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Digital Campus in Higher Vocational Colleges: A Survey of Nine Colleges in Chongqing

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Abstract: *The digital campus is a key vehicle for the digital transformation of vocational education. Drawing on survey data of digital campus business items collected from nine higher vocational colleges in Chongqing, China, this study conducts a statistical and categorical analysis of 2,173 business items supported by 75 application systems. The findings show that: (1) the scale of construction varies dramatically across colleges, revealing a marked inter-college digital divide; (2) business coverage is unbalanced, characterized by the prioritization of teaching administration and student affairs and the lag of research management and school-enterprise cooperation; and (3) two construction models, namely decentralized system development and integrated platform development, coexist, while the depth of online workflow adoption differs considerably among colleges. Accordingly, countermeasures are proposed in four aspects: strengthening top-level design, filling gaps in underserved business areas, deepening data governance, and improving long-term mechanisms, so as to provide a reference for digital campus construction in higher vocational colleges.*

Keywords: *Higher vocational colleges, Digital campus, Educational informatization, Business items, Countermeasure research*

1. Introduction

Educational digitalization represents an important breakthrough for opening new tracks and fostering new advantages in educational development. China's Education Modernization 2035 identifies accelerating educational transformation in the information age as a strategic task, and the Education Informatization 2.0 Action Plan requires that educational informatization evolve from integrated application toward innovative development. With the launch of the national strategic action for educational digitalization in 2022, the digital transformation of education in China has entered a stage of comprehensive acceleration. As a type of education of equal importance to general education, vocational education's digital transformation bears directly on the quality of technical and skilled talent cultivation. The Ministry of Education has successively issued the Specifications for Digital Campus Construction in Vocational Colleges and the Digital Campus Specifications for Vocational Colleges, which provide standard-based guidance for the planning, construction, and evaluation of digital campuses in vocational institutions. In the literature, a digital campus, often discussed under the broader notion of a smart campus, refers to a campus environment in which teaching, research, management, and services are ubiquitously supported by digital technologies and data-driven infrastructures[1][2].

The governance system of a higher vocational college covers numerous business domains, including teaching and academic affairs, student affairs, human resources and faculty development, finance and assets, and research services. In essence, digital campus construction means using information technology to support business process reengineering and to enhance governance capacity. To assess the actual level of a college's digital campus, one should look beyond the number of systems launched and examine how many business items those systems cover and how many business processes they support. Existing studies have examined the digital transformation of higher education from the perspectives of strategic planning, maturity assessment, and institutional operations[3][4][5][6][7], or have reviewed the development of smart campus models and their enabling infrastructures[1][8]. However, empirical analyses based on first-hand, business-level data from multiple institutions remain insufficient. Using business item survey data from nine higher vocational colleges in Chongqing, this study portrays the current status of digital campus construction along three dimensions - construction scale, business structure, and construction model - analyzes the existing problems, and proposes targeted countermeasures, with a view

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to offering insights for peer institutions.

2. Data and Methods

2.1. Data Source

The data come from a survey on digital campus construction conducted among nine higher vocational colleges in Chongqing. Taking the business item as the basic unit, the survey itemized the business items for which information technology support had been implemented in each college, producing a three-field inventory consisting of business item name, existing application, and business item description. After data cleaning, 2,173 valid business items were obtained, corresponding to 75 application systems. The sample colleges span various institutional types, including medicine, teacher education, commerce, information technology, arts, and resources and environmental protection, and are therefore reasonably representative. For research ethics, the names of the nine colleges are anonymized in this paper and denoted as Colleges A to I in descending order of business item count.

