

Research on the Development and Application of Campus Card in Colleges and Universities

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Abstract: With the rapid development of the construction of smart campus in Colleges and universities and the maturity of related technologies, campus card has become the most frequently used and the most frequently used core component of smart campus. Based on the actual construction of one-card system in domestic universities and the author's years of experience in campus card management, this paper makes a systematic study on the development of campus card, virtual campus card, big data application, information security and other aspects, with a view to providing effective reference for the construction of campus card in Colleges and universities.

Keywords: Campus card; Virtual card; Big data application

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1 Introduction

The Nineteenth National Congress of the Communist Party of China made an important judgment that socialism with Chinese characteristics entered a new era, and opened a new journey to speed up the modernization of education and build a strong educational country. In June 2018, the State issued the General Framework of Intelligent Campus (GB/T 36342-2018), and put forward the overall system

framework of intelligent campus construction. In the actual construction of colleges and universities, a consensus has been gradually formed: Campus Card is a new smart campus system project which integrates school administration, public service and decision-making support. It is the core component of smart campus. Campus Card provides a comprehensive data acquisition platform for smart campus. With the help of school management information system, data center and campus network, learning can be formed. School-wide digital space and shared environment^[1].

1.1 Current situation at home and abroad

In the summer of 1996, the concept of smart card was first put forward by the University of Florida in the United States. It is mainly through the smart card system to grant scholarships to students. The smart card can also be used for all kinds of other consumption in the school (buying books and reading information in the library, swimming in the entertainment room, using the laundry room, dining in the restaurant, etc.). The relevant data show that the smart card is not available. It is only loved by teachers and students, but also greatly improves the management efficiency of the college.

The domestic campus card system developed from the early dining hall dining system. The main manufacturers are Harbin Synjones Electronic Co., Ltd., Newcapec Electronics Co., Ltd., Zhengyuan Intelligent Science & Technology CO., LTD. and so on. With the emergence of PHILIPS MIFARE1 card, one-card manufacturers have launched a restaurant

charging system based on M1 card. Fuzhou Yinda, which has a banking background, has docked with the banking system, and introduced the Bank-school one-card system, which has opened the way for the later one-card system to dock with the bank. According to the expansion and convenience of the card, the first generation of the card system is introduced by the card manufacturers to lead the campus information transformation.

With the People's Bank of China and many other financial institutions, the basic application of China's financial CPU card has been specified. CPU card is also slowly introduced into the campus card. The early investors of campus card mainly concentrated on Telecom operators. Due to the operator's involvement, in a period of time, "braided card" appeared. Students use the designated operator's mobile card. Because there is an external antenna on the card, it is commonly known as "braided card". Because the antenna is easy to break and it is inconvenient to repair the card, the card has not been popularized in a large area at the end of the day. Subsequently, the promotion of financial IC cards began. Some Schools Invested by banks also used financial IC cards to replace the original campus cards. Financial IC card can use electronic cash and industry application part. Electronic cash needs to be recharged by bank. Industry application is consistent with common CPU card, and secondary card issuance is carried out in schools. In recent years, with the rapid development of intelligent terminals, virtual campus card has become the main development direction of campus card.

1.2 Problems in Universities Card System

1.2.1 Ideological understanding still needs to be deepened

Some universities are still not fully aware of the revolutionary impact of information technology on education, and lack of understanding of the important role of the card system in the construction of information-based campuses; some universities need to improve their enthusiasm and efforts to promote the construction of the card system, the functions of the card system need to be further expanded, and the operational mechanism needs to be improved.

1.2.2 System security needs to be improved

There are many factors affecting the safe and stable operation of card system, such as communication

security, network security, operation security, data security, system security, card security, terminal security, etc. In view of the actual situation of the construction of one-card system in Colleges and universities, the construction of security mechanism for the operation of one-card system is not perfect enough.

1.2.3 System compatibility is not strong

At present, many university management departments have developed or purchased relevant business management systems according to their own business needs. These business systems lack unified planning and unified technology and norms to a large extent, resulting in the incompatibility of these business systems with the card system and the unreasonable allocation and sharing of data resources ^[2].

1.2.4 Inadequate utilization of system data

The operation of one-card system has produced a large amount of data, which has not been effectively excavated and used. Even if the data are used, it is only a basic application, not in-depth mining and high-effect use, and cannot provide strong data support for the development of school construction.

