Research on the Relationship Between Big Data Analysis Ability, Resource Integration Ability and Business Model Innovation

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Abstract—In addition to the three traditional assets of capital, land and labor, big data has become an important resource for enterprises. Businesses are starting to learn how to employ big data analysis technology to deal with the expanding volume of data as they increasingly recognize and value the value of data. As other technologies, like big data and cloud computing, are increasingly widely and deeply incorporated into business operations, they will also become the next frontier of competition, innovation, and productivity improvement. Big data-driven innovation mode opens up new opportunities for the development of businesses. There is not enough research on big data analytic capability in academia, and more research is mainly on theoretical and empirical research on the relationship between the antecedent factors influencing the application of big data, the specific practice of big data analytic application and business decision making, and less theoretical and empirical investigation into the connection between innovative business models for enterprises and big data analytics. This paper explores the impact of big data analytic capability on business model innovation and the mediating role of resource integration capability in it using questionnaire data from 156 enterprises in China.

Keywords-big data analytics; business model innovation; resource integration capabilities

1. Introduction

The Internet era is generating data all the time, and the explosion of huge data contains endless information resources, which bring opportunities for enterprise innovation and development. Whether enterprises can use big data analysis capabilities to extract key information resources from a large amount of data that are advantageous to the advancement of the organization, and integrate these resources to encourage enhancing business performance and building innovation skills to achieve environmental sustainability has become a very important issue.

This paper tests the mediating role of resource integration capability in the connection between big data analysis capability and business model innovation, reveals the mechanism of the role of big data analysis on business model innovation, and provides important theoretical reference for promoting business model change and innovation in the big data era.

This paper adopts the questionnaire method, and all data samples are from enterprises all over China. 156 valid sample data are collected to carry out the empirical analysis and test, and the descriptive statistical analysis test, reliability and validity test analysis, correlation analysis are

BDEIM 2022, December 02-03, Zhengzhou, People's Republic of China

DOI 10.4108/eai.2-12-2022.2328858

conducted by using Amos and SPSS software on the sample data, and the 10 hypotheses proposed in the paper are tested by multiple regression analysis and other testing methods.

2. Materials and Methods

First put forward the hypothesis according to the literature, then design the questionnaire according to the maturity scale, then investigate the questionnaires, and analyze the results of the questionnaires to determine whether the hypotheses are valid.

There are various views on the definition of business model innovation, such as research that business model innovation refers to innovative changes in the basic logic of enterprise value creation, or changes in the constituent elements of business models, involving innovations in industry value chains, profit models, enterprise models, or innovations in technology, value networks, etc. Studies have shown that big data analytics contributes to business model innovation. Some literature empirically demonstrates that big data analytics can facilitate organizational innovation and thus earn more performance returns for companies.

This paper draws on gupta to define big data analytics capabilities as three dimensions: big data analytics foundation capabilities, technological capabilities for big data analyticss, and big data analytics management capabilities. In this regard, this paper proposes the following hypotheses.

H1a: Big data analysis infrastructure capabilities can successfully encourage the creation of company models.

H1b: Big data analysis technology capability can successfully encourage the creation of company models.

H1c: Big data analysis and management capabilities can effectively promote business model innovation.

Integration of resources is a complicated process that describes the dynamic process by which businesses locate, use, and eliminate unnecessary resources in order to create new resources. Enterprises actually create the ability to integrate resources during this process.

Big data analytics can acquire and process and analyze the huge volume, complex structure and real-time update of internal and external data and information of enterprises, which encourages deep mining and analysis of already-existing knowledge and information, making it simpler to discover new tools and approaches for problem-solving, and promote the integration of enterprise resources. Big data analysis itself, as a new skill and thinking, can obtain new laws and discoveries in the huge amount of complex data. In this regard, we suggest the following scenario:

H2a: Big data analytics foundation capabilities have an advantageous effect resource integration capabilities.

H2b: Big data analytics technical capability has favorable effects on resource integration capability.

H2c: Big data analytics management capability has a positive impact on resource integration capability.

