Research on Big Data Information Processing Model of Management Communication Under the Background of Big Data

Hongtao Mao
School of Economics and Management, Wuhan University of Engineering Science, Wuhan, Hubei, China

Keywords: Big Data Technology, Information Processing, Communication Model.

Abstract: Management under the background of big data is faced with the application of big data technology and the change of thinking mode, and how to better integrate the two is the purpose of the research. Through the analysis of relevant theoretical models, the qualitative method, inductive method, deductive method and comparative analysis method are used to analyze the significance of management communication effectiveness in the context of big data, and focus on providing the effectiveness strategy of management communication in the context of big data. In the context of big data, the effectiveness of management communication is not based on a simple upgrade of technology, but more based on the upgrade of management thinking in the context of big data, with the ability of big data information processing.

1 INTRODUCTION

Big data, also known as big data, refers to the amount of data involved that is so large that it cannot be captured, managed, processed, and organized into more active purposes for business decisions within a reasonable time through mainstream software tools. "Big data" requires new processing models to have stronger decision-making, insight and process optimization capabilities to adapt to massive, high-growth and diversified information assets. Big data requires special techniques to efficiently handle large amounts of data that tolerate elapsed time. Technologies for big data, including massively parallel processing (MPP) databases, data mining, distributed file systems, distributed databases, cloud computing platforms, the Internet, and scalable storage systems. Of course, big data is a kind of appearance or feature of the development of the Internet to the current stage, there is no need to myth it or maintain awe of it, in the cloud computing represented by the technological innovation curtain, these originally difficult to collect and use data began to be easy to use, through the continuous innovation of all walks of life, big data will gradually create more value for human beings. (Huang,2022)

Management communication in the context of big data is based on the basic knowledge of management, mathematics and computer technology, and the systematic use of big data management technology and methods to communicate in the context of big data, cloud computing, artificial intelligence and other emerging technologies under the background of big data storage, big data analysis and optimization management, big data governance and assisted decision-making. This means that management communication in the context of big data not only emphasizes the impact of big data technology on modern management, but also emphasizes the importance of big data thinking. (Zhang, 2022)

2 THE PROCESSING PROCESS OF BIG DATA INFORMATION

The strategic significance of big data technology is not to master huge data information, but to professionalize the processing of these meaningful data. In other words, if big data is compared to an industry, then the key to the profitability of this industry is to improve the "processing capacity" of data and realize the "value-added" of data through "processing". (Liu,2021)

Technically, the relationship between big data and cloud computing is as inseparable as the two sides of a coin. Big data must not be processed by a

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single computer, and must adopt a distributed architecture. It is characterized by distributed data mining of massive amounts of data. But it must rely on the distributed processing of cloud computing, distributed database and cloud storage, and virtualization technology. The term big data is increasingly being used to describe and define the massive amounts of data generated in the era of information explosion, and this era of massive data is known as the era of big data. (Xu,2022)

With the advent of the cloud era, big data has also attracted more and more attention. Big data is often used to describe the vast amount of unstructured and semi-structured data created by a company that takes too much time and money to download into a relational database for analysis. Big data processing generally includes four steps: collection, import/preprocessing, statistics/analysis and mining.

2.1 Big Data Collection

Big data collection refers to the use of multiple databases to receive data from the client (Web, App or sensor form, etc.), and users can use these databases to perform simple query and processing work.

For example, e-commerce companies use traditional relational databases such as MySQL and Oracle to store every transaction data, and NoSQL databases such as Redis and MongoDB are also commonly used for data collection.

In the process of collecting big data, its main feature and challenge is the high number of concurrency, because there may be thousands of users to access and operate at the same time, such as train ticket sales websites and Taobao, their concurrent visits reach millions at the peak, so it is necessary to deploy a large number of databases at the collection end to support. And how to load balance and shard between these databases does require deep thinking and design. (Wang,2022)

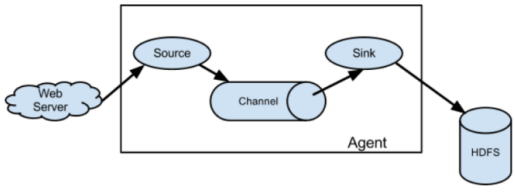

Figure 1: Important components of Flume.

For example, Flume, a tool for data collection, can ensure that data is delivered to the big data platform safely and in a timely manner, no matter what the company or how large the data comes from, no matter what the data comes from, and users can focus on how to understand the data. Flume supports customizing various data senders in the logging system for data collection. Flume provides the ability to perform simple processing on data and write to various data recipients.

