Research on Big Data-driven Business Management Effectiveness Enhancement Methodology

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Abstract. In the digital era, business management effectiveness enhancement is an important way to promote enterprises to gain competitive advantage, and enterprises use big data to drive business model innovation and business risk warning. Based on the progress of existing data-driven business model research, the intrinsic mechanism and methods of big data-driven business model innovation are analysed based on the perspective of business model element restructuring. Meanwhile, in business risk management, especially in the financial banking sector, where risk management is the core of its business management, big data plays a crucial role.

Keywords: Business management, Risk early warning, Business model innovation, Big data.

1. Introduction

In recent years, "big data" has become a hot topic of concern in the enterprise and science and technology sectors. The rapid development of big data has shortened the technology gap between enterprises and made it more difficult for them to innovate technology. Business model innovation is an important way to leverage the value of technological innovation, and the two together help to improve organizational performance. Big Data can be a game changer, and the success of companies depends not only on new technologies but also on how they use Big Data to innovate their business models. Progress in research on big data-driven business model innovation. Relevant foreign research mainly focuses on the positive impact of big data-driven on enterprise performance and the characteristics and components of data-driven business models. Irina Avdeeva and Kaisar Alpysbayev (2022) [1] found that digital transformation is important for the management reform of modern business models. Ljuben Kraev (2003) [2] argues that the constant changes in automated economic data have an impact on the business world. The key success factor for companies is to use data as an asset to extract valuable information from data resources by using big data to change business strategies and business models and make better decisions in business processes. Jia Fu and Yan Yuan (2022) [3] suggest that uncertainty in economic policies can affect business strategies and also affect the surplus management of companies.

Domestic research has focused on the driving mechanism of big data-driven business model innovation.W. Wang and H. Wang (2022) [4] analyzed the role of big data on data drive in economic research at three levels: industry, industry chain, and enterprise.H. Zhang (2020) [5] distilled the role of big data in industrial structure from the characteristics of the era of big data, smart transportation.

2. Methodological mechanism of big data-driven business model innovation

A business model describes how a company operates its business, using internal resources and external networks to develop and deliver products and services to create and capture value. Big Data not only drives changes in the components of a business model, such as a company's key resources, value proposition, and key activities but also changes the core logic of value creation of the original business model.

2.1. Big Data as a Key Resource Drives Business Model Innovation in Firms

The resource-based view of the firm (RBV) argues that the interaction between tangible and intangible resources of a firm forms a unique pool of resources and that the scarcity and heterogeneity of key resources determine a firm's key competitive advantage. Big data is a new form of economic resource that can stimulate business model innovation in firms and change the relationship between producers and consumers; big data, as a new and highly heterogeneous form of resource in today's market, is a key resource for companies to carry out business model innovation. The driving force behind big data is primarily the economic benefits of the enterprise. Despite the scarcity of resources, information resources are unlimited, and big data as an information asset can be processed in innovative and cost-effective ways for insight and decision-making. Enterprises can access more information and knowledge resources by analyzing and processing Big Data, enabling data, information, and knowledge resources to be transferred and traded in the enterprise innovation ecosystem, thereby facilitating innovation in enterprise business models.

2.2. Big data disrupts the value proposition of an enterprise's traditional business model

Big data technology has overturned the traditional value proposition, and companies that provide homogeneous products to their customers can no longer gain an advantage in competition. Enterprises need to analyze and forecast big data, mine more valuable information from big data, focus on customers' personalized needs and make the realization of customer value proposition their core objective. Through personalization and flexible production, the all-around information interaction between enterprises and customers is realized, prompting the transformation of the enterprise's value proposition according to the personalized needs of customers and changing the core logic of value creation, thus overturning the original business model system and realizing business model innovation. Although big data processing generates a lot of valuable information, due to the existence of false information, before the value proposition of a data-driven business model is generated, the data must be screened, analyzed, and evaluated to ensure the integrity, authenticity, and reliability of the data, thus ensuring the accuracy of big data in predicting the personalized needs of consumers.

2.3. Big data drives continuous improvement of key activities and processes in an enterprise's business model

With the exponential iteration of data and the development of Big Data-related technologies, the analytical power of information is also being enhanced. Enterprises use Big Data technology to continuously optimize and improve key business processes such as design, production, logistics, and services, improving organizational efficiency and product and service quality. Companies rely on data analytics to make decisions and use big data to drive continuous improvement in key business processes, leading to innovation in business models. For example, manufacturers collect production data and equipment information from smart factories around the world through sensors and real-time monitoring systems, and extract, store, and intelligently analyze data from the manufacturing chain through big data, enabling production organizations to dynamically estimate, analyze and predict the invisible state of equipment, effectively avoiding losses caused by delayed repair after an equipment failure in traditional production processes. In addition, the aviation services industry has improved business process efficiency by reducing manual intervention and optimizing information flow, using Big Data technologies for process redesign.

