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Research on the Path of Information Management for Piano Rooms in Colleges and Universities

Yutao Ying

College of Art, Zhejiang Normal University, Jinhua 321004, Zhejiang, China

Abstract: ***With the continuous development of art education in universities, the piano room, as an important venue for music teaching and practice, has its management efficiency and service quality directly affecting teaching effectiveness. Traditional piano room management models face issues such as uneven resource allocation, low usage efficiency, and difficulties in supervision. However, with the iteration of informatization and intelligence, informatization management can achieve optimal allocation of piano room resources, real-time monitoring of usage processes, and scientific management decision-making by introducing modern information technology. This paper aims to explore feasible paths for the informatization management of university piano rooms, analyze its advantages and challenges, and propose corresponding implementation strategies, with the hope of providing reference for the reform of university piano room management.***

Keywords: University piano room, Information management, Smart piano room, Digital transformation**.**

1. Introduction

The piano room is a core space in music and teacher education institutions that carries out professional skill training, fosters artistic character, and disseminates music culture. However, in stark contrast to the importance of the piano room's function, its management method has long lagged behind the overall progress of higher education informatization development. Traditional piano room management relies heavily on manual registration, inspection, and scheduling, which poses problems such as delayed information transmission, resource waste, and potential safety hazards. Against the backdrop of comprehensive promotion of smart campus construction, the informatization transformation of public spaces such as libraries, laboratories, and sports venues has become increasingly mature, while piano room management still heavily relies on manual scheduling, paper registration, and on-site inspection. The "time lag" of this management model and the practical needs of piano rooms as high-frequency usage spaces constitute a set of structural tensions that urgently need to be resolved.

Informatization management is not simply a technical implantation, but a systematic reconstruction of the operational logic of the piano room. It involves not only the digital reengineering of business processes such as appointment, access, use, maintenance, and traceability, but also the coordination of interests and behavioral reshaping among multiple stakeholders such as managers, teachers, and students. Furthermore, it touches upon the deep-seated issue of how to achieve optimal allocation between efficiency and fairness in the use of piano rooms as teaching resources. Therefore, research on this path needs to go beyond the mere description of technical solutions and delve into the problem domain where management concepts, institutional design, and technical implementation intersect.

2. Why Carry Out Informatization Transformation

2.1 Inefficiency and Imbalance in Resource Allocation

Piano room resources exhibit a high degree of spatiotemporal competition: the number of available piano rooms is fixed daily, yet students' demand for practice time is extremely unevenly distributed across different time periods - during peak hours such as lunchtime and evening, "it's hard to find a room," while other times are largely vacant. Under manual management, this mismatch between supply and demand is almost impossible to dynamically adjust. Management personnel can only allocate rooms based on fixed schedules and the first-come, first-served rule, which makes it difficult to identify the true intensity of piano usage demand and impossible to reallocate vacant resources. At the same time, there is a lack of differentiated management mechanisms for piano usage permissions among students of different majors and grades, leading to a widespread phenomenon where "those who practice frequently can't get enough, while those who occupy rooms without using them go unmanaged." As a scarce teaching resource, the use efficiency of piano rooms is far from optimal.

2.2 Extensive and Passive Management Approach

The traditional management of piano rooms is based on the basic model of "manual duty + paper registration". The operation of teachers and students on the piano is cumbersome, identity verification relies on visual inspection, and usage duration is recorded manually, making it difficult to guarantee accuracy and traceability. Some universities use IC cards for manual swiping and timing, which no longer aligns with the current trend of digital identity development. This model incurs high management costs - requiring a significant investment of manpower for routine inspections, key distribution and collection, sanitation checks, IC card processing costs, and replacement costs, among other administrative tasks. However, the management effectiveness is unsatisfactory - management personnel lack real-time perception of the actual usage status in the piano rooms, and can only identify problems through post-event spot checks. Management remains in a state of "passive response" rather than "active intervention". Furthermore, issues such as failure to clean the piano rooms promptly after use, disordered item placement, and unreported equipment damage have not been resolved for a long time due to a broken management chain.

2.3 Information Silos and Data Blind Spots

The deeper dilemma lies in the fact that traditional piano room management generates almost no usable data. Questions that are crucial for management decisions, such as how many students use the piano room each day, how the practice time is distributed, which time periods are the real peak usage times, and which types of equipment malfunctions are concentrated, are all unanswerable due to the lack of a data collection mechanism. The lack of data interoperability between piano room management and various school platforms forms a typical information island. Managers cannot optimize resource allocation based on data, teachers cannot understand students' autonomous learning situations, and students cannot receive personalized practice advice. Piano room management has long been in a vague state of "relying on experience and intuition," which is seriously out of touch with the overall requirement of refined governance in higher education.

