Manipal Institute of Technology
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Mini Project Report mapping with
BIS standards

On
Smart Library Seat Occupancy
with Breaktime Logic and QR Login

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Abstract:

This report presents the mapping of Bureau of Indian Standards (BIS) with the Smart Library Seat Allocation System project. The project focuses on the design and implementation of an IoT-based system for automated seat management in libraries to enhance user convenience and space efficiency. Relevant BIS standards such as IS 13252 (Part 1):2010 for IT equipment safety and IS 13213:1991 for ergonomic design principles are analyzed. A case study of library automation systems and stakeholder perspectives are presented, along with a comparison of BIS with international standards (ISO/IEC). The report concludes with the societal, economic, and sustainability implications of BIS compliance in smart IoT solutions for educational institutions.

1. Introduction and Objective

The Smart Library Seat Allocation System is designed to optimize the seating arrangement in libraries using IoT sensors and real-time data. It automates the seat allocation and availability tracking process, thereby improving user convenience and overall space utilization.

The main objectives of the project are:

To integrate IoT-based hardware and software for efficient library management.

To identify and map relevant BIS standards applicable to the project.

To assess the technical, economic, and societal impacts of BIS compliance.

To compare BIS standards with international norms such as ISO/IEC and identify harmonization opportunities.

This exercise aims to strengthen understanding of national standardization systems and how they influence design, safety, and innovation in emerging technologies.

2. BIS Mapping

The Smart Library Seat Allocation System involves electronic components such as microcontrollers, power supplies, display units, and sensors. These fall under the purview of safety and ergonomic standards defined by the Bureau of Indian Standards.

Applicable BIS Standards:

1. IS 13252 (Part 1):2010 – Information Technology Equipment – Safety – General Requirements

Clauses Applied: Protection against electric shock, insulation, wiring safety, and power supply protection.

Rationale: Ensures that the system's microcontroller units, display screens, and connected sensors are safe for operation in public environments like libraries.

2. IS 13213:1991 – Ergonomic Principles for Visual Display Terminals Used in Office Work

Clauses Applied: Layout and user interface ergonomics, display brightness, and user accessibility.

Rationale: Supports the design of intuitive and user-friendly reservation screens for students.

Relevance:

These standards directly address electrical safety, human comfort, and usability — key aspects of IoT deployments in educational spaces.

Compliance promotes reliability and confidence among institutional users.

3. Case Study Development:

(a) Consultation with MSME and Stakeholders

A consultation was conducted with a local MSME specializing in IoT-based automation solutions for educational environments.

Key Findings from the Consultation:

Awareness of BIS standards among small firms is limited but gradually increasing due to industry outreach programs and customer demand.

Certification costs and complex documentation remain major challenges faced by MSMEs, especially for first-time applicants.

Limited access to technical expertise and testing facilities also hampers smooth compliance with BIS requirements.

Despite these barriers, compliance with BIS standards significantly enhances customer trust, product credibility, and eligibility for government tenders.

MSMEs expressed that aligning with BIS could open doors to exports and partnerships with larger industries.

Stakeholders emphasized the need for simplified registration processes and greater digital support from BIS to encourage wider participation.

Training sessions and awareness workshops were suggested to help MSMEs understand the technical and procedural aspects of standard compliance.

Overall, there was a positive perception of BIS certification as a long-term investment for business growth, even though initial efforts can be resource-intensive.

Evidence (summary):

Consultation conducted with "TechNova IoT Solutions," Mysuru.

Duration: 20 minutes (virtual call).

Participants: Project Engineer and Quality Officer.

They highlighted the need for simplified BIS documentation and regional awareness workshops.

(b)Comparison with International Standards

Parameters	BIS Standard	ISO/IEC Equivalent	Scope and Alignment
Electrical safety	IS 13252(Part1):2010	IEC60950-1	Harmonized; equivalent testing and insulation guidelines
Ergonomics	IS 13213:1991	ISO 9241-210 (2019)	Partial alignment; BIS focuses on terminals ISO on human-system interaction
Data security	---	ISO/IEC 27001(2013)	BIS has no direct loT data security equivalent
Product quality	IS 9000 series	ISO 9001	Aligned; both cover process quality and manufacturing reliability

Analysis:
BIS standards are well aligned with IEC for electrical safety but lag in areas such as IoT connectivity, cybersecurity, and environmental sustainability. ISO/IEC frameworks are more comprehensive for digital ecosystems. BIS harmonization initiatives can bridge these gaps.

4. Analytical Discussion

Technical Impact:
Adherence to BIS standards enhances safety, reliability, and compatibility in IoT systems. It ensures standardized wiring, component insulation, and ergonomic design, minimizing hazards and improving system uptime.

Economic Impact:
For MSMEs, BIS certification can be a gateway to domestic and international markets. Although initial compliance costs are high, long-term benefits include improved brand image, easier procurement approvals, and access to public sector projects.

Societal Impact:
BIS compliance supports sustainability and the UN Sustainable Development Goals (SDGs) —
particularly SDG 4 (Quality Education), SDG 9 (Industry, Innovation and Infrastructure), and SDG 12
(Responsible Consumption). The Smart Library system reduces manual work, optimizes resource usage,
and provides equitable access to study spaces.

Gaps Identified:

Lack of IoT-specific BIS guidelines for networked sensor devices.

Limited support for small enterprises to navigate compliance pathways.

Absence of unified certification schemes for smart campus technologies.

Opportunities for Improvement:

Development of new BIS standards focused on IoT, AI, and cloud integration.

Digitization of certification processes to reduce MSME burden.

Public-private collaboration to build testing labs at the regional level.

5. **Conclusion: Prospects and Perspectives**

BIS standards play a critical role in ensuring the safety and reliability of electronic systems in educational
institutions. The Smart Library Seat Allocation System demonstrates how adherence to these standards
enhances operational quality and user satisfaction.

Future Prospects:

BIS is expected to move toward harmonization with ISO/IEC frameworks for IoT and digital devices.

Expansion of digital standardization and automated testing tools can further simplify certification.

Integration of AI-driven monitoring systems will enhance smart infrastructure safety.

Personal Reflection:

Through this exercise, I learned how standardization forms the backbone of technological innovation. BIS standards not only ensure safety and quality but also foster innovation by providing clear design and testing guidelines. Understanding their implementation has deepened my appreciation for engineering ethics and sustainability.

6. References

1. BIS IS 13252 (Part 1):2010 — Information Technology Equipment – Safety – General Requirements.

2. BIS IS 13213:1991 — Ergonomic Principles for Visual Display Terminals.

3. ISO/IEC 27001:2013 — Information Security Management Systems.

4. ISO 9241-210:2019 — Ergonomics of Human-System Interaction.

5. IEC 60950-1:2005 — Information Technology Equipment Safety.

6. BIS IS/ISO 9001:2015 — Quality Management Systems – Requirements.

7. TechNova IoT Solutions, MSME Interview Notes (2025).

7. Annexures

Annexure 1: Interview Summary

MSME: TechNova IoT Solutions (Mysuru).

Key challenges: Cost of BIS certification, lack of testing facilities.

Opportunities: Collaboration with eduAligned; both cover

process quality and
manufacturing reliabilityAligned; both cover
process quality and
manufacturing reliabilitycational institutions, government incentives.

Annexure 2: Comparison Table of BIS and ISO Standards
Detailed comparison matrix between IS 13252 and IEC 60950-1, IS 13213 and ISO 9241-210, highlighting harmonization and deviations.

Annexure 3: System Architecture Overview
Prototype uses ESP32 microcontroller, IR sensors for seat detection, cloud database for availability tracking, and an LCD interface for users.