2 Purpose and significance of the study

Campus card system is a comprehensive service platform for all staff, teachers and students on campus, including identity recognition, consumer media and other functions. Due to the needs of campus administrators, a relatively perfect and stable cartoon management platform has been formed, including the services of storage, card handling, loss reporting and inquiry. The standardization of management improves the effectiveness of management.

In digital campus management, campus card plays a vital role. In the past ten years, the card system has been continuously improved. It integrates and optimizes the excellent resources in the school, realizes the efficient allocation of resources, makes the business process in the school more concise and optimized, and realizes the card traveling all over the campus. Campus card system operation process is concise and clear, with strong expansibility, and operation and maintenance costs are not high, because the expansion of schools, geographical location is no longer in the same place, in such circumstances, most schools also support cross-campus information query. But the original idea of designing one-card system in Colleges and universities is usually to realize campus management. Although

there are no problems in the practical use of one-card system, data collection, storage, query and other aspects are not considered comprehensively. The sense of existence of data mining in campus card management system and even campus management is almost zero. Digital campus management lacks effective digging of its own data. Excavation and analysis [3]. In recent years, with the rapid development of virtual campus card and the continuous training and output of high-end talents in database technology, the existing data display of campus card no longer meets the needs of users. The great potential and practical benefits of data mining of campus card have attracted the attention of many domestic universities, and began to explore related directions.

3 System design

3.1 Design Ideas

Many experts and scholars, such as Jiang Dongxing [4], Cheng Jiangang [5], Miaoyong [6], believe that the biggest difficulty in the practice of digital campus does not come from technology. In the practice of digital campus construction, the key issue is not technical issues, but "coordination and cooperation". The "coordination and cooperation" of various organizations and departments seriously restricts the construction of digital campus and the development of its functional benefits. The construction of digital campus is a complex system engineering, which needs to be studied from multiple disciplines and perspectives. However, in general, there are many studies on digital campus from the perspective of technology. Taking master's degree theses on digital campus as an example, more than 67.6% of the studies on digital campus are carried out from the perspective of technology, and few from the perspective of management, pedagogy, educational technology and system science. Studying digital campus from different disciplinary perspectives will help deepen the research on digital campus and better solve the practical problems in the construction of digital campus. For example, from the perspective of management, the realization of the synergy effect of digital campus depends on the interaction and interaction of eight mechanisms, namely, leadership mechanism, guarantee mechanism, incentive mechanism, security mechanism, management mechanism, resource sharing mechanism, evaluation mechanism and service mechanism; From the perspective of synergy theory, in the process of

promoting digital campus, it is necessary to maximize the synergy effect. Reduce internal and external resistance in the construction of digital campus, ensure that the resultant direction of the factors affecting the development of digital campus is consistent and forward, so as to realize the co-evolution and co-development of digital campus; Apply Internet of Things technology to the construction of digital campus, and promote the upgrade and development of "digital campus" to "smart campus". Systems science (old three theories: system theory, information theory, cybernetics; new three theories: dissipative structure theory, synergy theory, catastrophe theory) as a group of disciplines composed of basic theory and applied development, which take system as the research object, provides a new perspective for understanding the objective world. The field of education is a complex field, a systematic project, involving many elements. Systematic science has broad application prospects in the field of education. However, according to the current situation of educational theory research, the educational application of the thought and method of system science still stays at the primary stage of general system theory, and the recent research results of system science are not paid enough attention. The in-depth application of system science in the field of education will have a great impact on education research. For example, after introducing the self-organization theory into the field of education and teaching research, collaborative learning, the innovation of educational technology research methods, the innovation and development of the theoretical basis of teaching design, and the self-organization of information in the human brain will be produced. Systematic Thinking is a way of thinking that regards the object of knowledge as a system and comprehensively examines the object of knowledge from the interrelation and interaction of system and elements, elements and elements, system and environment. Systematic thinking is called a method of solving problems.