Simply put, Flume is a data acquisition engine that collects logs in real time (Figure 1). Flume has three important components, Source, Channel, and Sink.

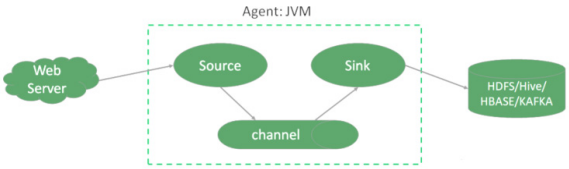

Figure 2: Flume architecture.

Components in the Flume architecture (Figure 2): An agent is essentially a JVM process that controls the flow of Event data from an external log producer to a destination (or the next Agent). A completed agent includes three components: Source, Channel, and Sink, Source refers to the source and way of data, Channel is a buffer pool of data, and Sink defines the way and destination of data output. Source is responsible for accepting data to the Flume Agent's component, which can process various types and formats of log data, including avro, exec, spooldir, netcat, etc. A channel is a buffer located between Source and Sink. Channel allows Source and Sink to run at different rates. The Channel is thread-safe and can handle write operations from multiple sources and read operations from multiple sinks at the same time. Commonly used channels include: Memory channels are queues in memory. Use in scenarios where data loss is allowed. If data loss is not allowed, you should avoid using the Memory Channel, as program death, machine downtime, or reboot can cause data loss. File Channel writes all data to disk. Therefore, there is no data loss in the event of program shutdown and machine downtime. The sink constantly reincarnates events in the channel and removes them in batches, and writes these events to the storage or indexing system in batches, or sends them to another Flume Agent. Sinks are completely transactional. Before deleting data from a channel in batches, each sink initiates a transaction with the channel. Once the bulk event is successfully written out to the storage system or the next Flume Agent, the Sink commits the transaction using the Channel. Once the transaction is

committed, the Channel removes the event from its own internal buffer. Sink components include hdfs, logger, avro, file, null, HBase, message queues, etc. An Event is the smallest unit of data streaming defined by Flume.

2.2 Big Data Import/Preprocessing

Big data preprocessing. Although there are many databases on the collection side itself, if you want to effectively analyze these massive data, you should import these data into a centralized large-scale distributed database or distributed storage cluster, and at the same time, complete data cleaning and preprocessing on the basis of import. Some users will use Storm from Twitter to stream data when importing to meet the real-time computing needs of some businesses.

In the real world, the data is generally incomplete, inconsistent "dirty" data, can not be directly data mining, or the mining results are unsatisfactory, in order to improve the quality of data mining, data preprocessing technology is produced. Data preprocessing mainly includes steps such as data cleaning, data integration, data transformation and data reduction.

Figure 3: Big data preprocessing process.

Usually, when we get the data, it is difficult for the data to reach our expectations, such as: missing data, accuracy problems, too many indicators, and so on. It always has to go through a series of analysis, and only through data manipulation can we get the data we want. Therefore, at this time, an important step - data preprocessing is particularly important. Big data preprocessing is very important, and data quality is the life of data. Data preprocessing is the key to data quality. The above big data preprocessing flow chart (Figure 3) shows that data preprocessing is mainly divided into five steps: data exploration, data cleaning, data integration, data specification, and data transformation. (Wang,2022)

2.3 Big Data Statistics/Analysis

Statistics and analysis mainly use distributed databases, or distributed computing clusters to perform general analysis and subtotals of massive data stored in them to meet most common analysis needs, in this regard, some real-time requirements will use EMC's GreenPlum, Oracle's Exadata, and MySQL-based columnar storage Infobright, etc., while some batch, or semi-structured data-based requirements can use Hadoop. The main feature and challenge of this part of statistics and analysis is that the amount of data involved in the analysis is large, which will greatly occupy system resources, especially I/O.

$$T = \frac{\bar{X}_1 - \bar{X}_2}{S_p\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$$

$$S_p^2 = \frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{n_1+n_2-2}$$

Figure 4: Student's t-test.