3. What has Informatization Transformed

The informationization transformation of piano room management has undergone comprehensive upgrades, encompassing upgrades to infrastructure such as door locks and surveillance systems, the integration with platform servers, as well as the development of front-end appointment and management interfaces, and the digital presentation of information.

The infrastructure layer serves as the physical foundation of the system, encompassing smart door locks (supporting multiple authentication methods such as facial recognition, QR codes, and IC card), intelligent power controllers (enabling remote and linked control of lighting and air conditioning), human body sensors and video surveillance equipment (providing real-time awareness of the occupancy status and personnel behavior in the practice room), environmental sensors, and network communication facilities (ensuring stable data transmission).

The foundational platform layer provides the core support capabilities of the system, encompassing modules such as organizational structure and personnel management, venue and equipment information management, unified identity authentication and permission control, data exchange, and interface services. The key to the design of this layer lies in its deep integration with the existing information technology system of the school, achieving seamless docking with the unified identity authentication platform, educational administration system, and smart card system.

The scene application layer is a set of functions directly facing users, mainly including: intelligent reservation management (students can view real-time piano room status and make online reservations through the program terminal), smart access control management (automatically authorize door opening based on reservation information, record the time of entering and exiting the piano room), energy-saving control (automatically power on during the reserved time period and automatically power off after the end of the period to prevent energy waste), equipment operation and maintenance management (online repair reporting, maintenance progress tracking, fault statistical analysis), data statistics and analysis (automatically generate data reports such as usage rate, attendance rate, violation rate, etc., forming a multi-dimensional data portrait).

The application presentation layer presents the system's operational status and analysis results to different user groups in a visual manner through various forms such as the management backend dashboard, mobile interface, and data dashboard, enabling administrators, teachers, and students to obtain information services that match their roles.

4. How to Carry Out Informatization Transformation

4.1 Standardization

Standardization is the prerequisite for information management. Without standards, system construction cannot be implemented; without unified standards, data cannot be interchanged. The standardization system required for the information management of university piano rooms covers the following aspects:

Business process standards - Unify the operational norms, time nodes, and authority boundaries for core business processes such as appointment, instrument loading and unloading, usage, check-out, maintenance, and storage, ensuring that all users act under the same set of rules.

Data Interface Standards - Establish data exchange specifications between the piano room management system and external systems such as the school's unified identity authentication platform and campus card system, breaking information barriers and achieving interconnectivity at the data level. This not only effectively avoids the tedious task of registering accounts repeatedly in different systems, significantly reducing management costs and time loss due to forgotten passwords, but also strengthens the defense line at the system security level. By strictly limiting intranet access permissions and securely docking with WebVPN in a web page format, the security of data transmission is ensured. At the same time, given the relatively small amount of front-end data, to avoid potential redundancy issues caused by the integration of mini-programs and potential limitations on mobile device compatibility, the integration method should be carefully selected to ensure the overall smoothness and stability of the system operation.

4.2 Intelligentization

Intelligentization refers to the qualitative leap in management capabilities achieved through technological means on the basis of standardization. Its core lies in transforming manual judgment and manual operation into algorithm-driven and automatic execution, thereby releasing management resources, improving response speed, and enhancing decision-making accuracy. Intelligent management is mainly reflected in three dimensions:

Intelligent Perception - Through real-time collection of spatial, equipment, and environmental status of the practice room via IoT sensors, managers gain the ability to "see" the situation.

Intelligent decision-making - Based on reservation data and usage records, we utilize data analysis algorithms to identify genuine demand for piano rooms, enabling dynamic allocation and intelligent recommendation of these resources, transitioning from “passive allocation” to “active matching”.

Intelligent execution - Automate the execution processes such as access control, power switching, and appointment approval through the system, achieving fully automated operation where “appointment is authorization, door opens upon arrival, and reminder is given for overtime”, minimizing manual intervention to the greatest extent possible.

5. Summarize

The informatization management of university piano rooms represents a systematic transformation, encompassing both conceptual and practical aspects, as well as technological and institutional dimensions. It entails more than just installing a smart lock on the practice room door or simply transitioning paper registration forms to a mobile phone screen. Instead, it involves a fundamental restructuring of the operational logic of piano rooms as teaching resources. This restructuring process necessitates addressing three core questions: How to achieve a dynamic balance between fairness and efficiency under resource constraints? How to maintain reverence and a return to the essence of education amid technological empowerment? And how to accommodate elastic space for differentiated needs amid the advancement of standardization?

Technology serves as a tool, while systems provide the safeguard. However, the ultimate determinant of the success or failure of information management lies in whether teachers and students are truly placed at the core of the system, and whether management is guided by its original intention of serving. Only by doing so can the “Smart Practice Room” avoid becoming an impersonal technological device, but instead, become a warm space that nurtures artistic growth and cultivates professional character.

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