Digital campus is a typical man-made system, its construction is a very complex system engineering, it is necessary to use the system theory to discuss the problems in the construction of digital campus. In the practice of digital campus construction, we often neglect the integrity of digital campus construction, lack of systematic thinking to analyze the problems in the construction of digital campus, fail to excavate the essential problems in the construction of digital campus

as a whole, so as to effectively guide the practice of digital campus construction. Systematic analysis of digital campus construction with systematic thinking is conducive to a comprehensive understanding of the problems in the construction of digital campus and a further understanding of the structure and function of digital campus. Using systematic thinking to analyze the constraints in the construction of digital campus is more conducive to promoting the coordinated development of digital campus.

There are four typical manifestations in the functional structure of the existing digital campus: firstly, the technology and media used in the construction of digital campus are very "dazzling", and their functions in supporting teaching and learning, improving the quality and level of education management are weak; secondly, the effect of digital campus on improving the quality and level of education management is more obvious. The effect of supporting teaching and learning is not obvious. Thirdly, the digital campus has strong artistry, which can well reflect the cultural characteristics of the school, but is slightly weak in supporting teaching and learning, improving the quality and level of management. Fourthly, the construction of digital campus has great support for teaching and learning, which truly reflects the main position of students and teachers, and can better improve the quality and level of education management. Ping, satisfies the needs of students, teachers, educational managers and other users well, adopts appropriate technology, uses appropriate media in the construction, and can better meet the needs of the future development of digital campus.

Among the four types of digital campuses mentioned above, the fourth type is the best one, which takes into account the educational, artistic, cultural and technical attributes of digital campuses. The other three types of digital campus either focus on the technical attributes of digital campus, or focus on the artistic or cultural attributes of digital campus^[7].

3.2 Design objectives

First, it is safe and reliable to strengthen the hardware and software construction of the card system, establish and improve the operating mechanism of the card system to ensure the safe operation of the network and the system; second, it is economical and practical to achieve the best benefits with the minimum investment, through the construction of the card system, the overall cost is effectively controlled and the card is multi-purpose; third, it is compatible to achieve

the compatibility with the various administrative departments of universities. The existing application systems are compatible, providing a good information interface to achieve cross-platform integration and compatibility. Fourthly, it is scalable. The whole system should have good openness and extensibility in order to continuously improve the comprehensive application function of the system.

3.3 Design Principles

First, we should serve the overall situation, adhere to the unified planning and scientific design, and construct a new pattern of campus card system construction by serving the overall situation of the school, so as to contribute to the development of university information construction; second, we should integrate innovation, closely integrate the needs of school construction and development, improve the efficiency of campus card system, promote development by innovation, and form a school-specific card system culture; third, we should develop a school-specific card system culture. Exhibition and application, further expand the scope of application of one-card system, through expanding the scope of application, play its role in all aspects of school construction and development; Fourth, improve the mechanism, establish and improve the mechanism of one-card construction and operation, through deepening reform and innovation of institutional mechanisms, solve the problems encountered in the process of promoting the construction of one-card system, straighten out the relevant departments of schools and the one-card system. The relationship between the unified operators forms the resultant force of the construction and development of the card system.

4 Virtual Card Application

4.1 Characteristics of physical cards

The advantages of campus card entity card are compact and easy to carry, high reliability, long service life, and simple and convenient operation. Response speed is fast, whether it is time to punch in or out of the apartment, it is completed immediately. Especially in the peak period of consumption in the canteen, the corresponding speed can reach milliseconds, the speed of card swiping can be easily coped with. The shortcomings of physical campus cards are also obvious. Campus cards must be pre-recharged before they can be consumed. When the balance of the cards is insufficient, they cannot be used for consumption. Most universities only have manual

cash recharge at the initial stage of the construction of one card, which is prone to all kinds of financial errors and waste a lot of manpower and material resources. With the one card opened one after another, the online recharge method such as Alipay and WeChat can slow down the task of recharging Campus cards. Campus card entity cards, when used, must be carried with you, forget to carry or lose campus cards, will bring great inconvenience; unable to consume in restaurants or supermarkets, because these places are not allowed to use cash; incoming and outgoing apartments cannot swipe cards, need to register, libraries cannot access and borrow; unable to swipe cards attendance, teachers and students' learning and life are greatly affected. After the loss of entity cards, it is necessary to report the loss first. If the loss card is not reported immediately, the funds on the card are also at risk of being stolen; if you want to regain the campus card, you need to fill the card, which is usually handled in the card service center. The teacher of the card service center does not always go to work, weekends and evenings need rest. During this period, you cannot fill the card, and the days without the card are real. You can't "walk all over the campus" easily. Loss of cards requires not only time cost, but also economic cost.