2.4. Big Data has changed the value creation logic of the original business model of enterprises

Big Data enables real-time information generation between enterprises and transmission through external networks, breaking the chronological "upstream and downstream" relationship, and each enterprise in the innovation ecosystem uses the information flow to itself to synchronize production, eliminating the "bullwhip effect" caused by information delays and transmission errors. This eliminates the "bullwhip effect" caused by information delays and transmission errors. Big Data has changed the way companies create value. The application of Big Data makes application software,

intelligent terminals, and computer technology intermediate products for value creation, which can achieve value co-creation between suppliers, end-product manufacturers, and consumers because their replication costs are almost nonexistent. In the process of value co-creation, core companies rely on big data to become coordinators and leaders of the innovation ecosystem, connecting new suppliers and consumers to participate, making the division of labor highly modular in a cooperative and competitive manner, promoting a mutually beneficial symbiosis and orderly development of the innovation ecosystem, thus changing the core logic of value creation and promoting collaborative innovation of business models.

A business model describes how a company runs its business, using internal resources and external networks to develop and deliver products and services that create and capture value. Big Data not only drives changes in the components of a business model, such as a company's key resources, value proposition, and key activities but also changes the core logic of value creation in the original business model.

3. Big data-driven approach to commercial risk management: the example of early warning management of commercial risk in banks

3.1. Analysis of the need for early warning for commercial management risks in banks

A commercial bank's risk early warning system has the following main needs: First, the early warning system should be usable and effective. When building a risk early warning system, a commercial bank should ensure that the system does not interfere with the bank's internal operations. The risk warning system should be independent and not dependent on the original business system of the commercial bank, and the IT resources and equipment resources of the commercial bank's risk warning system should be limited; secondly, the commercial bank's risk warning system should be able to fully match the usage scenarios of the bank's various businesses. There are various departments within commercial banks, so the early warning risk system should be targeted when monitoring in real-time, and the monitoring and warning for each department should be focused, taking into full consideration the risk focus of different departments, personnel, and businesses within commercial banks; third, when building the risk warning system, commercial banks should ensure that the system has strong stability so that there is no need to waste human, material and financial resources to maintain the risk warning system. Fourth, a commercial bank's risk warning system should be scalable and open, so that it can be applied to all types of business within the bank. Fifthly, the risk warning system built by commercial banks should present the analysis results to the managers visually, so that they can identify the types and levels of risks, thus providing strong support to the management in making relevant decisions and risk response. (ii) Bank commercial management risks.

3.2. Design objectives of risk early warning for bank business management

The design objectives of a big data-based risk warning system for commercial banks include the following: first, centralized monitoring. The risk early warning system should be able to support the centralized monitoring of the operation of the business status information resources of multiple departments within the commercial bank from a single window and a single location, to provide early warning and real-time monitoring of the potential risks of various businesses from a global perspective and facilitate the unified scheduling of resources by the management to deal with various risks. Secondly, the risk warning system should be able to dynamically present statistical information, key data, and operation of various businesses of commercial banks to the outside world in real time, which can help the management of commercial banks to observe the changes and risk level of various businesses and make clear and favorable judgments on time; thirdly, the risk warning system should visually present the information resources of commercial banks and the operation status of various businesses, and be able to convey the risk type and risk status of various businesses to the outside world in real-time through the mode of dynamic charts and graphs and show their deep-seated

correlation Fourth, the risk early warning system should create a display of the risk situation. Fourthly, the risk situation display should be created to show the operational health and risk level of each business of the commercial bank through the color categories of the display, such as red for high risk, yellow for medium risk, and blue for low risk, so that the management can observe the real-time dynamic changes of each business and fix the relevant risks in time to prevent the problem from deteriorating and leading to more serious consequences.

3.3. Risk warning process for bank business management risk warning

The risk warning process of commercial banks based on big data is as follows: firstly, the risk warning system extracts raw data of various businesses from the internal transaction logs and databases of commercial banks; secondly, the risk warning system performs format transformation and filtering operations on the extracted data. Third, the risk warning system needs to classify the raw data after format conversion and filtering with the help of data classification algorithms, and at the same time carry out modeling operations with historical transaction data; fourth, the risk warning system uses the data analysis and processing system platform to analyze various types of data according to the predefined Fourth, the risk warning system uses the data analysis and processing system platform to analyze the risks contained in various types of business data according to the pre-defined risk engine and risk warning model and records the analysis results. The results of the analysis records are formatted and transmitted to the push platform, and the collated risk analysis results are transmitted to the management of commercial banks.