For example, the statistical method used for evaluation, the hypothesis test, the Student's t-test (Figure 4), assumes that the distributions of the two populations have equal but unknown variances. And assume that each population is normally distributed. In this case, T (t-statistic) follows a t-distribution with degrees of freedom (df) (n1 + n2 - 2). The farther T from zero is to the point that it is impossible to observe such a T-value, the greater the difference between groups. If T is too large, the null hypothesis will be rejected. According to the formula, the greater the difference in the mean, the larger the T. When the variance of the population is larger, the smaller the T. Significance level - α: The likelihood that the null hypothesis will be rejected when it is actually TRUE. For a small probability, such as α=0.05, look for the value of T* such that P(| T| ⩾ T*) = 0.05。 After sampling and calculating the observations according to the formula, if | T| ⩾ T*, the null hypothesis (μ1 = μ2) is rejected. A student's t-test that considers the probability of μ1 > μ2 and μ1 < μ2 is called a bilateral hypothesis test, and the sum of the tail probabilities of the two t-distributions should equal the significance level. For the most part, it is customary to evenly divide the level of significance between the two tails. (0.05 / 2 = 0.025) −t and t are both t-statistically observed values. p-value: is the sum of P(T <= -t) and P(T >= t). If the null hypothesis is TRUE, the p-value provides the observed | T| >= the likelihood of t. In general, the p-value represents the probability that a sampling result will lead to the null hypothesis. Therefore, when p-value < significance level, the null hypothesis can be rejected. The opposite is true. Confidence is an interval estimate based on the population parameters of the sample data.

2.4 Big Data Mining

Different from the previous statistical and analysis process, data mining generally does not have a pre-set theme, mainly on the existing data based on various algorithms of calculation, so as to play the effect of prediction, so as to achieve some high-level data analysis needs. Typical algorithms include Kmeans for clustering, SVM for statistical learning, and NaiveBayes for classification, and the main tools used are Hadoop's Mahout. The characteristics and challenges of this process are mainly that the algorithms used for mining are complex, and the amount of data and computation involved in the calculation are large, and the commonly used data mining algorithms are mainly single-threaded.

With the development of the times, the data generated by humans has grown exponentially, and the open application of data and the value of data mining are getting higher and higher. Behind a series of hot words such as big data precision marketing and big data insight, it is data mining and analysis technology that plays an important role. Data mining technology has not only become an important means for government departments to improve their governance capabilities, but also the key to enhancing the core competitiveness of all walks of life. Data mining is the process of extracting hidden information and knowledge from large, incomplete, noisy, fuzzy, and random data that people do not know in advance, but have potentially useful information and knowledge (Figure 5). It can be seen that data mining is the name of the result of a process, that is, the main goal is to mine hidden information from the data. It is an interdisciplinary field of science influenced by multiple disciplines, including database systems, statistics, machine learning, visualization, and information science.

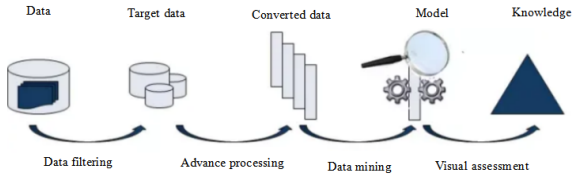

Figure 5: Big data mining process.

Therefore, the general process of the entire big data processing should meet at least these four aspects of the steps in order to be regarded as a relatively complete big data processing.

3 THE SIGNIFICANCE OF MANAGING COMMUNICATION EFFECTIVENESS IN THE CONTEXT OF BIG DATA

John Naisbitt, a famous American futurist, once said: "The competition of the future will be the competition of management, and the focus of competition is on the effective communication between members of each social organization and with external organizations." Indeed, communication is the soul of management, and effective communication determines the efficiency of management. Through effective communication, managers can accurately convey information such as the organization's vision, mission, expectations and performance to the members of the organization, so as to more effectively implement organizational reform, improve management functions, coordinate the behavior of organizational members, and adapt the organization to changes in the external environment. In the context of big data, modern managers attach great importance to the role of effective communication as the key to business success. This not only shows the important position and role of effective communication in management activities, but also shows that it is not easy to achieve effective communication, and requires the efforts and efforts of both parties involved.

