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A Study on Improving Organizational Structure and Cultural Alignment Based on Iterative Computing in Enterprise Digital Transformation

Ye Wu[1,✉], Chuan Tian[1], Huan Wan[1]

[1] *Department of Economic Management, Jiangxi Tourism & Commerce Vocational College, Nanchang, Jiangxi, 330100, China*

ABSTRACT

In the context of big data, with the accelerated development of digital technology, enterprises are facing the pressure of digital transformation, and at the same time, big data computing system provides technical support for the digital transformation of enterprises. In this paper, we propose a data analysis system based on iterative computing for the digital transformation of enterprises. In order to avoid the resource consumption caused by unnecessary repeated calculations in iterative computing, this paper proposes optimization based on Spark fault-tolerant mechanism and constructs an enterprise data analysis system based on iterative computing model, which provides technical support for enterprise digital transformation. On this basis, this paper also provides optimization strategies in terms of organizational structure and cultural coordination for enterprise transformation, which provides an effective path for realizing comprehensive digital transformation of enterprises. Through the test of this paper's iterative computing data analysis system, the speed of Spark optimization based on this paper is increased by nearly 2 times, which illustrates the usefulness of this paper's optimization based on Sparl fault-tolerant mechanism. Meanwhile, the cache misses of the data analytics system are in the range of 46% to 60%, which provides better performance performance in terms of cache hits and time overhead. In this paper, we provide practical and feasible transformation paths for enterprise digital transformation from three aspects, including digital technology, enterprise organizational structure and culture, and promote the development of enterprise digital transformation.

Keywords: iterative computing, Spark, fault tolerance mechanism optimization, enterprise digital transformation

1. Introduction

Enterprise digital transformation poses new challenges to traditional organizational structures.

✉ Corresponding author.
E-mail address: 15180560090@163.com (Y. Wu).
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Traditional organizations are usually hierarchical, with slow information flow and cumbersome decision-making processes. Digital transformation requires enterprises to achieve rapid decision-making and efficient communication, so the organizational structure needs to be redesigned. The new organizational structure should be flat, emphasizing teamwork and information sharing [1-4]. By breaking down departmental barriers and promoting cross-departmental collaboration, enterprises can better adapt to market changes and customer needs. In digital transformation, enterprises also need to introduce new roles and functions [5-6]. For example, the emergence of new positions such as data analysts and digital experts provides enterprises with more digital capabilities. At the same time, enterprises also need to develop leaders with digital thinking and skills who can lead teams to meet digital challenges and drive organizational change [7-9].

In addition to organizational restructuring, enterprise digital transformation also requires cultural change. Enterprise culture is the core values and code of conduct of the enterprise, which plays a crucial role in the development of the enterprise. In the digital era, enterprise culture needs to be adapted to digital transformation in order to promote enterprise innovation and change [10-13]. The key to cultural change is to cultivate a culture of openness, innovation and learning. Enterprises should encourage employees to come up with new ideas and perspectives, stimulate innovative thinking, and break traditional stereotypes. In addition, companies should provide learning and development opportunities to help employees continuously improve their skills and knowledge to adapt to the changes in the digital era [14-17].

The enterprise organizational structure in the digital era is relatively flat, decentralized and individualized, so in the process of enterprise digital transformation, it is necessary to establish a set of organizational structure system for enterprise characteristics and actual situation in order to better promote digital transformation. Literature [18] specifies the importance of digital transformation to the organizational structure of enterprises and the organizational barriers to this transformation process. It aims to examine the key aspects of organizational structure that support digital transformation and give possible coping strategies for organizational models in the digital era. Literature [19] describes the ways in which organizations can successfully implement digital technologies, and the results reveal a conceptual framework designed to support corporate management in understanding the actions available to implement digital transformation. Literature [20] explores the impact of digital transformation on the organizational structure of a firm. Based on an overview of digital transformation and an analysis of the evolution of business organizations, it is concluded that digital transformation can increase organizational flexibility, improve the quality of decision-making and work efficiency, etc., and recommendations are made through an example study. The impacts of digital transformation on business organizations are revealed and provided as a reference for business management. Literature [21] discusses the impact of digital transformation on enterprise architecture. It points out the shortcomings of EA and discusses the construction of EA for organizational flexibility and resilience by proposing a vertical typology of organizational capabilities, assuming that digital environments require adaptive capabilities that go beyond the traditional concept of dynamic capabilities. Literature [22] highlights the impact of digital transformation on business organizations. Aims to develop a model, which outlines the structure of by business organizations and their interactions under digital transformation, will allow for the self-assessment of the organization on the path of digital transformation. Literature [23] elucidates the multiple elements of digital transformation and proposes a model for accelerating overall digital transformation efforts. Based on the case study the key factors for achieving digital transformation are identified, based on which a value creation model for accelerating digital transformation is introduced.