The ability of a business to accurately detect resources and access resources for inventive endeavors in the face of challenging market environment changes is known as resource integration capability. Resource integration capability opens the channel for enterprises to acquire new knowledge, and the "stimulation" of this new knowledge can stimulate creative thinking and breakthrough actions, accelerate the sharing of internal and external resources, and facilitate the development of innovative activities. The improvement of resource integration capability helps enterprises accurately grasp the resources they need in the complex social network, and then efficiently and actively acquire the resources related to their business development and innovation activities, and finally improve their core competitive advantages to achieve business model innovation. The capacity to allocate resources refers to an organization's capacity to choose and restructure the resources it gets, as well as to fully aggregate and swiftly match them.

A company's ability to match internal and external resources, activate new resources, and motivate existing resources to develop a resource management strategy in line with the competitive environment, continuously adapt to changing market conditions depends on how well it can integrate its resources, it also can judge the new development direction of the enterprise and complete the reform and innovation. Therefore, this study considers resource allocation capability as the basis for enterprises to accomplish business model innovation and puts out the following theories.

H3: The ability to integrate resources has a favorable effect on the innovation of company models.

It is further argued that the key to the process of enterprise big data analytics capability for business model innovation lies in the integration of the enterprise's existing resources. Resource integration transforms the resources and knowledge gained by big data analytics into positive factors that promote business model innovation. In this regard, the following hypothesis is put forth.

H4a: Resource integration capability plays a mediating function in the interaction between business model innovation and the fundamental capabilities of big data analysis.

H4b: Resource integration capability serves as a mediator in the relationship between technical capability of big data analytics and business model innovation.

H4c: Resource integration capability plays a mediating role in the relationship between big data analytics management capability and business model innovation.

In this study, 156 valid questionnaires—or an effective recovery rate of 52%—were ultimately retrieved from a total of 300 formal questions that were dispersed through surveys gathered by businesses. Among them, the asset scale of enterprises is mainly 10 million yuan - 30 million yuan, accounting for 46.7%.

The main variables were measured on a five-point Likert scale, with 1 indicating strongly disagree and 5 indicating very high or strongly agree. Big data analytic capabilities were formed by referring to the measurements and descriptions of gupta et al.

The scale of resource integration capability for business model innovation was referred to Zott and Amit's study. Also, the duration of time since founding, size, type of industry, number of employees, total assets and nature of the company were used as control variables.

3. Results & Discussion

The test results showed that the Cronbach's α values of each observed variable were greater than 0.8, indicating that each scale had a high degree of confidence. Significant correlation exists between the primary variables according to the correlation coefficients. (table 1), so the mediating effect can be further verified. First of all, the measurement of questionnaire variables is based on the maturity scale, which has high content validity; Second, according to the division of dimensions, a 5-factor model is established (x^2 /df=1.723; RMSEA=0.07, GFI=0.85, NNFI=0.916, CFI=0.927), better than other models, Indicates that the validity of the distinction is better. At the same time, the normalized factor loads for all the items in this study were between 0.56 and 0.9, and the T-values were shown to have high significance. The CR values of each variable are above 0.8, and the AVE values are above the threshold value of 0.5, indicating that there is a good convergence validity.

Table 1 Factor covariances

factorA	factorB	Nonstandard estimated coefficients	z	P	Standard estimated coefficient
X1	X2	0.433	6.348	0.000***	0.971
X1	X3	0.38	6.352	0.000***	0.895
X1	Y	0.553	6.894	0.000***	0.931
X1	Z	0.292	5.74	0.000***	0.981
X2	X3	0.272	5.779	0.000***	0.943
X2	Y	0.382	6.098	0.000***	0.947
X2	Z	0.2	5.242	0.000***	0.988
X3	Y	0.336	6.102	0.000***	0.873
X3	Z	0.176	5.252	0.000***	0.915
Y	Z	0.267	5.612	0.000***	0.991
X1, X2, X3, Y and Z respectively represent Big data analysis's fundamental skill,Big data analysis's technical prowess, the capacity for managing large data analysis, the capacity to integrate resources and the inventiveness of business models					

The mediating impact of resource integration ability is examined using the regression analysis method, and Table 2 shows the regression analysis results. The data shows that the basic capabilities of big data analysis, big data analysis technology capabilities and big data analysis management capabilities have a profoundly favorable effect on resource integration capabilities ($\beta=0.325$, $p<0.001$; $\beta=0.172$, $p<0.05$; $\beta=0.2$, $p<0.05$), capabilities of big data analysis, big data analysis technology, and big data analysis management have a profoundly favorable effect on business model innovation($\beta=0.324$, $p<0.001$; $\beta=0.195$, $p<0.05$; $\beta=0.22$, $p<0.001$). At the same time, innovation in business models is greatly benefited by the capacity to integrate resources. ($\beta=0.468$, $p<0.001$), Therefore, H1a, H1b, H1c, H2a, H2b, and H2c are all supported.