4.2 Necessity of Virtual Card Construction

With the rapid development of intelligent terminals and mobile Internet, mobile payment has penetrated into every part of daily life, bringing great changes to people's living habits. The traditional M1 or CPU media campus card has been unable to adapt to the teachers and students' habit of swiping cards with non-card media. With the increasing popularity of mobile phone scavenging applications, such as Aliped or WeChat, they are welcomed by teachers and students. How to combine the functions of traditional campus card identification and electronic payment with mobile phone scanner to expand flexible, convenient and functional applications is an important trend in the recent development of campus card. A virtual campus card which represents personal identity information can be generated by mobile APP or Alipay, and it can realize convenient scan payment and identity authentication on campus. Teachers and students can enjoy all the services of physical campus cards through virtual campus cards, without worrying about forgetting to bring cards, insufficient balance, queuing recharge, missing supplementary cards and other issues, and form effective complementary and extension with physical

campus cards, so that teachers and students can easily walk through the campus with only one mobile phone^[8].

4.3 Sweep Payment

Scanning payment is a new generation of wireless payment scheme based on account system. Sweeping payment can be divided into two kinds. One is active scanning, which is to take out the mobile phone to actively sweep the merchant's receipt code. The other is passive scanner. The scanner that shows the payment code to the merchant belongs to passive scanner. In fact, the principle of the two sweeping methods is the same, but the difference between receiving and paying is that sweeping the business receipt code belongs to the business receipt, showing the payment code to the business sweeping is customer payment, whether active or passive will not change the result of customer payment to the business. The earliest appearance is active scanner, which scans the receipt information on the merchant's receipt code through the mobile phone. These people cannot see the information. After decoding the scanner software, they can get the information inside. It contains the information of the merchant's receipt account. Knowing the merchant's account, the payment software can help the customers transfer money to the merchant's account and complete a scanner payment. The process. Although scanning payment is simple, it still has some shortcomings after all. When voice prompts for receipts did not appear in the early stage, whether customers pay or not can not be quickly known, and the posted receipt code is easy to be replaced. The emergence of passive scanner solves these problems. As long as the customer shows the payment code and the merchant scanner sweeps, the merchant immediately displays the payment results.

5 Big Data Applications

The application of big data technology in the construction of intelligent campus is not only to obtain a large amount of data confidence, but also to process these data professionally. Big data technology will still play an important role in the construction of smart campus in the future. A large number of structured, semi-structured and unstructured data have been processed to extract useful information and knowledge. According to the characteristics of big data technology and smart campus, big data technology plays an important role in the future construction of smart campus in the following aspects^[9].

5.1 Construction of School Data Management Support Platform

In order to achieve the goal of intelligent management in the construction of smart campus, it is necessary to conduct adequate data analysis in the aspects of enrollment, teachers, employment, school assets and so on, so as to build a data management support platform for schools. Enrollment data and employment data analysis: According to the data information of region, specialty, gender and specialty students in the past enrollment situation of the school, this kind of data information is analyzed, so as to provide effective data for the formulation and implementation of the future enrollment plan of the school. By analyzing the change of students' employment rate and contract rate, the employment area and employment characteristics of students of different majors are analyzed, and the relevant factors in students' employment are fully explored, so as to provide more professional employment guidance for students, so as to intervene in students' employment scientifically in time, so as to ensure that students' learning is useful. At the same time, according to the feedback of the students' employment situation in the market, we can adjust the curriculum of the school. By analyzing the enrollment data and employment data, this paper analyses the enrollment trend of each enrollment project and the source of students in the school, so as to optimize the allocation of resources in the school. Teacher strength data analysis: In the development of schools, the construction of teachers is of great significance. In the construction of smart campus, we must also pay attention to the quality analysis of teachers. Through the analysis of the data of school teachers from their academic qualifications, professional titles, posts, employment methods and scientific research, it can provide scientific basis for adjusting the structure of school teachers, strengthening and perfecting the school's cognitive assessment, and promoting teachers. At the same time, according to the results of the data analysis, we can identify the weak parts of the construction of the teaching staff and introduce excellent talents. Financial data analysis: Through the application of big data technology, we can collect and analyze the financial data information of the school for many years, combine with the actual development needs of the school, form the relevant financial data needed for the development of the school, so as to optimize the allocation of all kinds of resources of the

school, and strengthen the financial management of the school from many aspects through the application of big data technology, and formulate a scientific advance. Computation management scheme. In the process of its analysis, it is necessary to collect data and information of various kinds of facilities and equipment, housing property, water energy, electricity and other resources in schools, to obtain the real-time use of various types of school resources and equipment, and to formulate effective management measures.