In the wave of digital transformation, the role of enterprise culture has become more and more prominent. The enterprise culture that promotes digital transformation can not only help enterprises better adapt to change, but also stimulate the innovation potential of employees and enhance the competitiveness of enterprises. Literature [24] discusses the cultural values of enterprises engaged in

IT industry in digital transformation. The results present nine organizational values, eight of which are similar to existing studies. It is emphasized that identified cultural values can raise awareness of organizations engaging in digital transformation and help organizations to identify cultural values that affect the success or failure of digital transformation. Literature [25] investigated digital culture change projects in several organizations using a qualitative multiple case study approach, and found that digital culture change is characterized by disrupted environments and the gradual and widespread use of digital technologies, and its study has a contribution to the digital transformation literature. Literature [26] used adaptive structure theory and the input-process-output model to narrate the organizational culture transformation of an enterprise before and after the implementation of a digital transformation program in a single case study. Digital transformation was found to have transformed the firm's organizational culture to one of increased collectivism and reduced power distance and uncertainty avoidance. Literature [27] aims to explore the impact of organizational culture on the success of digital transformation. Questionnaires were administered to workers in different firms, and SEM and AMOS software were used to assess the information and develop the proposed conceptual framework. The results show that employee empowerment has a positive impact on digital transformation and that aspects such as teamwork do not have an impact. This result facilitates the understanding of the important role of culture in digital transformation. Literature [28] discusses culture change with methods to support digital strategies, namely agility and open innovation, by using these methods existing applications to further digitalization.

This paper develops an exploration of enterprise digital transformation in the context of big data. In terms of digital technology, this paper proposes an iterative computing model based on the Spark fault-tolerant mechanism, and builds an enterprise data analysis system based on this model, which provides digital technology support for enterprise digital transformation. Considering the enterprise organizational structure and enterprise culture comprehensively, this paper proposes the optimization strategy of enterprise organizational structure and the road of cultural coordination enhancement to comprehensively realize the enterprise digital transformation.

2. Enterprise digital transformation paths based on iterative computing

2.1. An Iterative Computational Model for Enterprise Data Processing

In the context of big data, with the development of data mining, machine learning and other related fields, more and more iterative computing is applied to many fields such as social network analysis, high-performance computing, recommender systems, search engines, pattern recognition and so on. Enterprises can apply advanced data analysis methods for decision making and predictive analytics, therefore, this paper is oriented to the digital needs of enterprises and explores the optimization path of iterative computing in enterprise digital transformation.

2.1.1. Iterative algorithm. In order to deeply study the application value of iterative computing in enterprise digital transformation, this paper firstly introduces three iterative algorithms such as common PageRank, K-mean and Descendant-Query.

PageRank algorithm is the basis of many important link analysis algorithms, PageRank algorithm is used to identify the level of web pages, a method of importance. PageRank algorithm makes those more “rank/importance” web pages ranked in the front of the search results to improve the relevance and quality of the bureau search results.

Page Rank is based on 2 premises. Given web page A, $L(A)$ denotes the set of web pages that link to A, $B(A)$ denotes the set of web pages that link to A, and $R(A)$ denotes the Page Rank value of A, the web page has the following 2 premises:

Quantity premise, the larger $|L(A)|$, that is, the more pages linking to A, then A is more important.

Quality premise, the quality of the pages in $L(A)$ is different, the higher the quality of the page, the higher the weight in the calculation of $R(A)$. So the more quality pages point to A, the more important A is.

Using the above two premises, the calculation process is as follows:

1) Initialization, web pages construct a Web graph by linking relations, in which each page is a node, the linking relations between pages act as directed edges between nodes, and each page sets the same Page Rank value (initial value), and then enters into the updating stage of Page Rank.

2) Update, in one round of update calculation, each page distributes its current Page Rank value evenly to the linked-out pages of this page, so that each link obtains the corresponding contribution. And each page will sum up the contributions from all the incoming pages to get the new Page Rank. When each page gets the updated Page Rank value, a round of Page Rank calculation is completed.

3) Termination, the algorithm terminates when the value of Page Rank does not change during the updating process and the final Page Rank value is obtained:

$$fp(u,D)=\frac{1-q}{N}+q\sum_{u_j\in B(p,i)}\frac{R(u_j)}{\left|B(u_j)\right|} \tag{1}$$

In practice, equation (1) is often used to update the value of PageRank. In equation (1), $R(p_i)$ represents the Page Rank value of page p_i, N is the number of all pages, q is a constant and $q=0.85$ (called the damping constant).

The K-Means algorithm is a very typical distance-based clustering algorithm that uses distance as an evaluation index of similarity, i.e., the closer the distance between two objects, the more similar they are considered to be. The algorithm considers that clusters are composed of objects that are close in distance, and therefore takes getting compact and independent clusters as the ultimate goal. While previous regression, plain Bayes, SVM, etc. have category labels c, clustering belongs to unsupervised learning, where there are no given c in the clustered samples but only features x. The aim of clustering is to find the potential categories c for each sample x.

The K-Means algorithm is abstracted by assuming that the training samples are $X=\left\{x^{(1)},x^{(2)},\ldots,x^{(m)}\right\}$ and their $x^{(i)}\in R^n\left(i\in[1,m]\right)$ and to cluster the samples into k clusters, the algorithm proceeds as follows:

1) Initialization, randomly select k cluster center of mass points, $\mu_1,\mu_2,\ldots,\mu_k$ where $\mu_i\in R^n\left(i\in[1,k]\right)$.