3.1 It Can Promote Employees to Form a Consensus on the Goals and Tasks Determined by the Enterprise

In the context of big data, enterprise managers should let employees understand the tasks and goals of the enterprise in a timely manner, and understand "What is the business (task) of the enterprise?" And, "What does the business want to become?" Enterprise managers should listen to (collect) employees' reasonable opinions and suggestions on tasks and objectives, conduct timely research, and further modify and improve enterprise tasks and goals. Then feedback the tasks and goals of the enterprise to employees in a timely manner. Through such effective communication, the company's tasks and goals are shared among all employees. This can not only make the enterprise goals reflect the will of all employees, but also improve the scientific decision-making. (Bi 2019)

3.2 Under the Background of Big Data, It is Conducive to Collecting Data and Sharing Information to Achieve Scientific Management

In the increasingly fierce market competition, in order to successfully achieve the goal and form a competitive advantage, enterprises must first fully understand all aspects of information, in order to make scientific decisions, in order to survive and develop in the changing environment. Effective communication can enable enterprises to understand various external information and intelligence, such as national guidelines, policies, the status quo and development trend of similar enterprises at home and abroad, the dynamics of the consumer market, etc., and timely adjust business decisions to adapt to changes in the external environment; It can enable enterprises to understand their own resource situation and ability to use resources; Can understand the basic situation of employees, know people well, and improve the enthusiasm of employees; It can gain insight into the relationship between various departments and improve the efficiency of management. Therefore, only by timely and comprehensively grasping all kinds of internal and external information, intelligence and data can we accurately control and direct the operation of the entire enterprise and achieve scientific and effective management. (Liu,2022)

3.3 In the Context of Big Data, It Can Improve the Interpersonal Relationship of Enterprises

Effective communication within a company, whether between departments, between departments, or between individuals, is extremely important. In reality, some enterprises have tense relations between departments and between people, fierce contradictions and internal interpersonal relationship imbalances, and the reason is nothing more than lack of communication or improper communication methods. If the information communication channels of an enterprise are not smooth, it is difficult for people to achieve effective communication, which will make people depressed and depressed. In this way, it will not only affect the mental health of employees, but also seriously affect the normal production of enterprises and reduce the efficiency of enterprises. Therefore, if an enterprise wants to develop smoothly, it must ensure the smooth flow of various communication channels within the enterprise, left and right, only in this way can we stimulate the morale of employees, promote the harmony of interpersonal relationships, and improve management efficiency. This is true (Figure 6), relationship-oriented leaders are positively correlated with high group productivity and high satisfaction, while work-oriented leaders are positively correlated with low group productivity and low satisfaction. (Qiu,2021)

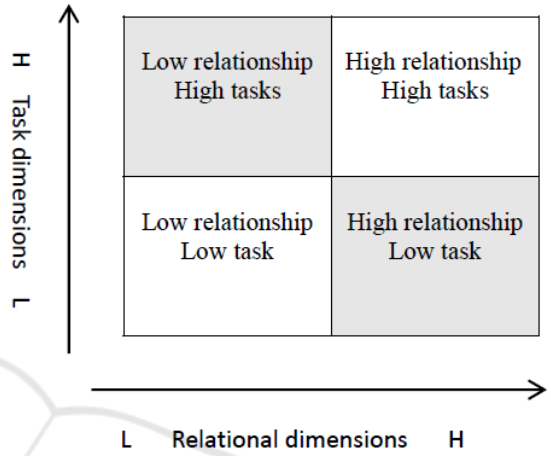

Figure 6: Task relationship model.

3.4 Under the Background of Big Data, It Can Enhance the Cohesion of Enterprise Employees

Employee cohesion is an important asset for enterprises. Strong cohesion indicates that the enterprise is attractive to members, so how to enhance the cohesion of employees? First, promote communication and support among employees. It is common for employees to have conflicts and opinions in cooperation, and the key is what kind of attitude to adopt to deal with the different opinions between each other, and the best way is to communicate, that is, take the initiative to exchange their own views with each other. Second, adopt a democratic management approach. In the process of enterprise management, it is necessary to listen carefully to the opinions of employees from all sides, especially different opinions. Third, companies should link performance and remuneration to employees, including rewards for employees who can work closely with others, which helps improve employee satisfaction. Fourth, we must attach importance to mutual trust among employees. Promoting trust can be considered in terms of: open communication from top to bottom and bottom up within the organization, and the concept of honest

communication; Involve employees in management; Advocate employee self-management, so that employees have a sense of trust in the enterprise and colleagues. Fifth, carry out performance management. The essence of the performance management process is the communication process, in the dynamic process assessment, creative employees and outstanding performance employees are rewarded; Employees with poor performance should be adjusted in a timely manner; Penalties are imposed for passive sabotage or disciplinary violations. Improve the performance of each employee through dynamic process performance management, thereby driving the improvement of the performance of the entire enterprise and the achievement of corporate goals. These need to be achieved through communication, so effective communication can enhance employee cohesion.

