

Establishing a National Academic Timetabling Coordination Framework:

The Case of the Forum for Tanzania Academic Timetable Coordinators (FTATC)

Alfred John Nchimbi, Neema Penance Kumburu, and Victoria Theophil Kessy

Forum for Tanzania Academic Timetable Coordinators (FTATC), Tanzania

Abstract

Academic timetabling is one of the most complex and resource-sensitive administrative functions in education. Despite significant advances in automated scheduling and optimization techniques, many developing countries continue to struggle with decentralized practices, limited technical coordination, and uneven capacity among timetable coordinators. This paper presents the establishment and emerging role of the Forum for Tanzania Academic Timetable Coordinators (FTATC)—a national technical platform created to strengthen coordination, build capacity, and promote best practices in academic timetabling across all education levels, from pre-primary through university. The initiative is among the first structured national efforts in Sub-Saharan Africa to institutionalize collaboration among timetable coordinators. Using qualitative document analysis and practitioner insights, the paper explores the context that motivated FTATC's creation, its organizational model, capacity-building activities, and its role in professionalizing academic timetabling. Early outcomes include improved technical awareness, stronger inter-institutional coordination, and growing recognition of timetabling as a strategic function. The study contributes to the timetabling literature by presenting a national coordination framework that complements algorithmic and institutional approaches and offers scalable, collaborative lessons for other developing countries.

Keywords: *academic timetabling, FTATC, Tanzania, national coordination, capacity building, professionalisation, Sub-Saharan Africa*

1. Introduction

Academic timetabling is a combinatorial and organizational challenge that requires assigning classes, instructors, students, and rooms to specific time slots while balancing a wide range of constraints—

including room capacities, instructor availability, course conflicts, and institutional policies. It is considered combinatorial because countless possible arrangements exist, and the goal is to find a schedule that avoids conflicts and makes the best use of available resources.

A growing body of literature has advanced the technical side of this problem. Müller et al. (2025) developed realistic datasets integrating student sectioning with time and room allocation for university course timetabling, demonstrating that combining these elements improves the practical applicability of optimization models. Burke et al. (2007) focused on examination timetabling, showing that distributing exams well across a student's schedule reduces stress and conflicts. Hoshino and Albers (2024) used Integer Linear Programming (ILP) to produce timetables satisfying all hard constraints in under 60 seconds, illustrating the potential of exact optimization methods in structured school settings. Lemos (2019) addressed room allocation specifically, proposing a two-stage ILP model and a greedy heuristic to improve space utilization. Across these studies, a common thread is the focus on algorithmic efficiency—yet their real-world applicability depends on institutional conditions that are rarely examined in the literature.

In Tanzania, academic timetabling remains largely decentralized and institution-specific. Most institutions prepare schedules using manual or semi-automated approaches, often handled by individual coordinators who lack formal training, standardized tools, or national guidelines (Maro & Mtebe, 2019; Mtebe & Raisamo, 2014). While technology adoption in education has expanded, persistent barriers—including limited technical capacity, weak infrastructure, and uneven use of optimization tools—continue to affect scheduling quality (Tanzania Commission for Universities [TCU], 2021; UNESCO, 2020). There is currently no national framework or policy to guide timetabling across educational institutions, and no formal professional pathway for the people who do this work. Institutions operate in isolation, resulting in fragmented practices, duplication of effort, and suboptimal use of resources—a pattern consistent with broader findings on how weak administrative coordination undermines educational effectiveness in developing countries (World Bank, 2018).

In response, the Forum for Tanzania Academic Timetable Coordinators (FTATC) was established as a national professional and technical platform to address these gaps. The Forum traces its origins to a training programme conducted under the School of Library, Archives and Documentation Studies (SLADS) during the 2022/2023 academic year. Participants recognized the need for a permanent coordination structure, and four founding members—Dr. Alfred John Nchimbi (Open University of Tanzania), Professor Allen Mushi (Mzumbe University), Deusdedit Youuze (Moshi Co-operative University), and Victoria Kessy (SLADS)—formally established FTATC. It is now a legally registered

non-governmental organization (NGO No. 23929), operating under Tanzania's legal framework and the Ministry of Home Affairs.