2) Update, given any sample $i(i\in[1,m])$, calculate the classification $c^{(i)}$ to which it belongs according to Eq:

$$c^{(i)}=\min_j\left\|x^{(i)}-\mu_j\right\|^2\ j\in[1,k] \tag{2}$$

Given any category $j(j\in[1,k])$, update the center of mass μ_j of that category according to Eq:

$$\mu_i'=\frac{\sum_{jc(j)=i}x^{(j)}}{|c(j)|}\ j\in[1,k] \tag{3}$$

3) Termination, the algorithm terminates when the center of mass point is not changing during the update process.

Descendant-Query is a common algorithm present in social networks, which is based on a table of user relationships and iteratively counts all the people known by a given user. The algorithm is abstractly described as follows: assume that the sample of users is U, and that U contains the ordinal couples of all directly known users. I.e., A and B are two directly known users, then $\langle A,B\rangle\in U$. The set of all users known to A is R. The Descendant-Query algorithm process is represented as follows:

1) Initialization:

$$R=\{\langle A,A\rangle\} \tag{4}$$

2) Update, through the connection operation of R and U and the de-duplication operation, the element in R is increased, and the result of the update is the initial value of R in the next iteration.
3) Termination, when R no longer changes, the algorithm terminates.

2.1.2. Optimization based on Spark fault tolerance mechanism. Spark, as an emerging distributed big data computing framework, is based on in-memory computing, which stores all intermediate processing data in memory, reduces the number of disk I/O, and greatly improves computing performance. Therefore, Spark is especially suitable for data mining, machine learning, and graph algorithms and other applications that require iterative computation with multiple repeated readings of data. However, while Spark improves performance, it consumes a lot of memory, and the scaling operation of data is also prone to memory overflow, leading to task failure and data loss, so it needs an effective fault-tolerant mechanism to ensure the reliability of its data.

In this paper, the fault tolerance optimization of Spark is optimized on the basis of Lineage fault tolerance mechanism, similar to the checkpoint mechanism, in case of failure and backtracking with Lineage, the backtracking process is interrupted by using the compensation function, the user's predefined compensation function is called to recover the data, and the re-execution starts from the data recovered by the compensation function, to avoid re-computation from the beginning. Therefore, an iterative computation process, if a fault occurs, is equivalent to re-executing only this iteration, and its overhead of recomputation is also controllable.

The optimization method in this paper is based on the fault-tolerant strategy of the compensation function.All the datasets to be used by Spark in processing iterative computation are abstracted as RDDs, but there are two types of datasets in the iterative computation data flow model, i.e., dynamic data and static data. Static data is data that remains unchanged all the time after it is read or initialized and can be read directly from HDFS or set to the initial state after loss. Dynamic data is categorized into iterative variables and intermediate variables, and can only be recovered using the compensation function if the RDD type is iterative variable. Intermediate variables are the intermediate conversion results of an iterative computation process for iterative variable updates, if this type of data is lost it can be backtracked to iterative variables according to the dependency relationship, and generated by iterative variable recalculation. On this basis, in the optimized fault-tolerant strategy, the RDD category judgment is carried out firstly, and the immobile fault-tolerant strategy is adopted for different types of RDDs.
1) Determine whether this RDD has set checkpoints, if this RDD has set checkpoints directly read the backup data, otherwise continue to execute step 2.
2) Determine whether the RDD is an iterated variable type, if the RDD is an iterated variable type, execute the compensation function to recover, otherwise get the dependent RDD according to the Lineage information and continue to execute step 1.

In addition, all the tasks of Spark are operations on RDD datasets and Spark provides operations for various types of computations. These operations are further categorized into two types: transformations and actions, since the compensation function execution has to regenerate the new RDD, it is necessary to perform a transformation operation.

Compensation function is to generate compensation value for the lost partition data of RDD for recovery, and in order to ensure the consistency of all the data of RDD, other partition data may also need to perform compensation function to convert to a new consistent state. And RDD is readable and unwritable, the recovered data can not be reallocated to the original RDD, therefore, it is necessary to perform a map conversion operation to perform the compensation function calculation process to generate a new RDD instead of the original RDD. The map operation is a very simple transformation operation that is performed once on each element of an input collection of data specified to generate a new RDD.

The optimized implementation of the DAG computation model based on Spark's fault-tolerant mechanism is shown in Fig. 1. Similar to many emerging distributed big data processing systems, Spark represents the execution process of an application through a directed acyclic graph (DAG). Once an application is submitted, Spark first generates a DAG for that application, and then splits the DAG and schedules tasks. In Spark, the DAG describes the entire execution of the application. The vertices represent the in-memory dataset RDDs of the operations, and the RDDs also record how the operations evolve from other RDDs, and the edges represent the dependencies between the RDDs. In order to implement the compensation function based fault tolerance policy, the DAG of the iterative application needs to be modified to add the execution process of the compensation function to the iterative part of the DAG graph. Therefore, during the generation of the DAG by Spark, a map operation is automatically added after the iteration variable labeled as IteratorRDD to execute the compensation function of the IteratorRDD.

