

ACTION RESEARCH PAPER

Improving Classroom Resource Management Through a Digital Classroom Booking System

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Institution Type	TTI-Samthang, Wangdue Phodrang
Level	High School / Vocational Training
Researcher Role	Prakash Sarki Associate IT Lecturer
Participants	21–40 Trainers
Duration	Ongoing (few weeks post-implementation)
Sample Data Date	18 March 2026
System URL	https://ttis.edu.gov.bt/student-services/bookclass/

Abstract

This action research paper examines the development and implementation of a digital Classroom Booking System at TTI-Samthang, a Technical Training Institute located in Wangdue Phodrang, Bhutan. The institution had long grappled with an operational challenge that was both simple in nature and deeply disruptive in practice: too many trainers competing for too few shared spaces — specifically, four classrooms designated for regular theory instruction, along with a conference hall reserved for internal institutional meetings and external bookings. Trainers were frustrated, scheduling was chaotic, and institutional time was being lost to conflicts that a well-designed system could have prevented.

In response to this recurring problem, the researcher — serving simultaneously as administrator and practitioner — designed and deployed a web-based hourly booking system that would bring order, transparency, and fairness to the process of room allocation. The system allows trainers to

book rooms on an hourly basis, view real-time availability, and manage their own reservations, while giving the administrator a clear view of how institutional spaces are being utilized.

Early evidence, drawn from system usage logs, booking frequency data, and informal conversations with trainers, suggests that the intervention is already producing meaningful improvements. Trainers have reported a perceived reduction in scheduling conflicts, and booking data indicates that trainers are planning their sessions in advance. The administration has also gained valuable insight into room utilization patterns. It is acknowledged, however, that the absence of pre-intervention conflict data means that the reduction in conflicts cannot yet be independently verified and should be understood as trainer-reported perception at this stage. The paper documents this journey — from the problem that prompted it, through the intervention that addressed it, to the reflections and recommendations that will guide its continued improvement.

1. Introduction

Every institution, however well-resourced, faces moments when its physical infrastructure is put under pressure. For TTI-Samthang, a technical training institute serving the Wangdue Phodrang region, that pressure was being felt keenly. The four classrooms available for regular theory instruction were, in principle, sufficient for the institution's needs, while the conference hall served a distinct and more restricted purpose — accommodating internal institutional meetings and external organisations seeking a hired venue. In practice, however, the absence of a structured system for managing access to these spaces meant that the burden of coordination fell entirely on informal communication — a solution that was proving increasingly inadequate.

This action research study was born out of that frustration. Rather than accepting the situation as an unavoidable feature of institutional life, the researcher chose to engage with it systematically — to understand its root causes, design a targeted intervention, implement that intervention, and evaluate its effects. This is the spirit of action research: not merely to study problems from a distance, but to act upon them from within.

The intervention chosen was a digital Classroom Booking System — a practical, technology-based solution that would allow trainers to reserve rooms on an hourly basis and give the administration a clear, real-time picture of how institutional spaces were being used. This paper documents the research process, presents preliminary findings, and reflects on what has been learned and what remains to be done.

2. Problem Statement

At the time this study was initiated, TTI-Samthang had no formal mechanism for managing access to its shared training spaces. A trainer who needed one of the four classrooms for a theory session had no reliable way of knowing whether it would be available, short of physically checking — or asking around. There was no central schedule, no booking record, and no system of prior claim. The result was a culture of uncertainty that directly affected trainers' ability to plan their lessons effectively and, by extension, the quality of their students' learning experience.

The specific problems that prompted this research can be summarized as follows:

- Trainers frequently discovered that a room they had expected to use was already occupied by a colleague, with no prior notice or warning.
- The absence of a visible schedule meant that planning ahead was difficult; trainers often made room arrangements on a day-to-day, or even hour-to-hour, basis.
- Verbal agreements between trainers were prone to misunderstanding, and informal arrangements sometimes broke down, leading to conflict.
- The administration had no reliable data on room usage and could not identify patterns, inefficiencies, or equitable distribution of access.
- Complaints from trainers about classroom management had become a recurring theme in staff meetings, signaling that the issue was affecting morale as well as operations.