5.2 Application of Teaching Management Platform

In the future, the application of big data technology in the construction of smart campus can also effectively improve its management quality and efficiency. On the one hand, it can provide reliable data support for teaching and research. Big data technology can be used to build a portrait of teachers, in which teachers' teaching, scientific research, student performance, position promotion and other aspects of the collection, so as to form a complete track of teacher growth. On the basis of applying big data, teachers can adjust teaching strategies scientifically, and schools can also evaluate teachers' teaching level according to students' situation. On the other hand, it can also analyze the relevant data of teachers' and students' learning behavior. It can collect and evaluate students' attendance rate, classroom performance, achievement and award-winning situation, so as to provide more professional and scientific personalized academic diagnosis report for students, so as to enable students to adjust their learning plans by predicting their academic achievements. Teachers can also refer to the relevant analysis data, so as to adjust the teaching content, teaching resources and so on.

5.3 Providing comprehensive logistical service data

5.3.1 Analyze the consumption data of students' campus cards

Generally, campus cards are handled for students in campus construction. Students using campus cards can not only produce consumption behavior in catering and bathing, but also play a role in fitness, library and other aspects. In the process of using campus cards, a large amount of data information will also be generated, which is also one of the main sources of data information to form a smart campus. By analyzing and mining the data of the campus card, we can get the real-

time flow of people such as restaurants and libraries, arrange our time reasonably, not only avoid congestion, but also effectively improve the efficiency of students' activities. By applying big data technology, students can get more data needed for their study and life.

5.3.2 Analysis of health data

With people's pursuit of quality of life is getting higher and higher. The application of big data technology in the construction of intelligent campus can also make more in-depth analysis and collection of school teachers and students' health data. Schools should collect and sort out the health status of teachers and staff in schools so as to clarify the health status of teachers and staff, so as to provide them with more comprehensive health services. Schools can also provide targeted physical examination content by analyzing the health situation of teachers and students, so that teachers and students can master more comprehensive health information.

5.4 Application of Intelligent Hint System

An important symbol of the construction of smart campus is the realization of intelligent prompts. If new business processing information emerges, it is necessary to combine the different roles of individuals in smart campus. Set up different reminder scenarios, and be able to promptly remind the relevant personnel to deal with the matter. For example, a system project can provide teachers and students with to-do reminders^[6]. Teachers and students can get such reminders as class reminders, learning progress reminders and credit cumulative reminders under the intelligent campus system. This can be achieved by analyzing a large number of individual information using large data technology. In the construction of smart campus, teachers, students and parents need to continue to pay attention to the needs of the module for continuous improvement and improvement.

6 Information security

6.1 Security of transaction data

6.1.1 Secure Storage of Transaction Data in POS

In order to ensure the security of the transaction data stored in the campus card, the POS machine should have a large volume of non-volatile storage space, which mainly saves off-line records and blacklists. If the free space of campus card data storage is insufficient, POS machine will automatically send out

warning signals; when the memory has been filled with a large number of data information, POS machine will automatically send out warning signals and refuse to produce all consumer behavior, in order to make the stored information have a certain degree of security.

6.1.2 Secure transmission of transaction records

In order to prevent the transaction records of campus card from being changed arbitrarily in the process of transferring from POS to data communication gateway, which threatens the security of transaction records. In the ordinary POS, when a transaction record is generated and uploaded, each transaction record is checked by 16-bit CRC. If there is a PSAM card inside the POS, then when the transaction record is generated and transmitted, the PSAM card encrypts and verifies the information recorded by the campus card, and finally uploads it to the data communication. In the gateway, the data communication gateway verifies the verification code of the information to provide the security, legitimacy and integrity of the information.