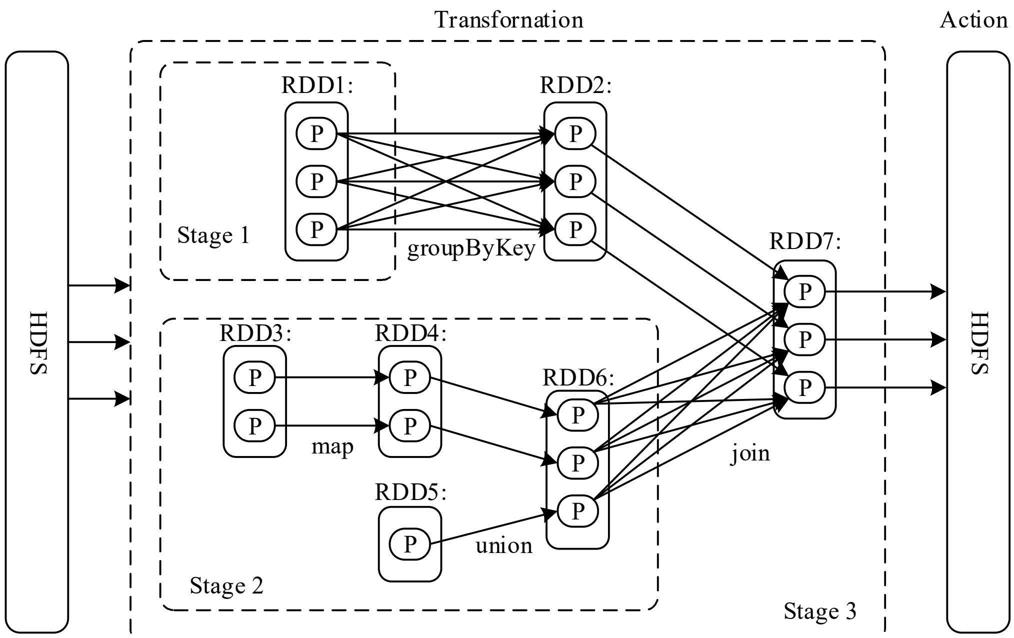


Fig. 1. Spark is based on the DAG model

2.2. Based on iterative computing in enterprise data analysis system

The architecture of the iterative computing system for enterprise data analytics is shown in Figure 2, where the dotted box marks the cluster architecture of the data analytics organization in each branch of the enterprise, including the Spark analytics compute cluster in each branch and the distributed file system for storing the data, and the dotted box marks the cluster architecture of the data analytics organization in the higher-level branch or headquarters, which is mainly composed of compute clusters of the Spark framework. Based on the internal Spark analytic computing cluster, each branch office analyzes its own enterprise data in the district to get the corresponding analysis results in the district, which serves the personalized enterprise decision-making within the formula and the future scientific and reasonable financial decision-making, and when the headquarters needs to analyze the comprehensive data of the enterprise, each branch office can feed back its own data in the district as well as the results of the analysis of the data in the district to the headquarters of the enterprise. When the headquarter needs to analyze the comprehensive data of the enterprise, each branch organization can feedback its own data and the results of data analysis to the enterprise headquarter, and the enterprise headquarter can analyze the results of data analysis of the company based on the Spark analysis and calculation cluster of the branch, and carry out merging and iterative calculations based on the results of the branch.