These were not trivial inconveniences. They were systemic failures that pointed to the need for a structural solution — one that would be transparent, equitable, and easy to use.

3. Research Questions

This study is structured across two action research cycles. The research questions below reflect that structure honestly: the first two questions are addressed in the current cycle, drawing on data that has already been collected; the third is a forward-looking question that will be investigated in the next cycle, once the trainer satisfaction survey has been administered and its results analysed. This two-cycle framing is not a limitation — it is a deliberate and transparent acknowledgement of where the research currently stands, and of the iterative nature of action research as a methodology.

- Cycle 1 — RQ1: How can a digital classroom booking system improve the management of shared training spaces within TTI-Samthang?

- Cycle 1 — RQ2: What are the trainers' early experiences and perceptions of the system, and what improvements do they consider necessary?
- Cycle 2 — RQ3 (Next Cycle): To what extent has the booking system reduced scheduling conflicts, as perceived by trainers, following full implementation?

4. Review of Related Literature

The challenges encountered in this study are not unique to this institution. Resource scheduling and space management have been identified in the broader literature as persistent concerns for educational and training organizations, particularly those operating with constrained infrastructure.

Beyrouthy et al. (2009) demonstrated that automated scheduling systems consistently outperform manual methods in resolving timetabling conflicts and optimizing the use of available spaces. Their findings are directly relevant here: the informal, verbal system that had governed room allocation was, in effect, a manual system — one with all the inefficiencies that entails. Schaerf (1999), in a comprehensive review of automated timetabling approaches, further underscores the administrative burden that manual scheduling imposes and the gains that even relatively simple digital solutions can deliver.

In the context of vocational training specifically, Billett (2011) has argued that the physical learning environment plays a more significant role in skills development than is often acknowledged. When trainers are uncertain whether they will have access to an appropriate space, their ability to plan effective, structured lessons is compromised. A reliable booking system, in this sense, is not merely an administrative convenience — it is a contribution to pedagogical quality.

From a methodological standpoint, the action research tradition provides a robust framework for this kind of practitioner-led inquiry. McNiff and Whitehead (2011) emphasize that action research is most powerful when it is rooted in real institutional problems and driven by the people who are closest to those problems. The researcher in this study — serving as both administrator and participant — exemplifies this approach, bringing both the authority to implement change and the proximity to observe its effects.

5. Methodology

5.1 Research Design

This study adopts a practitioner action research design, following the cyclical plan–act–observe–reflect framework described by Kemmis and McTaggart (1988). The researcher is not a detached observer but an active participant — someone who identified the problem, designed and implemented the intervention, and is now in the process of observing and reflecting on its effects. This insider perspective is both a strength and a responsibility: it enables deep contextual understanding while also demanding honesty and self-critical reflection.

5.2 Setting and Participants

The study is set at TTI-Samthang, a Technical Training Institute located in Wangdue Phodrang, Bhutan. The institution operates five managed spaces: four classrooms (Classroom A, B, C, and RAC) used regularly for theory-based instruction, and one conference hall that is reserved exclusively for internal institutional meetings and for external organisations that hire the facility. Between 21 and 40 trainers make use of the four classrooms on a regular basis. The researcher serves as the system administrator, a role that provides direct access to system data and a clear view of how the booking system is being used in practice.

5.3 The Intervention

The intervention is the development and deployment of a web-based Classroom Booking System. The system was designed with simplicity and transparency as its guiding principles — it needed to be easy enough for all trainers to use without extensive training, and clear enough that everyone could see, at a glance, what was available and what was not.

