

# Access Control System Utilization Analysis and Resource Optimization Practice at Xi' an Jiaotong-Liverpool University

Yuqi Pang

Management Information Technology and System Office

Supported by LM

## 1. Background

The access control system at Xi' an Jiaotong-Liverpool University covers all key areas across the campus; however, it lacks dedicated data dashboard interfaces for analysis and presentation. Operational staff are required to manually consolidate data, which is time-consuming and error-prone. As a result, access control utilization rates cannot be accurately assessed, leading to blind or inefficient resource allocation. In addition, abnormal access behaviors are difficult to identify in a timely manner, weakening overall security prevention and control capabilities.

At present, access control data are used only for basic permission verification. The potential value of such data—such as insights into personnel movement patterns—has not been explored, and therefore

cannot support campus management optimization. There is an urgent need to integrate and analyze access control data to enable intelligent upgrades and data-driven management.

## 2. Solutions

### 2.1 Core Data Integration Scope

With access card swipe data as the core, multi-dimensional information was integrated to form a unified dataset, including:

- **Basic swipe data:** swipe time, device ID, access result, and frequency statistics;
- **Personnel attribute data:** card type, user category, affiliated department, school, and year of study;
- **Spatial attribute data:** device location, associated area, and building function.

### 2.2 Key Functional Design

- **Multi-dimensional analysis module:** utilization rates are analyzed by area, time period, and personnel category, with results presented through visual dashboards;
- **Data sharing module:** supports customized report export, enabling cross-departmental data sharing and collaboration.

## 2.3 Process Optimization Approach

A unified data middle platform was established to enable real-time data synchronization. Automated analysis workflows were introduced to reduce manual intervention. A closed-loop mechanism of “collection – analysis – decision – feedback” was constructed, transforming analytical results into concrete management measures and continuously tracking their effectiveness.

## 3. Outcomes and Benefits

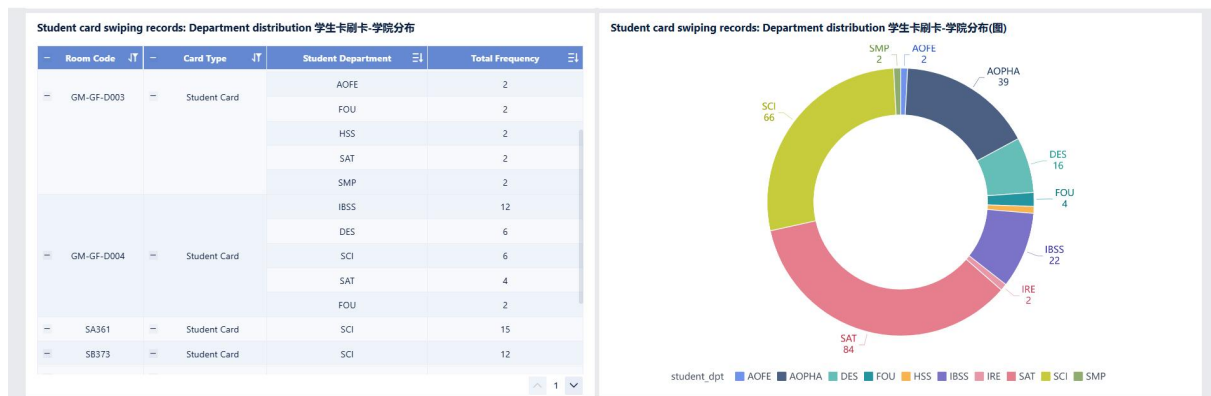


Figure 1. Student card swiping records: Department distribution



Figure 2. Student card swiping records: Distribution by degree level and

*grade*

### **3.1 Significant Improvement in Management Efficiency**

Data consolidation time was reduced from approximately eight hours per week to real-time generation, with analytical efficiency improved by 90%.

### **3.2 Precise Optimization of Resource Allocation**

Additional access control devices were deployed in high-frequency areas to alleviate congestion, while operating modes of low-utilization devices were adjusted. Resource allocation became more targeted and effective.

### **3.3 Full Realization of Data Value**

Through the analysis of access card swipe data, behavioral patterns of students and staff were identified, providing data support for space planning and other management decisions, thereby unlocking the value of access control data.

### **3.4 Refined Upgrade of Equipment Management**

By correlating device operation status with utilization data, equipment performance can be accurately assessed. High-efficiency devices are prioritized for maintenance, while problematic devices are upgraded or replaced, enhancing overall system stability.

## **4. Replicability and Promotion Value**

The “data integration – analysis – optimization” model established in this case is applicable to multiple scenarios, including higher education

institutions, corporate campuses, and residential communities. The analytical framework can be directly transferred to support resource optimization and improve security management across different environments.

Peer universities can readily replicate this model by adjusting data dimensions to align with their own operational contexts, significantly reducing implementation costs.

## 5. Next Steps

**Functional enhancement:** introduce mobile alerts and develop utilization forecasting models;

**Data expansion:** integrate facial recognition data and link campus consumption data to build comprehensive behavioral profiles;

**System upgrade:** optimize data middle platform performance and develop visual decision-support tools;

**Standardization output:** establish management standards to provide reference models for peer institutions.