



Research on the Practical Dilemma and Solution of Big Data Talents Cultivation

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Abstract. In the internet age, massive data gives birth to so called big data. Big data is affecting people's life in every regard. Therefore, big data age has resulted in high attention from all stakeholders. The development of big data industry raises the new challenge of talents cultivation. The article firstly analyses the position requirements of big data industry to talents. Then practical dilemma in the process of big data talents cultivation is discussed. To solve these problems, the methods of talents cultivation in universities should be changed. The solution includes the reconstruction of talents cultivation system, optimizing teaching contents, teaching methods reform and teaching quality assessment.

Keywords: big data · talents cultivation · industry · practical capacity

1 Introduction

Big data which comes into being following the development of internet is deeply affecting society development and human daily life. Nowadays, big data is highly concerned by every country all around the world. And it is generally applied into cloud computing, digital economy, artificial intelligence (AI), blockchain, internet of things and other emerging technologies. Big data is becoming the key technology in international competition. The big data development is an opportunity to promote technological innovation and commercial decision-making of intelligence science [1]. At the same while, these new changes provide a great challenge to colleges, because the talents cultivation in colleges should meet the market requirements.

Data would become one of the most important strategical resources in the 21st century. Whether commercial value in mass data is excavated would be the key aspect of economy development. However, the use ratio of data worldwide is less than 0.1 percent. This results in serious waste of data resources. To sufficiently take advantage of data resources, big data talents cultivation extremely urgent.

Big data talents can be divided into three types: data scientist, data engineer and data analyst. The former two types of talents are cultivated in research universities. While the last one is cultivated in applied colleges, even in vocational colleges [2]. These colleges can offer many big data related programs, such as educational big data, e-commerce big data, logistics big data, travelling big data, agriculture big data and so on. Therefore,

many programs in colleges should offer big data courses to relieve the dilemma of big data talents lack. Especially in the context of new liberal arts education there are lots of difficulties when big data program offers courses like big data analysis. A new mode reform of engineering education is introduced here. It is CDIO, which means Conception, Design, Implementation, and Operation. According to the CDIO teaching syllabus, comprehensive big data talents should master solid basic knowledge, powerful personal abilities, teamwork awareness and the ability to solve complex problems. In recent years, CDIO model is a research hotspot topic in higher engineering education field.

2 Current Requirements of Big Data Talents Cultivation

2.1 Nationwide Development Policies Related to Big Data

All over the world, people are involved in big data age. Massive data covers our daily life and every aspect. All we need to do is to dig data and found out the potential commercial value and make scientific decision.

Because of this awareness, almost every developed country has formulated policy on how to boost their own big data industry. For example, United States of America proclaimed *Big Data for Development: Challenge and Opportunity* in 2014. The project emphasized that big data is the cardiotoxic of economic development and technology advancement [3]. The policy started a craze of developing big data. In 2017 UK came on *UK Digital Strategy* which aims to create an impeccable system of data increase economy. And other major economies have enacted policies related to big data. This means big data has been highly emphasized by global countries. And these policies and following governmental action are moving big data forward in 21st century. Because of these, big data industry makes great progress. The application of big data in different industry is getting wider and wider.

To stimulate the research and innovation of big data, many national engineering laboratories of big data related to big data algorithm and analysis, big data application, big data analysis system, big data circulation and trade, medical big data application technology, educational big data application technology, comprehensive transportation big data application technology and other big data application, have been set up. These series of policies and other great measures suggest that big data age is coming. Accordingly, big data industry puts forward newer and higher requirements on big data talents.

From the investigation to several recruiting portal websites, we can find that the requirement to talents focuses on two types: technical talents and management talents. Technical talents include data management, data integration, data development, data digging. The talents who can do these works are data development engineer, big data architect, algorithm engineer, testing engineer, operation and maintenance engineer. Management talents include data analysis, business analysis, data operation, data production. Big data technical talents are cultivated by data science and big data technology. And management talents should be cultivated in new liberal arts universities. Because of the widespread position, big data management talents' position and their requirement capabilities are listed in the following form (Table 1).