3.4. Technical architecture design for big data-based commercial risk management

The risk early warning system of commercial banks based on big data is mainly divided into a data information presentation layer, a data information analysis module, and a data information collection module. The specific workflow is the start stage, data information collection stage, data information storage stage, data information analysis stage, risk analysis results, and the end of the presentation. When designing the technical structure of the risk early warning system, the data information collection layer needs to be designed so that the system can collect and carry out pre-processing work on data information in a unified manner. The data collection layer of the risk warning system mainly converts the format of the original data information with the help of pre-defined scripts to unify the format of the original data information; the data information gathered from channels such as channel integration, transaction core flow, WeChat banking, pre-banking system, and mobile banking has different types of formats, which need to be unified through the data collection layer. The data storage layer of the risk warning system will store the original data information after format unification, but due to the limitation of system capacity, it will mainly store special data and important information data. The risk warning system can choose to classify the raw data information directly in the data storage layer and selectively push it to the data information analysis and processing layer. The stored and algorithmically classified data information will enter the risk engine and risk analysis model of the risk warning system.

3.5. Early warning application case of commercial bank risk management based on big data analysis

The processing process of big data analysis mainly includes: first, after the data information is processed by scripts and classified by algorithms, the data is transferred to the system platform; second, for better risk analysis, the data subscription format needs to be transformed with the help of function nodes; third, the intermediate result set is formatted according to the rules of the risk engine; fourth, the transformed intermediate result set is imported into the temporary database; fifth the intermediate result set in the temporary database is triggered by the trigger node every second and the data information is transmitted to the system processing platform in stream form; sixth, the data information of different chart types and formats is converted into a set and sent to the visualization platform for easy access by managers.

(1) Case 1: Early warning of risky operations by tellers

The early warning content of the risk warning system of commercial banks on the operation risk of tellers mainly includes frequent inquiry operations, business handling at non-prescribed times, and violation of the rules to handle their own business. The sources of risk warning data information for bank tellers are mainly customer personal information forms, employee information forms, and transaction logs. For example, the risk warning rules engine for bank internal tellers is as follows: business description model, which analyses the transaction data information in the transaction settlement log to determine whether the business processing customer is the same as the business processing teller and whether the customer information is the same as the settlement customer information; risk description model, which regulates the irregular business operations of the teller; operation frequency model, which monitors the business operations of the teller in real time; warning display model, monitoring and warning of the teller's transaction flow number, transaction amount, name, time, account name and teller number; priority model, based on to calibrate the data algorithm and source.

(2) Case 2: Failed transaction business warning

For frequent query account warning rules are: business content description, timely understanding of the status of failed business transactions, to ensure the smooth conduct of transactions; risk point description, to prevent business failure, the potential risk of transactions; frequency of operation, real-time monitoring; warning display content, failed transaction business type, failed transaction business amount; priority, the data source to determine frequent, algorithm uncertainty.

(3) Case 3: ATM large amount of money changes

A large number of funds change early warning risk rules engine for business content description, ATM large amount of cash withdrawal, a large amount of funds transfer across banks, the occurrence of amounts exceeding the threshold; risk point description, by the Central Bank's interim regulations on cash management; frequency of operation, real-time monitoring; early warning display content, cash withdrawal amount, transaction date, account type, customer name, account number; priority, data algorithm to determine. atm large amount of transactions Risk warning analysis results should be presented in a visual panel, showing risk warning results for large cash withdrawals through bar charts, fully recording ATM transactions with cash withdrawals greater than $100. When setting up the coordinate system, the account number and user card number are used as horizontal coordinates and the cash withdrawal amount of the transaction is used as vertical coordinates, with the aid of a dynamic table showing the changing status of inter-bank transfer information, recording the records of inter-bank transfers with transaction amounts exceeding the threshold, displaying data information such as transaction time amount, customer number and stream number.

4. Summary

Big Data-driven business model innovation is a dynamic and complex process that requires extensive upfront investment in the human and intellectual capital within the organization and the synergy of the corporate innovation ecosystem. To better enable Big Data-driven business model innovation, the function of Big Data collection, processing, and analysis is outsourced to Big Data consulting firms that have the infrastructure, scale, and experience to manage Big Data projects.

When building a big data-based risk early warning system for commercial banks, the underlying theory should be clarified, the risk early warning needs of commercial banks should be analyzed, design objectives should be set, the risk early warning process should be clarified, and then the risk early warning system for commercial banks based on big data should be built by constructing technical structures, optimizing algorithms and clarifying big data analysis methods, and by analyzing the application status of the risk early warning system for commercial banks on an ongoing basis Optimize and improve the risk early warning system.

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