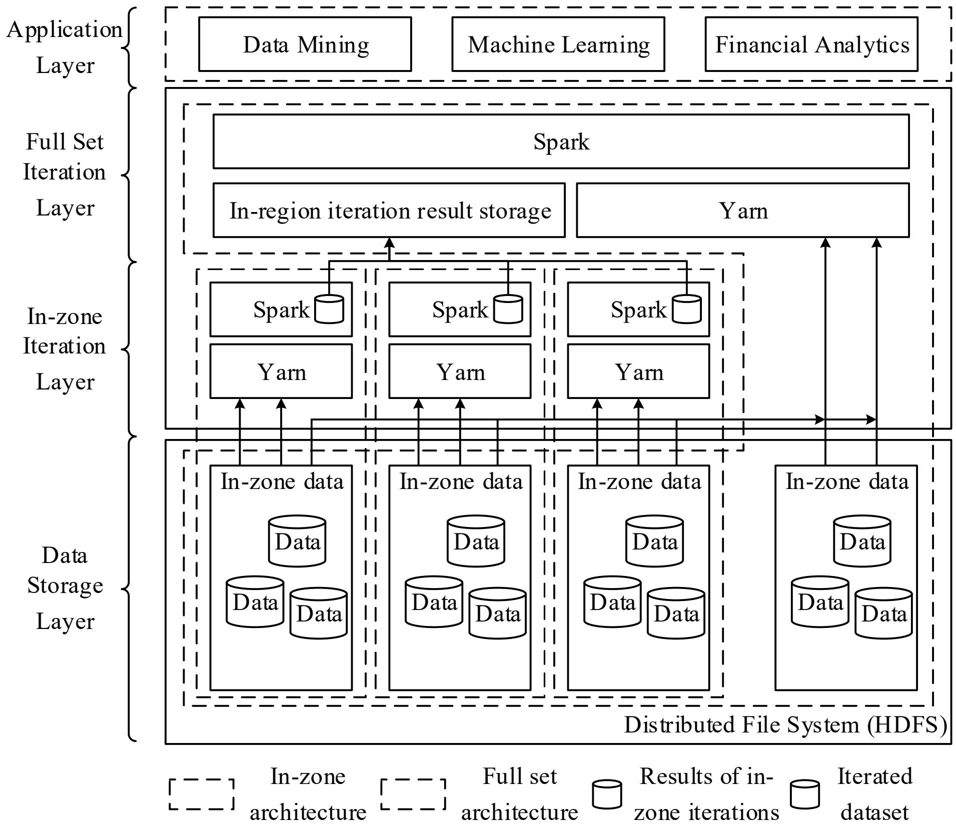


Fig. 2. An iterative computing system architecture for enterprise analysis

2.3. The realization path of enterprise digital transformation

This paper applies iterative computing to the enterprise's data analysis, which provides a technical route for the enterprise's digital transformation, but the enterprise's digital transformation also requires technology and multifaceted combination of more. For this reason, this paper conducts research from the enterprise organizational structure and enterprise culture, and proposes a realistic path for enterprises to achieve a comprehensive digital transformation.

2.3.1. Organizational structure optimization strategy based on enterprise digital transformation. One of the core contents of the digital transformation of enterprises is the introduction of digital technology and triggering changes and innovations to the enterprise organization. This paper constructs a data analysis system based on iterative algorithm, realizes the introduction of digital technology, and then launches a research on the change and optimization of enterprise organization structure.

The study of organizational structure optimization in the context of digital transformation is the result of the interaction of multiple causal factors, and the TOE influencing state factor model is shown in Fig. 3. Using the TOE theory, this study tries to incorporate the influencing variables into the research framework, and study the matching relationship and linkage between its three dimensions from the group perspective, and the research is about the level of organizational structure adaptation in the construction industry, and the research aims to improve the enterprise's organizational structure adaptation level to improve the success rate of digital transformation.

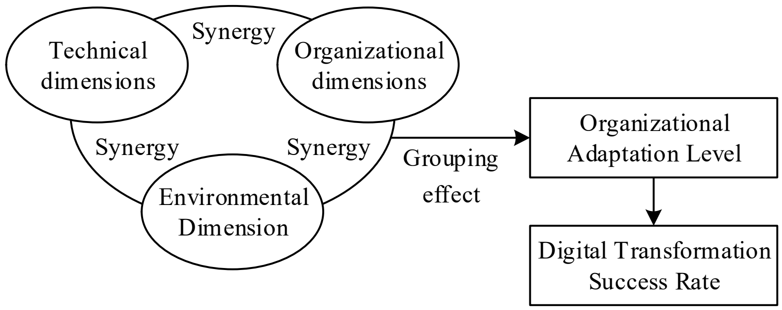


Fig. 3. TOE influence state model

1) Technical factors. At the technological level, enterprises can make business processes more efficient by accessing digital technologies such as cloud computing, big data, and intelligent construction, and can propose new industry solutions based on digitalization. The level of enterprise digital technology and the application coverage can change the ratio of employee structure, promote the organizational structure change, and reduce the cost of the enterprise.

2) Organizational factors. In the context of digital transformation, from the organizational level, the leadership level of the organization plays a key role in digital transformation, especially the consistency of managers has an important impact on the goal of promoting digital technology to a higher stage of development. At the same time, digital technology requires professionals who have mastered the appropriate skills to guide or use, therefore, the recruitment of digital talent and the training of employees play an important role in the implementation of the enterprise digital strategy, prompting business managers to adjust the organizational staff structure toward a reasonable level.

3) Environmental factors. From the environmental dimension, government departments will carry out macro-control of different industries, and the inclination of policies and resources, the regulatory environment and compliance requirements have a far-reaching impact on the digital transformation of construction enterprises. On the one hand, policy subsidies have pushed enterprises to carry out digital transformation, which has led to high capital valuation of enterprises and achieved the effect of blood transfusion to enterprises to some extent. On the other hand, changes in the external environment require companies to revisit their organizational structure to ensure compliance and obtain more policy support in the process of digital transformation.

2.3.2. Cultural harmonization enhancement based on enterprise digital transformation. In the process of digital transformation of the enterprise, enterprise culture runs through all aspects of the enterprise. The thinking mode of the enterprise changes from empirical to scientific, and the operation mode changes from product-centered operation to service-centered operation. The management mode shifts from affectionate management to rational management and people-oriented management, and human resource management shifts from management according to kinship to management according to competence; the core of the above aspects is the enterprise's cultural issues.