Table 1. Data management talents' position and their requirement capabilities

capability	position			
	data analyst	business analyst	data operation engineer	data production manager
basic common ability	Excel/SPSS/Python/Hadoop, data visualization, relation database and SQL			
industry data understanding	education, health, agriculture, transportation, logistics, supply chain, finance, e-commerce, internet social media.			
prototyping tool				✓
product requirements document writing				✓
A/B testing design analysis			✓	✓
data product planning				✓
Linux/Shell	✓			✓
multidimensional model design	✓	✓		✓
correlation analysis	✓	✓	✓	
taxonomic clustering	✓	✓	✓	
recommendation algorithm	✓	✓	✓	
client portrait		✓	✓	✓
product operation analysis			✓	✓
business data analysis		✓		
growth hacker			✓	

3 Realistic Difficulties of Big Data Talents Cultivation

In the age of big data talents scarcity, universities get the exact opportunity to increase big data program. But at the same while, big data education has to face the following challenge.

3.1 The Difficulties from Big Data Talents Supply

In recent years, many colleges have been aware of the importance of big data talents cultivation and the setting of big data program. A number of colleges apply for big

data program. Some of them succeed to the setting. From the superficial view, big data programs increase rapidly in short term. But in fact, the supply of big data talents is still lacked. Because these new programs are set in recent years. And these colleges do not have enough graduates which would meet the requirement of big data industry and enterprises. Therefore, the supply of big data talents is pretty insufficient [4].

3.2 The Difficulties from Big Data Faculties

Big data program has high need to faculties. Because big data is a comprehensive interdisciplinary which includes math, statistics, informatics, computer, machine learning. At the beginning stage of big data program, there is few faculties to teach. Therefore, the faculties in big data program are mostly from other programs. At the same time, these faculties do not have enough capabilities to teach the latest knowledge of big data. It is just because the faculties resource. They still have superficial understanding of big data program. Therefore, the faculties problem hinders the development of big data program.

3.3 The Difficulties from the Quality of Big Data Students

Nowadays, big data is becoming a rising hot program and getting focused by society stakeholders. So many students and their parents want to get enrolled by big data program. As described above, big data is an interdisciplinary. Correspondingly, this promotes higher requirement on student resources. They should have good computing capability, statistics knowledge, machine learning and other knowledge background. Meanwhile, big data is hard to study. Therefore, they have hard learning burden once they get enrolled. The learning difficulties is a challenge to them.

But in fact, college students come from all over the country. Therefore, students' quality and basic knowledge are highly different. Some big data program enrolls liberal arts students and science students. Under the circumstance, mathematics and science are a learning obstacle for them. Once they do not grasp basic knowledge, they would have many difficulties to study new knowledge. In terms of student quality, universities should enroll more science students. For students' standpoint, they need be more cautious when they select big data program.

4 The Development Route of Big Data Talents Cultivation

To solve these problems mentioned above, colleges should track out the breakthrough of bottleneck problems of big data talents cultivation. The countermeasures include many stakeholders.

4.1 To Reconstruct Big Data Talents Cultivation System

Big data talents can be divided into three types: data scientist, data engineer and data analyst. Therefore, colleges would plan their talents cultivation syllabus to two talents types: theoretical engineering talents and analysis applied talents. Theoretical engineering talents include data scientist and data engineer. These two types of talents are cultivated

in new engineering universities in which there are two programs: data science and big data technology, big data management and application. Analysis applied talents are data analysts who are cultivated in new liberal arts colleges in which there are many programs related to big data. For example, education, economics, transportation, logistics, medicine, agriculture and so on.

Universities can ally government on big data talents cultivation. Big data industry park established by government and enterprises would provide big data resources to meet the requirements of talents cultivation [5]. These three stakeholders cooperate on the big data talents cultivation together.

Because many of faculties are lack of industry experience and have less chance to communicate with enterprise experts. Under the circumstances, government must take part in the cooperation with enterprises on training faculties. Based on big data industrial park of government and industry-academy cooperation platform, big data industry resources would make their respective advantages complementary to each other. The cooperation between government and enterprise would help big data talents cultivation. At the same while, universities can produce more quality big data talents.

4.2 To Optimize Teaching Content

Big data talents cultivation focuses on big data development and application. Curriculum system carries out the mode of multiple dimensions. There are three curriculum modules. The first module is introduction course whose goal is to cultivate students' big data thinking and learning interests. The second module is intermediate course whose goal is to cultivate students' big data theory, technology and instrument. The last module is internship course which can cultivate students' practical ability [6].