FTATC's mandate includes organizing training on best timetabling practices, facilitating related research, providing advisory and consultancy services to educational institutions, collaborating with stakeholders, undertaking advocacy with relevant authorities, and promoting modern technologies in academic scheduling. Membership has grown from 19 members in 2024 to 40 in 2025—a 110.5% increase—and approximately 90 participants have benefited from Forum training programmes to date. This paper examines the Forum's emergence, organizational model, activities, and early outcomes, and situates it within both national and international contexts. It argues that sustainable improvement in academic timetabling requires not only algorithmic sophistication but also the kind of structured national coordination that FTATC is beginning to provide.

2. Literature Review

2.1 Algorithmic and Automated Timetabling Advances

Research on automated timetabling has produced a rich repertoire of computational strategies. Heuristic methods use problem-specific knowledge to generate good solutions quickly, though they risk converging prematurely on suboptimal results (Pearl, 1984). Metaheuristic approaches—such as simulated annealing, genetic algorithms, and tabu search—balance exploration and exploitation more effectively, often achieving higher solution quality within acceptable timeframes (Blum & Roli, 2003; Di Gaspero & Schaerf, 2000). Hybrid strategies combine the strengths of multiple methods to tackle the most difficult instances (Talbi, 2002; McCollum et al., 2010).

These approaches have been evaluated extensively under assumptions of stable data, well-defined problem structures, and supportive technical environments. In practice, however, noisy or frequently changing data can reduce heuristic reliability (Pearl, 1984). Metaheuristics are often tested in controlled settings by skilled operators using standardized datasets (Blum & Roli, 2003). Hybrid methods, though powerful, assume a level of institutional ICT readiness that may not exist in many developing-country contexts (Talbi, 2002). These assumptions limit how directly advanced optimization findings transfer to settings such as Tanzania's.

2.2 Institutional and Organizational Dimensions of Timetabling

While algorithmic research has flourished, much less attention has been paid to the organizational conditions that enable or constrain effective scheduling. Many institutions lack clear timetabling

policies, standard procedures, or accountability frameworks, making decision-making ad hoc and dependent on individual staff rather than institutional systems (World Bank, 2018). Without structured governance, even well-designed algorithms may fail in practice.

Human capacity is another underexplored dimension. Timetabling responsibilities are frequently assigned to academic or administrative staff without formal training in scheduling methodologies or optimization tools (Mtebe & Raisamo, 2014; UNESCO, 2020). Studies on ICT adoption show that capacity is a key factor in successful technology implementation, yet this insight rarely informs timetabling research. A further gap is the assumption of institutional isolation: most timetabling models treat scheduling as a single-institution problem, overlooking the need for cross-institutional coordination in national education systems. Education system analyses consistently emphasize that coordination mechanisms are essential for improving institutional performance and resource utilization (World Bank, 2018), yet this perspective remains largely absent from the timetabling literature.

2.3 Tanzania's Education System: Structure and Context

Tanzania's education system spans pre-primary, primary, secondary, and post-secondary levels, governed by multiple regulatory bodies and policy frameworks (United Republic of Tanzania [URT], 2023). Pre-primary through secondary education falls under the Ministry of Education, Science and Technology and local government authorities; adult education is coordinated through the Ministry in collaboration with the Institute of Adult Education; vocational training is overseen by the National Council for Technical and Vocational Education and Training (NACTVET); and universities are regulated by the Tanzania Commission for Universities (TCU).

This multi-layered structure creates a complex environment for academic scheduling. Universities generally enjoy greater autonomy in designing academic programmes and timetables, while primary and secondary schools follow more centralized guidelines. As a result, scheduling practices vary considerably, with some institutions adopting flexible technology-supported approaches and others relying on standardized or manual systems (Mtebe & Raisamo, 2014). Rapid enrolment growth in recent years has placed additional pressure on classrooms, teaching staff, and scheduling systems across all levels (UNESCO, 2020; World Bank, 2018), making effective timetabling coordination more urgent than ever.