Based on the cultural coordination adjustment of enterprise digital transformation as shown in Figure 4, enterprise transformation in different stages of the enterprise should be different adjustments to the enterprise culture, and thus enhance the coordination of enterprise culture. The development of enterprise transformation can be mainly divided into the gestation period, development period and maturity period. The incubation stage of the enterprise culture for the participatory enterprise culture, the enterprise is easy to rely on flexible, simple, fast advantage to develop the market and occupy a certain market share. During this period, the economy is flexible, simple and fast by the characteristics of the family members are easy to communicate with each other, to facilitate rapid decision-making, enterprise members to participate in the development of decision-making, and gradually develop and accumulate into a participatory corporate culture.

The development period to regulate the operation of the enterprise by the system, to avoid excessive constraints on the enterprise to the individual entrepreneur. Lower cohesion within the enterprise can be achieved by establishing an order-oriented enterprise culture, with the help of power hierarchy and specific regulations, so that all employees are in hard constraints to ensure that the behavior is standardized, providing a viable method for the orderliness of the personnel and stopping the abuse of power.

Maturity stage enterprises enter the harvest stage, enterprise transformation gradually to standardize the evolution of modern enterprise business model, internal management from centralized mode to decentralized mode. During this stage of enterprise transformation, the enterprise culture is diverse, and the enterprise should establish a pluralistic enterprise culture dominated by innovative culture to establish an environment conducive to innovation for employees and maintain the competitive advantage of the enterprise. The diversified culture should be embodied in innovative culture, speed culture, learning culture and integration culture.

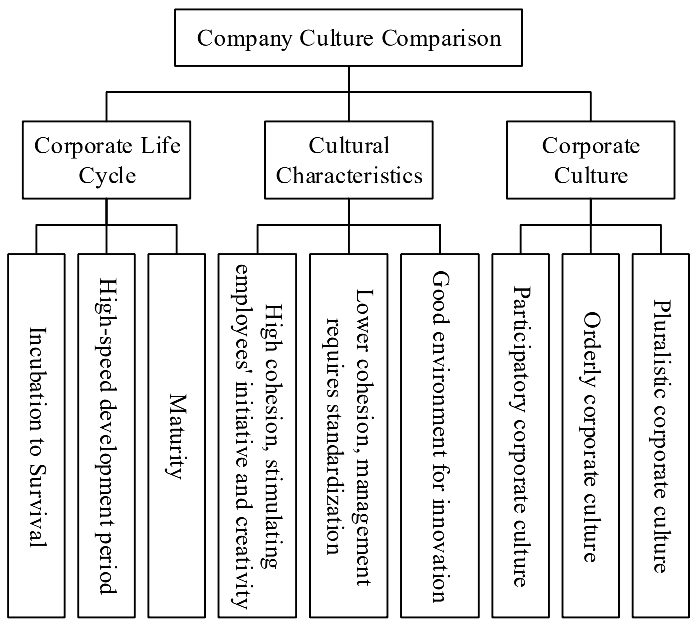


Fig. 4. The cultural coordination adjustment based on the transformation of enterprise number

3. Empirical analysis of enterprise digital transformation based on iterative computing

3.1. Spark-based optimization effect analysis

In order to comprehensively evaluate the performance of this paper's optimized iterative model based on Spark's fault-tolerant mechanism, a detailed experimental design was carried out in a clustered server environment on a CentOS 7 system, where the use of including multiple types of GPU hardware and NVIDIA CUDA Toolkit 10.0 software, and the distributed computation platform is based on the open-source Spark 2.4.1 architecture. This experimental environment consists of nine Worker nodes and one Master node, and each node is equipped with an Intel Xeon CPU E5-2678 processor, which contains 48 compute cores running at 2.50 GHz, and 125G of memory. In addition, to verify scalability and applicability, the cluster environment is equipped with several types of GPUs, including NVIDIA Tesla K20, NVIDIATesla P100, and NVIDIA Tesla M40.

3.1.1. Comparative testing of different algorithms. In order to evaluate the performance of the iterative computation model of this paper, the improved model of this paper based on Spark's fault tolerance mechanism (DSpark) is compared with PageRank (PP), Connected Components (CC), and K-means (KM), and a comparison of the computation time of the iterations of different algorithms is shown in Figure 5. It can be seen that the execution time of the first iteration is very long regardless of whether the application is executed on Spark or DSpark. Then the execution time decreases dramatically and remains stable and increases slightly in the last iteration. Most of the execution time of the first iteration is spent on fetching data and transferring it to the GPU for caching. The results of the last iteration need to be returned to the host side. Therefore, the trend of iterative computation in the figure is obtained. Moreover, it can be seen that the second iteration takes slightly longer when the application is executed on DSpark. This is because when the data is executed in incremental iteration mode, it needs to be cached in the on-chip shared memory, which takes some time for cache processing. The speedup of these benchmarks after the DSpark optimization in this paper is nearly 2x, illustrating the usefulness of the optimization based on the Sparl fault tolerance mechanism in this paper.