The teaching process of big data program should pay attention to the integration between theory and practice. Students spend sufficient time on theory learning. At the same while, students must grasp operational ability. Theory is the base of talents cultivation. Practical abilities are the orientation. Talents are cultivated by sorts.

4.3 To Reform Teaching Methods

According to CDIO model, teaching resources should be developed by college faculties and enterprises' experts. For example, teaching textbook, teaching cases, internship projects. Enterprises can send big data experts to campus to give speeches so that students would obtain latest industrial progress. Colleges can also send faculties to enterprises so as to get the chance to understand the real production and ability requirement of different work position [7]. Then faculties would know more about big data industry to teach students more about enterprises' requirements. These requirements are the goal of talents cultivation. In brief, in the process of big data teaching, government can unite colleges and enterprises with the talent cultivation.

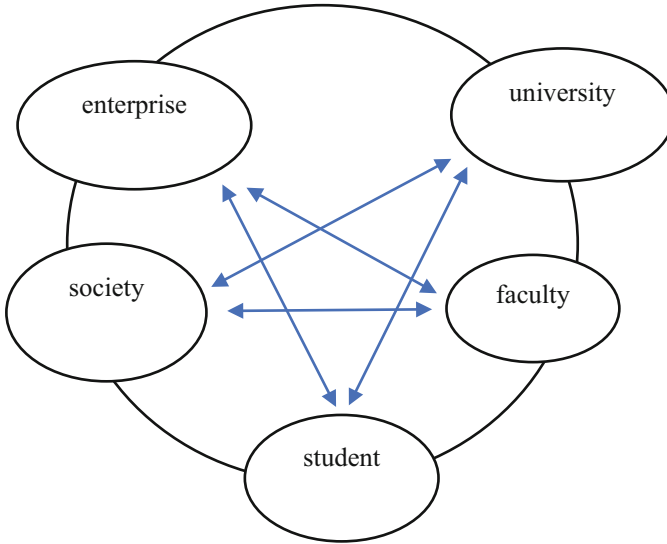


Fig. 1. Teaching Assessment of big data talents cultivation

4.4 To Assess Teaching Process

To learn about the real teaching status, teaching process should be assessed in time. The assessment must be carried out by five stakeholders: student, faculty, college and enterprise. The center of talents cultivation is students. Therefore, students are the indispensable stakeholder. And student assessment should be normalization operation. Students' feedback is collected regularly. At the same time, faculties also assess students' learning outcome and the administration. Administration plays an important role in the process of talents cultivation. Enterprises assess students' practical abilities when taking part in university-industry cooperation [8]. Society and government assess the circumstance of talents cultivation through big data social status and their influence (Fig. 1).

CDIO engineering education focuses on project practical teaching, so teaching process is divided into three levels. Level one project runs through the whole process of big data analysis. Students can experience project's conception, design, implementation and operation. Level one project has two different types which respectively exist in freshman semester and the last semester. Level two is curriculum group of big data core competence. For example, Linux operating system, Python and Spark, Hadoop data analysis tool. But theoretical engineering talents and analysis application talents are different in level two project. Theoretical engineering talents should be proficient in not only data science theory but also the innovation and practice of big data technology, methods and tools. While analysis application talents just need to master how to take advantage of big data technology solving practical problems. Therefore, the curriculum setup should be different to the two types big data talents. Analysis application talent is one branch of new liberal arts education. The proportion of big data curriculum can obviously be too high. But essential skill curriculums of data analysis must be indispensable, like data

digging, data visualization. Theoretical engineering talents are mainly from big data program. Therefore, the curriculum system is very comprehensive. The curriculum system includes mathematics, statistics, computer science, machine learning and other courses related to data science field. Level three is to construct interconnected talent-cultivation mechanism which connect government, university and enterprise. Because of faculties being lack of practical experience, government should take part in the cooperation of big data talents cultivation. Government unites enterprises so that they make their respective advantages complementary to each other. The cooperation of these three stakeholders would guarantee the quality supply of big data talents.

5 Conclusion

In the internet age which is driven by data, data resource has become valuable assets of market competition. Big data acts as the core power in international competition. When facing big data talents requirement, university undertakes the task of big data talents cultivation. There are opportunities and challenge. To solve talents cultivation problems, universities should reconstruct teaching system, optimize teaching contents, reform teaching methods and assess teaching quality. Big data talents are comprehensive quality talents who can meet the requirements from big data industry and enterprises.

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