2.2. Methods

Descriptive statistics and content analysis were combined in this study. First, the numbers of business items and application systems were aggregated by college to examine the construction scale. Second, based on item names and descriptions, the 2,173 business items were classified into twelve business domains: teaching and academic affairs, student affairs, human resources and faculty affairs, cybersecurity and IT operation and maintenance (O&M), finance, assets and procurement, administration and Party affairs, logistics and campus security, research management, library and archives, school-enterprise cooperation, enrollment and employment, and general affairs, so as to examine the business structure. Finally, the relationship between the number of systems and the volume of items carried in each college was analyzed to investigate construction models and application depth.

2.3. Limitations

Two limitations should be noted. First, the survey data reflect the coverage of informatization - whether a business is supported - rather than the quality of such support. Second, the sample is confined to nine colleges in Chongqing, so caution is required when generalizing the conclusions nationwide. In addition, the descriptions of some items in certain colleges are rather brief, which may introduce a degree of error into the domain classification.

3. Current Status of Digital Campus Construction

3.1. Construction Scale: A Wide Inter-College Gap

In terms of business items, the nine colleges report 2,173 items in total, or 241 per college on average, yet the gap between institutions is striking: the largest, College A, reports 614 items, whereas the smallest, College I, reports only 22, a difference of about 28 times. As for application systems, the maximum is 34 in one college while the minimum is a single platform. Overall, the sample colleges fall into three tiers: the first tier (over 400 items) comprises Colleges A, B, and C, all featuring comprehensive inventories and broad coverage; the second tier (100-400 items) includes Colleges D and E; the third tier (fewer than 100 items) consists of colleges whose business item inventories remain incomplete and whose digital coverage is conspicuously narrow. The detailed figures are shown in Table 1.

Table 1: Comparison of digital campus construction scale among the sample colleges.

College	Business items	Application systems	Items per system
College A	614	34	18.1
College B	448	2	224.0
College C	433	9	48.1
College D	339	14	24.2
College E	114	12	9.5
College F	85	1	85.0
College G	74	1	74.0
College H	44	1	44.0
College I	22	1	22.0
Total	2,173	75	29.0

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3.2. Business Structure: Broad but Uneven Coverage

The distribution of business domains reveals a distinctly unbalanced pattern of digital coverage. Teaching and academic affairs ranks first with 539 items (24.8%), covering course scheduling, grade management, enrollment status changes, teaching supervision, and practical training and internships, indicating that core teaching business is the priority of informatization in every college. Student affairs follows with 343 items (15.8%), and human resources and faculty affairs with 293 items (13.5%); transactional processes such as freshman orientation, dormitory management, financial aid, professional title review, and performance appraisal have been largely moved online. Cybersecurity and IT O&M accounts for 236 items (10.9%), covering situational awareness, internet behavior management, data backup, and classified protection of cybersecurity, which reflects the growing attention paid by all colleges to network and data security.

In sharp contrast, five domains each account for less than 2.5% of all items: research management (43 items, 2.0%), library and archives (41 items, 1.9%), school-enterprise cooperation (40 items, 1.8%), enrollment and employment (39 items, 1.8%), and logistics and campus security (52 items, 2.4%). School-enterprise cooperation, the business domain most characteristic of vocational education as a type, turns out to be the least digitally covered, creating a gap with the policy requirement of deepening industry-education integration. The distribution is illustrated in Figure 1.