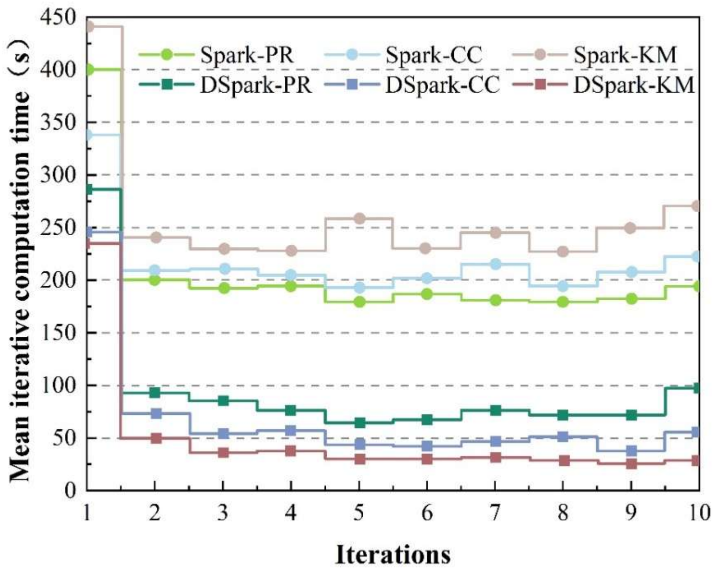
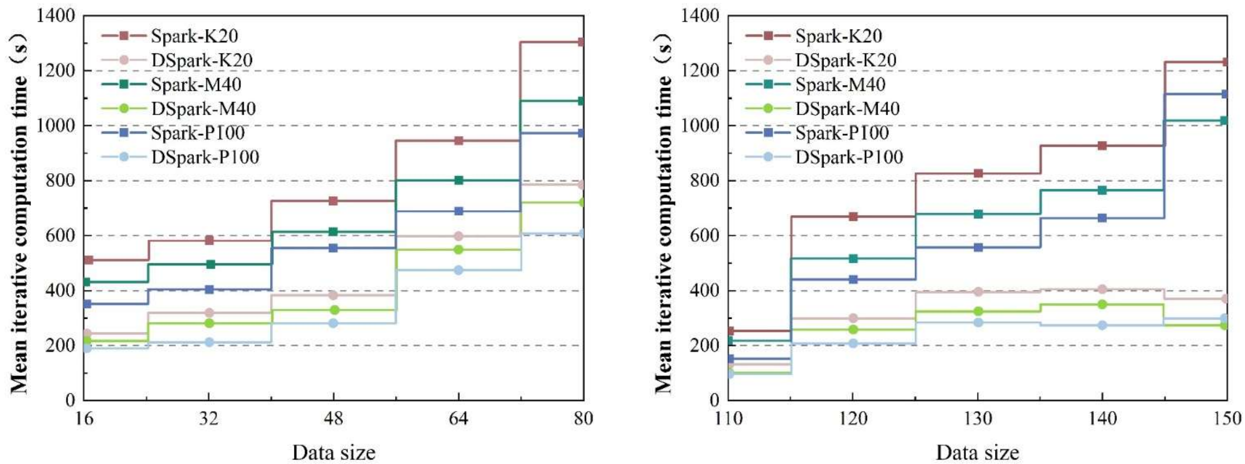


Fig. 5. The calculation time of different algorithms is compared

3.1.2. Analysis of the impact of the platform of the hardware on the execution time of the computation. CPU hardware is an important influence on iterative computational models, and for this reason this paper evaluates the impact of platforms with various GPU hardware on computational execution time. Where the execution time of PageRank and Connected Components and K-means on NVIDIA Tesla K20, NVIDIATesla M40 and NVIDIA Tesla P100 are compared respectively. The results of the impact analysis comparison are shown in Figure 6, where (a) and (b) are the experimental results for Connected Components and K-means, respectively. The computational speed of Connected Components on all types of GPUs remains stable as the data size increases.The computational speed of the benchmark on P100 is improved by 2.5 times.P100 outperforms M40 and K20 because P100 outperforms the others in terms of both computational power and on-chip buffering, which is a difference brought about by the hardware attributes.K- means is the same as Connected Components. As the data volume increases, its execution time increases, but the execution time of traditional Spark increases linearly, while the execution time of the optimized DSpark in this paper increases slowly. Finally, when the data volume increases to 130M, the execution time starts to remain stable. The optimization method in this paper can significantly improve the execution speed of jobs in a variety of benchmark tests, and effectively reduce the computational execution time of the iterative model, effectively reduce the computational execution time of the iterative model.



(a)Connected Components (b)K-means

Fig. 6. Impact analysis

3.2. Performance testing of data analysis systems based on iterative computation

The data analytics system of this paper for enterprise digital transformation is tested and analyzed to verify its effectiveness in enterprise digital transformation. The test system runs on Linux-2.6.32 operating system. The experimental datasets include Orkut (OK), Soc-LiveJournal (Lj), Twitter2010 (Tw) and Friendster (Fs) The system is compiled and linked based on Cmake, and at the same time, since the original maiter system is written based on the MPI messaging and communication interface, the system needs to install the MPI interface library as well as the runtime program openmpi. The system is tested for cache hits by the valgrind tool.

