implemented a data science education program aimed at developing data scientists for students studying at private liberal arts university. This paper identifies on the discussion on the abilities of human resources required in digital transformation era and propose robust data science education program at a liberal arts university.

1. Introduction

With the progress of digital transformation promotion in corporation, particularly, technological innovations centered on artificial intelligence in recent years have led to a rapid progress in problems solving that were previously difficult to approach in various fields. Another very hot topic is the word called metaverse, which refers to a three-dimensional virtual space and its services that are different from the real world built in a computer or computer network. Whichever it is, the shortage of human resources in the development of AI applications and data scientists is becoming more serious in the current Japan, and there is an urgent need to deal with such situations.

On the other hand, the government's "AI Strategy 2019" states that "all universities and technical college students, regardless of the humanities or science in majors, will acquire the literacy education with the elementary-level on mathematics, data science, and AI technologies in their courses. It is claimed as a concrete goal [1]. Furthermore, it is also important for the liberal arts universities to develop human resources who can handle data and AI applications, especially data science because it's not enough all over the society. In this paper, we describe the optimal data science curriculum design of the KUISs with consideration of the features of a private university of liberal arts.

2. Digital transformation and abilities required

Curriculum development for the liberal arts university to nurture human resources incorporating data science in the DX era
Zhihua ZHANG[†] Toshiyuki YAMAMOTO[‡]
School of Sociology, Kansai University of International Studies (KUISs)^{†,‡}

The biggest buzzword from 2015 till now is "Digital Transformation", a phrase that has already acquired the somewhat it goes far beyond mere change or innovation, but so-called revolution or evolution in various fields. Transformation will be top priority for most companies and organizations as exponential technological change impacts them across the board. The key point is it keeps moving and we all know Moore's Law. The law claims "technology doubles in power about every 18 to 24 months". And that is the challenge to keep up with when you are in a business. But what exactly is digital transformation? What kind of ability is required for human resources who can promote it? Unfortunately, the reality is that many people don't understand exactly the difference between "digitized" and "digital".

Generally, digital transformation is the integration of digital technology into a business whole, fundamentally changing how to operate and deliver value to customers, which is a cultural change that requires organizations to challenge its status quo continually. At social-level, digital transformation means that "the penetration of ICT will change people's lives for the better in every aspect." New social and economic systems will be born. At corporate-level, digital transformation means new business model based on digital resource and digital technology;

Digitization is the conversion of analog information into digital. For instance, to convert music information from cassette tape to mp3 format; Once you take advantage of what has become digital, it can lead to improve the business efficiency or added value. For instance, if you make paper information digital, you can read books anytime, anywhere like kindle service. This is digitalization. Also, when music is in digital, you will be able to listen to songs anytime, anywhere, and in addition, you can select the songs to listen according to your taste, and the system can deliver it easily. This means a new model of business.

So, the talents of human resources required in digital transformation era include the abilities on digitization and digitalization. The former is the ability to convert traditional operations from analog to digital, and the latter is the ability to innovate business processes, that is, automate and streamline existing operations, in addition the product innovation, that is, the ability to develop new services model and products.

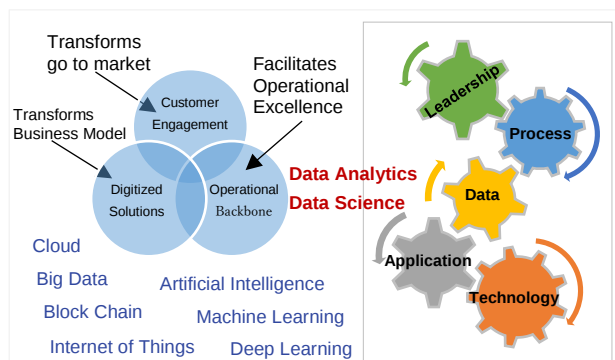


Fig.1 Talents on Digital Strategy Basics for Business DX

Fig.1 shows the talents on digital strategy basics for business DX which consists of the transforms of market, customer engagement, digital solutions and operational backbone [2]. For an organization, not limited to business, but how to create the operational backbone is most important. To do this, it is essential for students to develop the ability to analyze data and utilize AI and machine learning, and the literacy of other technology shown in Fig.1. And, in essence, it is about developing human resources with data scientist capabilities. Specifically, it is the business ability based on specific domain knowledge, data scientist ability for temporary verification based on data, and data engineering ability to solve problems.

3. Curriculum design for data science education

Based on the above, as a concept of curriculum design about data science education program, it is necessary to comprehensively develop the subjects on computer and information system knowledge, statistics-related skills, domain knowledge of specific fields, problem-solving experience, and communication and presentation skills.

Table 1. Subjects of data science education curriculum

	subject name	Course period	Credit
Area I	basic statistics A	1 year (spring)	2
	basic statistics B	2 year (spring)	2
	entry to research	1 year (autumn)	1
Area II	ICT literacy	1 year (spring)	2
	ICT application A	1 year (autumn)	2
	Data science	2 year (spring)	2
Area III	Data science theory	2 year (spring)	2
	Data science practice exercise	2 year (autumn)	2
	Basics of artificial intelligence	2 year (autumn)	2

Table 1 shows the subjects of data science education program curriculum were performed at our university, which is mainly related to three knowledge areas. Area I is about basic statistics skills, Area II is about ICT and data science basics, and Area III is for the programming technology and the basics of IoT, big data, and AI.

The work performed mainly consider with two aspects. The first is to systematize the relationships between the subjects while standardizing the contents of the subjects that are currently being implemented. The second one is going to award "Data Science Education Curriculum Certificate" by acquiring the prescribed credits from the subject group in table 1. If a student has completed the prescribed 4 subjects with 7 credits, he will be awarded the "Data Science Education Curriculum Beginner's Certificate". And if completed the prescribed 6 subjects with 11 credits, "Data Science Education Curriculum Intermediate Certificate" will be awarded. Due to the page limitations, the details are omitted here.

4. Consideration of problems about liberal arts students in data science education

Japan Inter-University Consortium for Mathematics and Data Science Education plays a central role so far to create and to disseminate a standard curriculum and teaching materials that will serve as models for high education. But the implementation of the curriculum is left to the discretion of each university [3].

Generally, liberal arts students are not good at math, their IT skills are low, lack of commands for critical thinking skills and not suitable for programming, these are their "hurdles". Consideration must be given to overcoming such difficulties in implementing a data science education program curriculum which is suitable for the students of a liberal arts university.

5. Conclusion

Fostering human resources who can promote digital transformation is essentially for developing the human resources with data scientist capabilities. Data science is one of the hottest professions of the decade, and the demand for data scientists who can analyze data and communicate results to inform data driven decisions has never been greater. Implementation of data science education curriculum, especially in private universities of liberal arts, considering constraint factors such as the basic academic ability of science and mathematics, IT skills, specialized education and educational resources of universities is an urgent issue.

6. References

- [1] Zhihua Zhang, The development of new information technology and necessity of data science education, Bulletin of Sanyo women's College No.41, (March 2020) pp. 1-20.
- [2] Jeanne Ross, Cynthia Beath, The Digital Challenge: How to Transform Your Business in the Midst of Crisis, MIT Industrial Liaison Program Webinar Series, 2020.
- [3] Yumi Matsuo & Kazue Tamada, Issues in data science education at liberal arts and private universities, Bulletin of Edogawa University No. 31 (March 2021) pp. 249-255.