After the introduction of intermediary variable resource integration capabilities, the significant impact of big data analysis capabilities on business model innovation has weakened, and the learning of big data analysis basic capabilities still has a tremendous impact on the innovation of company models. The resource integration capability plays a partial intermediary role in the basic capability of big data analysis and business model innovation, so H4a is supported.

Table 2 Results of mediating effect analysis

Results of mediating effect analysis (n=156)			
	Z (BMI)	Y	Z (BMI)
	β	β	β
X1	0.325	0.324	0.173
X2	0.172	0.195	0.081
X3	0.2	0.225	0.095
Years of establishment	0.057	0.045	0.036
number of employees	0	-0.009	0.004
T total assets	-0.029	-0.105	0.02
Subordinate to the industry	0	0.003	-0.002
Enterprise nature	-0.046	-0.015	-0.039
Y			0.468
R^2	0.759	0.775	0.806
Adjusted R^2	0.746	0.76	0.792
F	F (8, 140)=55.253, P=0.000***	F (8, 140)=60.153, P=0.000***	F (9, 139)=64.371, P=0.000***

Table 3 Inspection conclusion

C The total effect	a	b	a*bMediating effect value	a*b(P)	a*b (95%BootCI)	c' Direct effect	Inspection conclusion
0.325	0.324	0.468	0.151	0.000***	0.234 - 0.09	0.173	Partial mediating effect
0.172	0.195	0.468	0.091	0.012**	0.179 - 0.033	0.081	Complete mediating effect
0.2	0.225	0.468	0.106	0.012**	0.201 - 0.037	0.095	Complete mediating effect

4. Conclusions

This paper draws the following conclusions: (1) Business model innovation is significantly benefited by big data analytical skills. (2) The resource integration ability has played a part of the intermediary role in the relationship between the basic ability of big data analysis and business model innovation. (3) When it comes to the relationship between big data technology capability and business model innovation, ability to integrate resources acts as a wholly intermediary factor. (4) Ability to integrate resources plays a completely intermediary position in the link between business model innovation and big data management proficiency.

In terms of management enlightenment, first of all, enterprises should fully grasp the development opportunities faced by innovation in business models in the big data age, and make corresponding investment in big data resources and infrastructure in combination with business needs, so as to improve the application ability of enterprise big data analysis.

Second, enterprises should make good use of resource integration capabilities by establishing a reasonable resource integration mechanism. Resource integration capabilities can help enterprises to grasp the internal and external resource allocation of the enterprise in a timely manner and make up for their own resource disadvantages, thereby promoting the enterprise to continuously innovate and create products and services that satisfy client’s needs to boost the company's fundamental competitiveness. Therefore, Businesses should focus on the functionality of resource integration capability as a bridge between big data analysis ability and innovation in business models in order to enhance the effect of business model innovation.

Finally, in an increasingly dynamic and complex big data environment, enterprises should be more mindful of promoting the refinement and mining of existing knowledge bases and data resources through the utilization of big data analysis, deepen the understanding and application of existing knowledge and resources, and further expand the content and depth of knowledge resources. The use of big data analysis to promote in-depth understanding of market segmentation and the current competitive situation, and to effectively respond to the im-

pact of environmental uncertainty by utilizing fully corporate resources, strengthen the innovation ability of enterprises.

Through empirical analysis, this study innovatively takes resource integration capability as a mediating variable during the business model innovation process, increases the explanatory power of big data analysis on business model innovation and furthers the study of the mechanism by which big data analysis capabilities affects business model innovation. It is also a key path to determine whether enterprises facing dynamic and complex market environment can filter valuable information through big data analysis and then promote business model innovation and create core competitive advantage with the help of resource integration capability.

Future research can further expand the study area or conduct a comprehensive study for a specific industry to improve the rationality of the sample. In addition, the improvement of resource integration capability cannot be achieved overnight, but needs to be accumulated gradually in practice, and other key factors affecting resource integration capability can be further explored in the future.

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