Here the cache miss rate is used as a test criterion to compare the optimization system of this paper with Maiter-RR and Maiter-CC on different datasets, and the cache miss rate of the system test is shown in Fig. 7. The results of the test experiments show that the operation results of Maiter-RR and Maiter-CC possess a high cache miss rate, and their cache miss rates are in the range of 65% to 83% and 65% to 89%, respectively. The data analysis system after being processed by the optimization mechanism in this paper has cache misses in the range of 46%~60%, which is always lower than Maiter-RR and Maiter-CC, and it reduces by 19% and 21% compared to Maiter-RR and Maiter-CC on the Lj dataset, which proves that the system in this paper has a better performance in terms of cache misses, and it can forward messages locally in a fast and centralized message forwarding, reducing the possibility of cache misses.

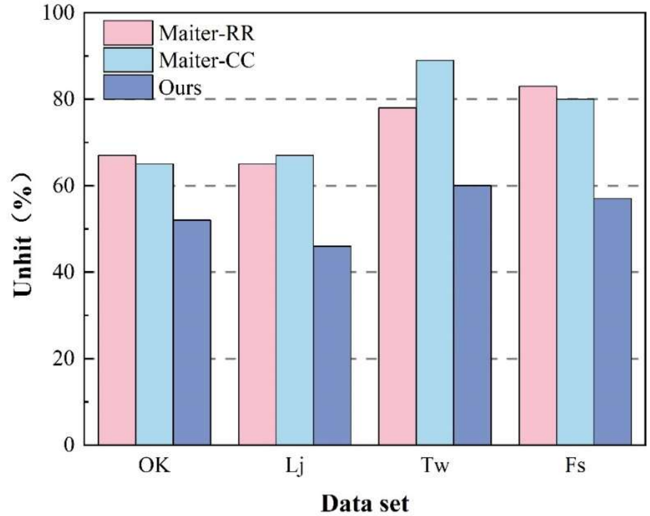


Fig. 7. System test cache unhit

In this paper, the data division overhead of the system on four different datasets is further analyzed and the data division overhead time on different datasets is shown in Fig. 8. It can be seen that the time overhead of Maiter-RR and Maiter-CC is more, especially when the Fs dataset are up to 128 s. While the system in this paper is under 128 s, and the time overhead is the lowest on all other data, which further verifies that the performance of the data analysis system in this paper is superior, and that it can have a better performance in the digital transformation of enterprises.

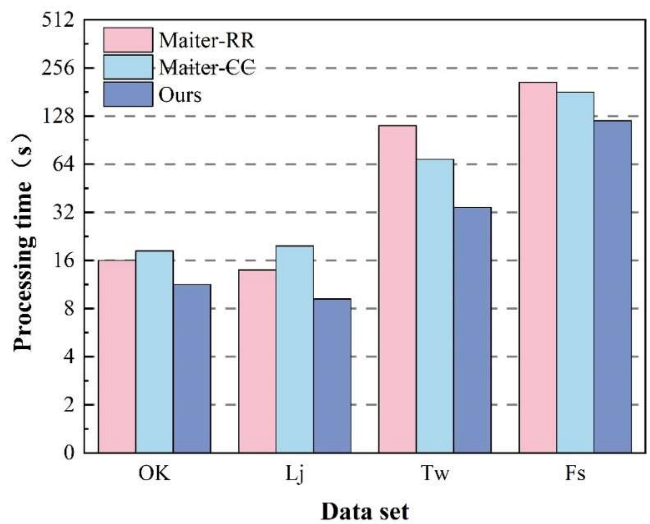


Fig. 8. Data partition overhead in different data sets

4. Conclusion

This paper constructs an enterprise data analysis system based on iterative computing, provides technical support for the digital sexual transformation of enterprises, and proposes optimization strategies from the aspects of enterprise organizational structure and enterprise culture.

In terms of digital technology, this paper proposes the optimization of fault-tolerant mechanism based on Spark, and through testing, the speed of benchmarking algorithms is increased by nearly 2 times after the optimization of DSpark in this paper, which verifies the effect of the optimization of fault-tolerant mechanism based on Sparl in this paper. With the increase of data size, the computational speed of the benchmark test on P100 increases by 2.5 times, and P100 outperforms

M40 and K20, and its execution time increases with the increase of data size. Taken together, the optimization method in this paper can significantly improve the execution speed of jobs in a variety of benchmark tests, effectively reducing the computational execution time of the iterative model, effectively reducing the computational execution time of the iterative model.

In addition, in the test of data analysis system, the data analysis system after being processed by the optimization mechanism of this paper, the cache misses are in the range of 46% to 60%, which is the best effect on all the four data. At the same time, the time overhead on each data set is the lowest, verifying the superiority of the performance of the data analysis system in this paper, which can provide an effective technical guarantee for enterprise digital transformation.

This paper also proposes optimization strategies for enterprise digital transformation from the aspects of enterprise organizational structure and enterprise culture, which, combined with the data analysis system based on iterative computing in this paper, provides a guarantee for improving the success rate of enterprise digital transformation.

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