Key features of the system include:

- Hourly booking slots across all five training spaces, covering the institution's operational hours from 9:00 to 17:00.
- A real-time availability display that prevents double-booking and gives trainers confidence in their reservations.
- A user-facing booking interface that allows trainers to reserve, view, and cancel rooms independently.
- An administrator dashboard that provides a comprehensive view of all bookings, usage patterns, and system activity.

The system was rolled out to all trainers and has been in active use for several weeks at the time of writing. The booking system is accessible online at: <https://ttis.edu.gov.bt/student-services/bookclass/> (Sarki, 2026).

5.4 Data Collection Methods

Data for this study were gathered through three complementary methods:

- **Admin Observation and Usage Logs:** The researcher monitors the system through the administrator dashboard on a regular basis, observing login patterns, booking behaviours, and any anomalies or recurring issues.
- **Booking Frequency Data:** The system generates quantitative data on the number of bookings per room, the distribution of bookings across the day, and the frequency of cancellations. This data provides an objective picture of how spaces are being used.
- **Informal Interviews:** Conversational exchanges with trainers have been used to gather qualitative insights into their experience of the system — what they find helpful, what they find frustrating, and what they believe could be improved.

6. Findings and Discussion

Although the system is still in its early stages of deployment, the data gathered so far offer a meaningful and encouraging picture of its impact. The following sections present the key findings, organized thematically.

6.1 Sample Booking Data: 18 March 2026

The table and chart below present a snapshot of classroom bookings recorded on 18 March 2026 — a representative sample day that illustrates how the system is being used in practice. This level of visibility into room usage was simply not possible under the previous informal arrangement.

Room	Trainer	Booked Slots	Available Slots	Utilization
Classroom A	Rada Wangmo	3 (9:00–12:00)	5 (12:00–17:00)	37.5%
Classroom B	Tashi Dorji Tamang	3 (9:00–12:00)	5 (12:00–17:00)	37.5%
Classroom C	Tandin HVM	3 (9:00–12:00)	5 (12:00–17:00)	37.5%
RAC	Nima Gyeltshen	1 (9:00–10:00)	7 (10:00–17:00)	12.5%
Conference Hall	—	0	8 (All day)	0%

Table 1: Classroom booking data for 18 March 2026, extracted from the system's administrator dashboard.