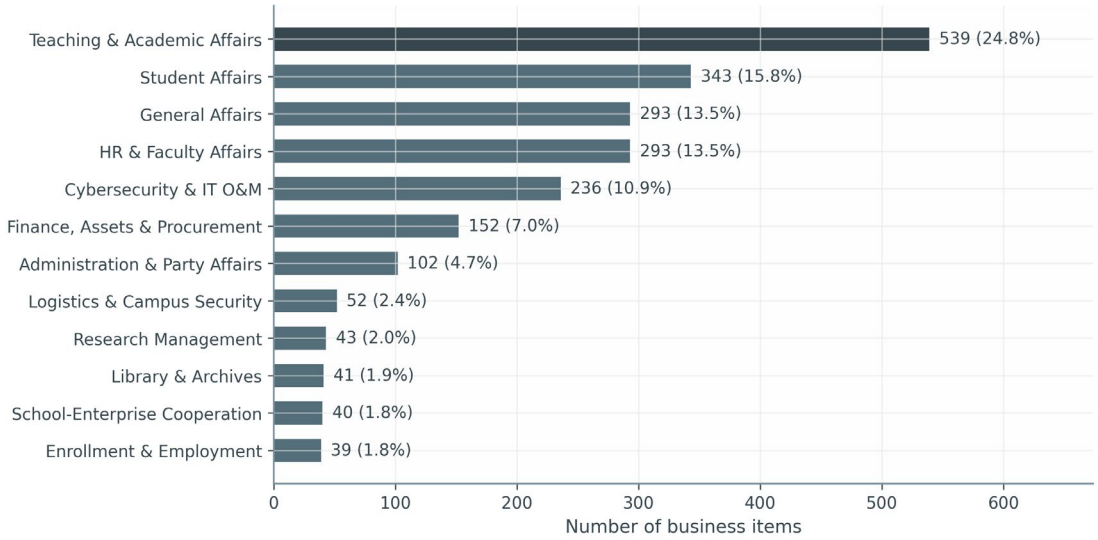

Figure 1: Distribution of business items across business domains.

3.3. Construction Models: Decentralized Systems and Integrated Platforms Coexist

Judging from the relationship between the number of systems and the number of items, the sample colleges exhibit two typical construction models. The first is decentralized development: College A operates 34 relatively independent application systems covering virtualization management, cybersecurity situational awareness, budget management, access control, and a data middle platform, among others. This model features a high degree of system specialization but faces considerable pressure for integration. The second is platform integration: College B carries 448 business items on only two platforms, and College F carries 85 items on a single teaching management information system, with the highest single-system load reaching 224 items - a pattern of large platforms with small applications. Most colleges fall somewhere in between, using an information portal or a one-stop online service hall as a unified entrance to integrate various services. Each model has its strengths and weaknesses: the decentralized model is flexible and quick to launch but prone to information silos, whereas the platform model enables a higher degree of data sharing but demands more of top-level design and sustained investment. These findings echo the smart campus literature, which emphasizes that a sound digital infrastructure and data architecture is the foundation of integrated campus services[1][8].

3.4. Application Depth: Uneven Adoption of Online Workflows

The level of detail in business item descriptions indirectly reflects the depth of workflow online

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adoption in each college. The survey shows that some colleges provide clear process descriptions for every item, averaging 79 Chinese characters per description and covering the full cycle of initiation, approval, and archiving, whereas a few colleges offer little more than item names, averaging fewer than ten characters. This suggests that in certain colleges digitalization remains at the stage of system launch: the standardization and normalization of business processes have yet to be completed, and genuine process reengineering is still some distance away.

4. Major Problems in Digital Campus Construction

4.1. The Inter-College Digital Divide Constrains Coordinated Regional Progress

The number of business items differs by up to 28 times and the number of systems by up to 34 times among the nine colleges - a gap far wider than differences in institutional size can explain. Leading colleges have entered the stage of data governance and platform integration, while lagging ones remain at the stage of isolated systems or even blank spots. The inter-college digital divide not only undermines the governance effectiveness of individual institutions but also hampers the co-construction and sharing of digital resources and the overall progress of vocational education digitalization across the region. Similar disparities have been widely documented in higher education, where uneven access to and use of digital technologies affects institutional effectiveness and student outcomes[9][10][11].

4.2. Unbalanced Business Structure: Emphasizing Administration over Services and Teaching over Research

Existing digitalization efforts are heavily concentrated in administrative and transactional domains such as teaching administration, student affairs, and personnel management, while business areas that directly serve research innovation and underpin industry-education integration are notably under-covered. The low digitalization of key business such as research management and school-enterprise cooperation is detrimental to the integration of science and education as well as industry and education, and it substantially weakens the supportive role of digitalization in reforming talent cultivation models.