4 MANAGE COMMUNICATION EFFECTIVENESS STRATEGIES IN THE CONTEXT OF BIG DATA

4.1 Improve Managers' Understanding of Big Data

In the context of big data, managers should raise awareness of the importance of communication and must effectively change their parent or authoritative communication roles. Equal communication is the foundation of good and effective communication. Managers should not only treat subordinates equally, but also treat themselves and subordinates equally, and truly achieve rationality, respect and trust in subordinates. Truly realize the one-way, top-down communication method of the past to equal and two-way communication, both top-down and bottom-up communication methods. Effective communication can only be achieved by equal and active two-way communication. In addition, to be fully prepared for communication, managers must develop clear communication goals and develop a clear communication plan before communication. At the same time, the personnel involved in communication are encouraged to negotiate and collect and analyze information and materials, and on this basis, publicity and explanation, to provide employees with a good communication environment, so as to fundamentally improve the efficiency of enterprise communication, and then improve the operational efficiency of enterprises. (Shen,2022)

4.2 Integrate Big Data Communication Channels

In the context of big data, the integration of communication channels is to adjust and combine existing channels, delete some inefficient or ineffective channels, and add some new, fast, efficient and acceptable big data information channels (Figure 7), while considering the complementarity of various channels, the purpose is to better perform communication functions and achieve communication goals. In the process of integration, the following principles should be adhered to: First, the system principle. An organization is a system, and changes or changes in any part of the organization will have a cascading effect on the entire system. The same is true of communication channels, each type of communication channel or method of communication does not exist in isolation, there are connections and influences between each other. Therefore, in the process of integrating communication channels, the connections and influences of channels should be considered. Second, the principle of openness. In the process of management communication, enterprises are required to disclose the channels of communication for most management communication activities that do not require confidentiality, and increase communication channels as much as possible to increase their awareness, transparency and openness. In this way, communication blind spots caused by information asymmetry can be reduced. Third, the principle of timeliness. It is required that in the process of communication, we must pay attention to the saving of communication time and the improvement of communication efficiency. Therefore, it is necessary to choose and adopt the shortest path to communicate as quickly as possible. Its purpose is to increase the speed of information transmission and reduce the possibility of information distortion caused by layer by layer transmission. Fourth, the principle of integrity. From the perspective of the communication process, a complete communication process includes the transmission, reception and feedback of information. The integrity principle emphasizes the integrity of the communication process. If there are only channels for information transmission and reception, and no channels for information feedback, this communication process is incomplete and its information communication is insufficient. Nowadays, in the process of channel integration,

special attention should be paid to the correction and supplementation of feedback channels.

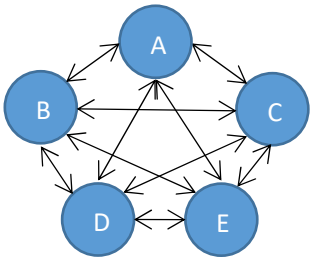

Figure 7: Equal communication model.

4.3 Improve Managers' Communication Skills in the Context of Big Data

First, improve managers' skills in listening effectively. In the process of communication, managers should first concentrate and not be absent-minded; Second, don't be preconceived, interrupt the other person, or show impatience. This will make the other party reluctant to continue the communication; Finally, be empathetic, appreciate the other person's emotional changes and unspoken meanings, and understand the spirit. Second, improve non-verbal communication skills. When you are listening to the messenger, the messenger will judge whether you are listening carefully and truly understanding by observing your expression. So, making eye contact with the messenger allows you to focus, reduces the likelihood of distraction, and can encourage the messenger. In addition, effective listeners will express the information they hear in non-verbal ways, such as approving nods, puzzled head shaking, appropriate facial expressions (such as smiling), etc., which indicate to the messenger that you are listening carefully and whether you understand, which is conducive to improving communication. Third, pay attention to emotional communication. In actual work, communication skills are usually manifested in whether managers can accurately describe the current situation and prospects of enterprise development, and let employees understand the current situation and development strategy of the enterprise through certain channels. The recognition of employees is the greatest support for managers and the most direct goal of manager communication. The humanistic management of modern enterprises requires managers not only to be good at correctly using oral expression and language and writing ability, clear expression, clear organization, concise language and strong pertinence; Be good at listening and paying attention, and respect the views of others; Improve bad communication habits, properly use expressions, movements and other non-verbal communication methods, but also require managers to be good at emotional communication with employees, integrate emotions into the whole process of management, so that employees realize their value to the development of the enterprise, so as to stimulate lasting work enthusiasm.