When students use campus card, when sending information to each other, they often lose the information and data they are transmitting because of network failure. So when designing the hardware device of POS, they should add the function of repeated collection. In this way, even when the off-line transaction data information is collected in a pipeline way, only the mobile pointer can play a role. At the end of the collection, the pipeline information can be stored in the campus card data storage system. The design of this scheme enables the campus card system to complete the collection of all information or information within a specific range at one time. As we all know, one of the main reasons for information loss in campus one-card system is the loss of data pointer in memory chip, so the designers of information security maintenance scheme of campus one-card system can set and save data pointer in different directions of memory, so as long as one data pointer exists, the correctness of system information reading will be achieved. There is a great guarantee, that is to say, to achieve the goal of information security maintenance of campus card system^[10].

6.2 Network Security

Campus card system can be regarded as a comprehensive application service management platform, which can collect various types of information together and make efficient use of it. This platform is

organically integrated with other types of management information systems applied by academic correction, which is one of the important means to improve various management information

systems in a long-term decentralized mode. So when designing the information security maintenance scheme of the campus card system, the establishment and perfection of its network framework needs the vigorous assistance and support of the campus network. One of the most important characteristics of the campus card system is to complete the transmission of large amount of data information between the central server and the consumer subsystem and the end of each service subsystem. Therefore, the security, timeliness and smoothness of data information transmission should be guaranteed in the aspect of network. At this time, the central server of the campus card system should be guaranteed. It is very difficult to be disturbed and infringed by the external environment, which is one of the key schemes to build a safe campus card system. The hidden danger of information security in campus card system is analyzed. The harm brought by campus network is extremely serious. At this time, network segments and firewalls are installed and anti-virus system is established and perfected. The implementation and application of the above-mentioned network security strategy can maximize the unimpeded and safe degree of the network. Then we can speculate that the campus card system is at this time. The requirement of system operation has basic guarantee, which is one of the most effective ways to maintain the information security of the system.

6.2.1 Network Segmentation

This is a simple measure to solve the hidden security problems in the network. The value of its application is to make irrelevant users and network resources always in a state of relative opposition and non-interference, so that irrelevant users cannot achieve the goal of data information acquisition. There are two forms of network segmentation: physical segmentation and logical segmentation. The application of VLAN technology fully reflects the role of logical segmentation. At this time, the campus one-card system adjusts the virtual network segment according to its own needs, in order to meet the changing needs of information points and locations.

6.2.2 Firewall Settings

Firewall can be regarded as a separator, limiter, and analyzer. As an effective network security model, it

can effectively connect the untrusted network with the trusted network, and access rights of students to risk areas will not be restricted. In a word, the construction of firewall is one of the effective countermeasures to improve the security of campus card network. The functions of the firewall are diversified, such as effective filtering of import and export data packets, detailed and effective recording of data information through the firewall, and restricting access rights of special sites to prevent the theft of campus one-card system information.

6.2.3 Construction and improvement of data storage security system

Data is the core component of campus one-card system. Its security directly affects the system and affects the state of the whole system. Data are usually input manually and generated automatically by the system. The establishment and improvement of this system can record the historical information such as transaction and consumption in the subsystem.

7 Future prospects

With the development of virtual campus card application and big data application, more IT giants will focus on campus card business. For example, Alibaba has cooperated with Zhengzhou New Cape to inject capital into perfect digital links, Tencent has made great efforts to build Tencent micro-school, and further promote the development and iteration of campus card. The data and application of campus card will be widely used in all aspects of University education, teaching, administration and teacher-student service, providing strong support for university development decision-making. At the same time, the data and application of campus card at provincial, municipal and national levels will be further integrated, and the relevant policies and guidance on smart campus and campus card will be further enriched and refined, and ultimately play a synergistic effect.

8 Summary

Campus card construction has gradually become the top priority in the construction of smart campus in Colleges and universities. To do a good job in campus card construction, we need to change our thinking from top-level design and put the card work into the overall work of the school. On the premise of ensuring information security and data security, we should closely integrate

data application, data sharing and university education and teaching, so as to help the administration and steadfastly conduct it. Teacher and student service, from the point of view of teachers and students' use habits, keeps pace with the times, combines the advantages of enterprises, and provides services quickly by using the application methods that teachers and students like. In this way, I believe that the construction of campus one-card system will get more approval and support.

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