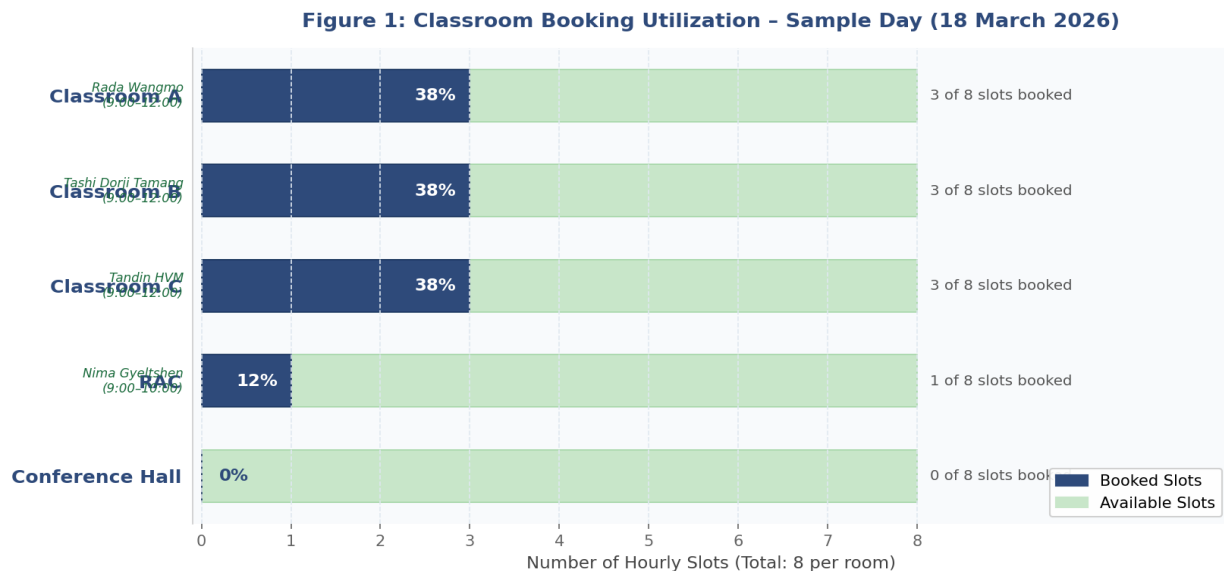


Figure 1: Classroom utilization rates based on booking data for 18 March 2026.

The data reveal several noteworthy patterns. Classrooms A, B, and C were each fully booked during the morning session (9:00–12:00), with individual trainers — Rada Wangmo, Tashi Dorji Tamang, and Tandin HVM respectively — occupying those spaces for three consecutive hours. The RAC room saw more limited use, with a single booking by Nima Gyeltshen in the first hour of the day. The conference hall recorded no bookings on this day, which is entirely consistent with its designated purpose: it is not a general-use classroom, but a dedicated venue reserved for important internal institutional meetings and for external organisations that hire the facility for their own purposes.

These patterns are themselves informative. The concentration of bookings in the morning hours suggests that trainers prefer early scheduling, leaving afternoons largely available — a pattern worth monitoring to understand whether afternoon slots are genuinely less needed, or whether there are barriers to afternoon bookings that the system could help address. The conference hall's absence from the day's bookings, meanwhile, reflects the system working exactly as intended: its access is appropriately controlled, ensuring it remains available for the occasions that warrant it.

6.2 Reduction in Scheduling Conflicts

Perhaps the most encouraging early signal from the system's deployment is the feedback from trainers regarding scheduling conflicts. Through informal conversations, several trainers have reported that they no longer experience the frustration of arriving at a classroom only to find it already occupied — an experience that many described, prior to the system, as both disruptive and demoralising. Trainers have expressed that having a confirmed reservation gives them greater

confidence in planning their lessons in advance. It is important to be transparent about the evidentiary basis of this finding. Because no systematic record of scheduling conflicts was maintained prior to the system's implementation, it is not possible at this stage to quantify the reduction in conflicts or to compare pre- and post-intervention data with precision. The finding is therefore best understood as trainer-reported perception — a meaningful and legitimate form of qualitative evidence within an action research framework, but one that would be significantly strengthened by more structured data collection. A formal trainer survey, administered in the next cycle of this research, will be essential to substantiate this claim more rigorously.

6.3 Administrator Oversight and Institutional Insight

From the administrator's perspective, the system has transformed the way institutional spaces are managed. Where previously there was no reliable record of how rooms were being used, there is now a detailed, searchable log of every booking made. This has practical benefits in the short term — it makes it easier to resolve disputes and answer questions about room availability — but it also has strategic value in the longer term, enabling data-driven decisions about timetabling, space allocation, and future infrastructure planning.

6.4 Ongoing Challenges and Areas for Improvement

Honesty demands acknowledgment that the system is not yet perfect. Several challenges have emerged in the weeks since launch, and addressing them is an important part of the ongoing action research cycle:

- Bug fixes are still being worked through, with some trainers reporting occasional technical issues such as booking confirmation errors and interface inconsistencies. These are being addressed on a rolling basis.
- A small number of trainers have experienced difficulty navigating the system, suggesting that a brief onboarding session or a simplified user guide would be a worthwhile investment.
- The absence of a formal booking policy means that questions around cancellation procedures, no-show protocols, and booking etiquette remain unresolved. The system provides the infrastructure; institutional norms need to provide the framework.
- Feedback collection is ongoing, and a more structured approach — such as a formal survey — would yield richer and more comparable data than informal conversations alone.

