NEW ARP:
Data-Driven Academia Resource Planning for CAS Researchers

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INTRODUCTION

The CAS (Chinese Academy of Sciences) is the highest academic institution of natural science in China. The ARP (Academia Resource Planning) system is an integrated application system to provide services for the researchers of CAS. With the rapid development of big data technology, the frequently changing of business processes, and the increasing decision-making demands of users, the ARP system meets grand challenges. The NEW ARP reconstructs the original ARP system and builds up an information application ecology covering the main scientific research management business by data-driven concept and big data analysis technology. It's a new-type information system for scientific research management, which also considers the utilization of data resources and data analysis technology. The authors study to provide intelligent data analysis application services through different dimensions, to realize the exploration of scientific research management innovation and intelligent decision making.

The chief contributions of this chapter are as follows. First, it provides a data-driven application framework to adapt the development of new management forms. And it proposes a data-driven workflow engine to meet the dynamically changing needs of approval processes. Further, it implements several data-driven applications and gives some examples of intelligent decision-making based on data analysis and data governance.

The chapter is divided into six parts. First, it is the introduction. The following section describes the background and the challenges that the NEW ARP is facing. Then the authors introduce some main focuses of the chapter, containing data-driven application framework, data-driven workflow engine, and some intelligent applications. The fourth section is the detail of the research. Section five and six look at the future research direction and conclusion.

BACKGROUND

The new generation of information technology is developing in both breadth and depth (Heath, 2019). And deep integration of informatization and multiple business areas is a notable feature of the current development of global informatization. The new generation of information technology, which is represented by cloud computing, big data, and artificial intelligence, is booming and widely used all over the world (Dillon, Wu, & Chang, 2018; Rahm, 2016; Zhu & Zheng, 2018; Newell & Marabelli, 2014).

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The information process characterized by intelligent service is also profoundly affecting and changing the way of human production, life, and cognition (Steininger, 2019). Accelerating the development of information technology has increasingly become a popular choice for most countries in the world. The transformation of the industrial structure is going faster, and the division of the industrial chain is more detailed. As business applications get richer, big data plays a significant role in discovering user needs and guiding product designs (Bechtel & Jayaram, 2020).

Scientific research management is the management of scientific process activities, involving organizations, projects, funds, personnel, assets, and other aspects related (Zhang, Liu, & Song, 2009; Lin, Cen, & Zhou, 2014; You, Li, & Zhao, 2013). Scientific research activities are exploratory and creative, with strong flexibility and uncertainty (Li, 2011). That makes the management work become a complex system engineering. However, innovative and effective management is an essential auxiliary to breakthroughs in science and technology, which can effectively improve the management level of scientific research institutions and promote scientific and technological progress (Yang, 2016; Zhou, 2019; Kang & Liu, 2021). Therefore, the authors hope to improve the efficiency of scientific research management through effective planning and intelligent managing of personnel, projects, scientific research achievements, and so on (Yongtao, 2019).

The ARP refers to ERP and adds the unique element of scientific research management (Ren, Guan, & Pan, 2003; Ji, 2011). It takes the entire life cycle of a scientific research project as the mainline and provides integrated management functions around the scientific research project management, including human resources, scientific research projects, finance, assets, and so on. With constant changes in technology and management, the business processes change frequently, but the data structures and data formats are relatively fixed. In this scenario, the data-driven application framework can solve the problem that the system has poor adaptability to management changes. The traditional information systems are driven by business, which makes it difficult for them to adapt to new forms of management (Hull, Mendling, & Tai, 2003; Romney & Steinbart, 2012; Benbasat, Goldstein, & Mead, 1987). However, data-driven processes can support dynamic changes well, and they simplify business processes. It can also discover the irrationality of business processes by using big data governance, then improve the standardization of management and bring more intelligent applications.

The NEW ARP has reconstructed the entire system to face the challenges of the big data environment (Syed, 2020). By using big-data technologies, it combines the business-driven mode with the data-driven mode and takes smart business applications and intelligent data analysis as the key point to study (Li & Whinston, 2020; Xiao et al., 2021). The NEW ARP solves the problems of the old system and has optimized some aspects, such as improving the adaptability to management changes, reducing the complexity of the business process, getting effective information from the vast amount of data, and so on. So far, the NEW ARP has been used by over one hundred units, receiving about ten million visitors and storing over 1.6 billion business records. It becomes an important foundation for improving the informatization and realizing the capabilities of intelligent management in CAS (Wu, Zhang, F. Liu, C. Liu, & Zhu, 2021).

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