4.4 Set Up A Scientific Big Data Organization

In the context of big data, organizational setup: On the one hand, it is necessary to consider the excessive organizational hierarchy caused by the organizational scale effect, resulting in easy loss and distortion of information, as well as the alienation effect caused by the organization being too large, and efforts should be made to reduce the organizational level vertically to reduce communication links, keep information smooth, and reduce interference, delay and distortion. At the same time, we will broaden the channels of information communication and promote the exchange of information through multi-channel communication. Horizontal exchanges and cooperation should be strengthened between horizontal departments, and the links between departments and between personnel should be strengthened; On the other hand, special communication bodies should be set up to facilitate communication. Although the informal communication mechanism has a certain degree of efficiency, it will inevitably be influenced and constrained by the personal preferences of managers, and greatly affect the effectiveness of communication. Therefore, it is necessary to establish special communication institutions to promote communication, and to truly achieve effective communication by institutionalizing communication.

4.5 Improve the Communication and Feedback Mechanism in the Context of Big Data

Communication without feedback is not a complete communication, and complete communication must have a perfect feedback mechanism. Otherwise, the effectiveness of communication will be greatly reduced. The establishment of the feedback mechanism should first start with the sender of the information, and the sender should obtain feedback information by asking questions and encouraging the recipient to give positive feedback after

transmitting the information. In addition, the sender should also carefully observe the reaction or action of the other party to obtain feedback indirectly. Because feedback can be intentional or unintentional. As the recipient of information, it is actually in the subject position in the communication feedback. In the context of big data, the information transmitter should actively accept the feedback from the recipient, so that organizational communication becomes a two-way communication in the true sense.

4.6 Learn to Think Differently Based On Big Data

In the context of big data, the most important communication strategy is empathy. People within an organization often have different backgrounds, values, and conflicts of all kinds. People will also process and choose information for the following reasons, one is that the information is not harmful or good to me, and the other is to transform it into what I like to hear. Therefore, the internal information changes its taste after layer by layer transmission, which is the obstacle and risk of internal communication within the organization. The solution is to think from the other party's point of view, that is, "empathy", to take the initiative to think about the other party's thoughts, opinions, emotions, attitudes, that is, how he thinks about this problem. We must let empathy permeate the specific strategy of communication, that is, transposition in the organization of information; transposition yourself in your own self-positioning; Consider how to take care of each other's emotions. (Zhao,2022)

5 CONCLUSIONS

At present, the downstream application fields of China's big data industry are very extensive, involving almost all fields of our daily life. According to the data, the top three applications of China's big data industry are finance, medical health and government affairs, accounting for 30%, 14% and 13% respectively (Figure 8).With the rapid development of information technology, we have entered the era of information explosion characterized by "big data, Internet of Things, cloud computing and mobile Internet". In business, economics and beyond, decision-making is increasingly based on data and analysis rather than experience and intuition. As a prerequisite for operational decision-making, big data has become the basis for influencing the government and enterprises to make major decisions such as investment analysis, credit financing, enterprise operation and management, and corporate strategic planning, and playing an increasingly important role in promoting high-quality economic and social development. In the future, business intelligent decision-making, building a smart government, building a smart city, and developing a smart society will all be related to big data, and management (communication) talents who understand big data and have big data thinking will be the bridge connecting business and technology, and will be the intelligent hub of data-driven enterprises.

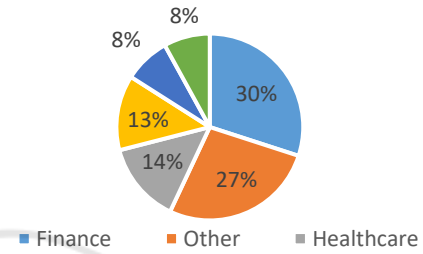

Figure 8: Big data application statistics in 2020.

In the era of big data, technology continues to iteratively upgrade, market competition is becoming increasingly fierce, cooperation and communication with all parties has become a regular activity of enterprises, the success of cooperation depends on the effectiveness of communication, rather than simply relying on the application of big data technology, therefore, communication should become one of the basic skills that managers must master. Based on the background of big data, the strategy of communication subject positioning should take into account elements such as integrity ethics and active listening, although the technological development of big data has a great impact, but sincerity and credibility are the most effective constructive communication weapons, integrity is the character of leaders, integrity is the source of leadership. In the context of big data, active listening means recognizing the importance of two-way communication, listening from the position of affirming the other party, overcoming a priori consciousness and mental model, and giving the other party a timely and appropriate response. In this way, our communication and management will reap joy.

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