7. Reflection

Reflecting on this process, what stands out most clearly is how much can be achieved when an intervention is genuinely aligned with a real need. The booking system was not developed because it seemed like a good idea in the abstract — it was developed because trainers were frustrated, time was being wasted, and TTI-Samthang deserved better. That alignment between the intervention and the problem it was designed to address is, in the researcher's view, the primary reason for its positive early reception.

At the same time, this experience has reinforced a lesson that action research practitioners often learn the hard way: implementation is only the beginning. A digital system, by its nature, requires ongoing attention — to the bugs that inevitably emerge, to the users who need support, and to the data that accumulates and demands interpretation. The current phase of bug fixing and feedback collection is not a distraction from the research; it is the research.

Looking back with the benefit of even a few weeks of experience, the researcher would also acknowledge the value of having more formal data collection mechanisms in place from the outset. The absence of pre-intervention baseline data — particularly a record of how frequently scheduling conflicts occurred before the system was introduced — is the most significant methodological gap in this study. It means that while trainers perceive the situation to have improved, this perception cannot yet be corroborated with comparative evidence. This is not an unusual limitation in practitioner action research, where interventions are often implemented in response to urgent institutional needs rather than as part of a carefully pre-planned study. Nevertheless, it is a limitation that must be honestly acknowledged, and one that the next research cycle will be designed to address through structured pre- and post-intervention data collection.

8. Recommendations

On the basis of the findings and reflections presented above, the following recommendations are offered for the next phase of this action research cycle:

- Develop and deploy a digital Classroom Booking System (Version 1.0) as the primary institutional response to the identified problem of unmanaged shared training spaces. The system should enable trainers to reserve rooms on an hourly basis, provide real-time availability, and give the administration full visibility over room usage across the institution.
- Develop and disseminate a Classroom Booking Policy that establishes clear expectations around advance booking requirements, cancellation procedures, and consequences for no-shows. The technical system and the institutional policy need to work together.
- Administer a formal trainer satisfaction survey to systematically capture perceptions of the booking system's usability, reliability, and impact on day-to-day scheduling. This will provide a more rigorous evidence base than informal conversations alone.
- Conduct a brief orientation session for trainers who are less comfortable with the system, ensuring that all users are able to make full use of its features.
- Continue to analyse peak usage data with a view to identifying whether current booking windows and slot configurations are meeting demand, and whether adjustments are needed.
- Develop Version 2.0 of the system by incorporating feedback gathered from the trainer satisfaction survey, with particular focus on improving the user interface and introducing features such as automated booking reminders and cancellation notifications.

9. Conclusion

This action research paper has demonstrated, in a practical and grounded way, how a targeted digital intervention can address a persistent institutional problem. The Classroom Booking System developed and deployed at TTI-Samthang has already begun to change the way trainers and administrators relate to the institution's shared spaces. Where there was once uncertainty and conflict, there is now a clear, transparent, and accessible process for reserving rooms — one that respects trainers' time and supports the institution's core mission of quality training delivery.

The data gathered so far — including the sample booking records from 18 March 2026, which show active and organized use of the system across multiple rooms — provide early but meaningful evidence that the intervention is working. The morning booking pattern visible in that data, with three classrooms each fully reserved for the same three-hour block, reflects precisely the kind of coordinated, advance planning that the system was designed to encourage.

There is, of course, more to be done. The system needs further refinement, the institutional policies that should accompany it need to be developed, and the data needs to be collected more systematically. Most importantly, the third research question — to what extent the system has reduced scheduling conflicts as perceived by trainers — remains to be answered in Cycle 2, once the trainer satisfaction survey has been administered and its results analysed. That next cycle is not a distant ambition; the survey instrument is already designed and ready for deployment. The foundation of this study is strong, and the direction is clear. Cycle 2 will build directly on what has been established here, and it is anticipated that the richer, more structured data it generates will allow for a far more rigorous and complete account of this intervention's impact.

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