4.3. Decentralized System Development Brings Risks of Data Silos and Redundant Construction

Some colleges operate numerous dispersed systems lacking unified data standards and interface specifications, making repeated collection and duplicate entry of the same data almost inevitable. Even for colleges adopting the platform integration model, excessive concentration of business items on a single platform raises concerns about platform load and operational risk. The asynchrony between system construction and data governance has become the main bottleneck restricting the release of data value.

4.4. Insufficient Process Standardization: Construction Outweighs Application

The absence of complete online process descriptions for many business items in some colleges indicates that business processes were moved online before standardization was completed, resulting in a mismatch between system functions and actual business. Meanwhile, the phenomena of valuing system procurement over operation and iteration, and of emphasizing launch assessment over usage evaluation, are widespread, leaving much room for improvement in application depth and in the experience of teachers and students.

5. Countermeasures and Suggestions

5.1. Strengthen Top-Level Design and Establish a Coordinated Promotion Mechanism

Colleges should incorporate digital campus construction into their overall development plans, conduct diagnostic assessments against the Digital Campus Specifications for Vocational Colleges, and formulate phased implementation roadmaps. Strategic planning and leadership commitment have been shown to be decisive factors in the digital transformation of higher education institutions[3][5][7]. A working mechanism led by college leadership, coordinated by the informatization department, and joined by all business departments should be established to prevent fragmented, uncoordinated development. Educational authorities may rely on regional vocational education alliances to pair leading colleges with weaker ones, promoting the co-construction and sharing of construction experience, data standards, and

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application scenarios so as to gradually bridge the inter-college digital divide.

5.2. Remain Demand-Oriented and Fill the Gaps in Underserved Business Areas

For digitalization lowlands such as research management, school-enterprise cooperation, enrollment and employment, and logistics services, colleges should prioritize a number of high-frequency service scenarios guided by the needs of teachers and students and by business pain points. In particular, digital transformation should be advanced for business related to school-enterprise collaborative education, technical services, internships, and employment, in line with the strategic requirements of industry-education integration and science-education convergence, so that digitalization shifts from management-driven to service-driven and better supports the identity of vocational education as a distinct type.

5.3. Deepen Data Governance and Promote System Integration and Data Sharing

Colleges should establish unified data standards and a master data management system that clarifies the authoritative source of each category of data, and promote system integration through a data middle platform, unified identity authentication, and a unified information portal. New systems must strictly comply with data interface standards, and legacy systems should be gradually incorporated into the sharing system through interface adaptation, thereby breaking down data silos at the source. At the same time, the requirements of classified protection of cybersecurity should be implemented to balance development and security.

5.4. Improve Long-Term Mechanisms and Shift from Construction to Application

Digital campus construction is not a one-off project. Colleges should build a closed-loop mechanism of planning, construction, application, evaluation, and iteration, incorporating system utilization rates, online processing rates, and user satisfaction into the performance evaluation of informatization projects. Training and promotion targeting teachers and students should be strengthened so that business processes and system functions can be continuously refined, truly letting data travel more and people travel less.

6. Conclusion

Based on an empirical analysis of 2,173 business items from nine higher vocational colleges in Chongqing, this study shows that digital campus construction in higher vocational colleges has achieved initial progress, with core business such as teaching administration and student affairs reaching a relatively high level of online adoption. Nevertheless, prominent problems remain: a wide inter-college gap, an unbalanced business structure, looming data silos, and insufficient application depth. Advancing digital campuses from scale expansion to quality improvement requires concerted efforts by colleges and educational authorities in top-level design, business balance, data governance, and long-term mechanisms. Future research may introduce multiple data sources, such as satisfaction surveys and system usage behavior, to evaluate the effectiveness of digital campus construction in a more comprehensive manner.

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