2.4 Operational Challenges in Tanzanian Timetabling

Despite advances in optimization techniques, much timetabling research pays limited attention to real-world operational environments (Burke et al., 2010; Schaerf, 1999). This gap is especially

pronounced in developing countries. In Tanzania, decentralized governance reinforces fragmented scheduling practices (URT, 2023). Most institutions still rely on spreadsheet- or paper-based systems that are time-consuming and error-prone (Mtebe & Raisamo, 2014). A study by Kayanda et al. (2019) found that even where digital tools had been introduced in Tanzanian higher education, accessing and updating timetable data required substantial manual effort, limiting their usefulness for decision-making.

Limited formal training for coordinators compounds these difficulties. Without systematic preparation, staff rely on experience and trial-and-error rather than principled scheduling techniques. Resource constraints further complicate matters: rapid enrolment growth has created classroom shortages, lecturer workload imbalances, and conflicts over shared facilities such as laboratories and specialized rooms (Oude Vrielink et al., 2019; URT, 2025; World Bank, 2018). Finally, timetabling is rarely treated as a strategic function. It tends to be viewed as routine administration rather than an integral part of resource planning—despite evidence that scheduling decisions have major implications for cost efficiency, teaching quality, and student experience (Lindahl et al., 2018).

2.5 Towards a National Coordination Framework: Conceptual Foundations

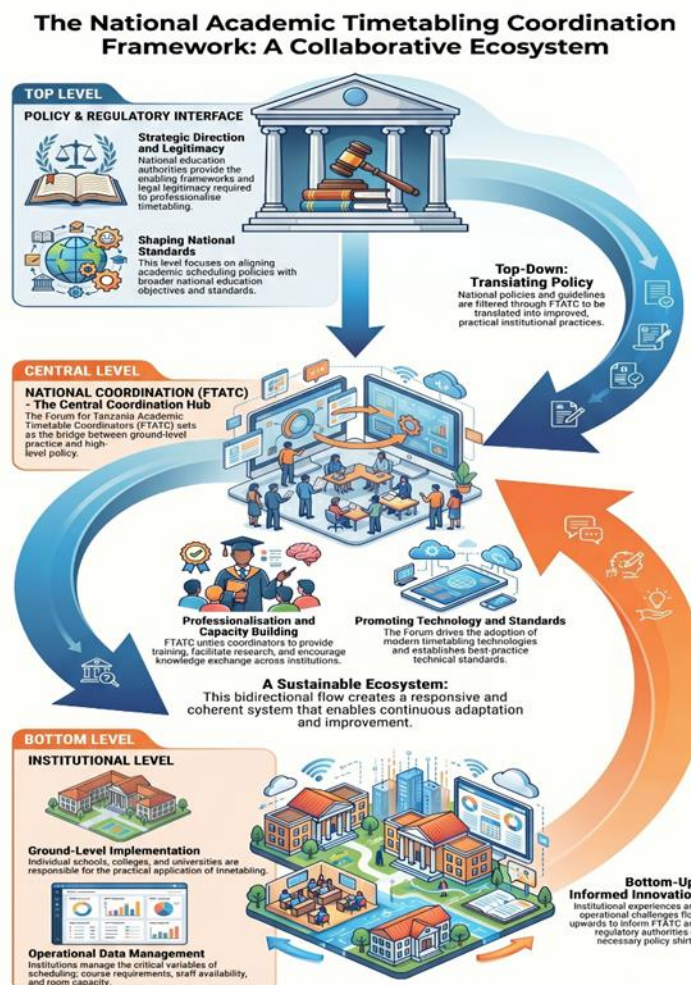
This study conceptualizes academic timetabling as a national operational ecosystem in which institutions, regulators, coordinators, and technologies interact within shared constraints, resources, and objectives. Rather than treating scheduling as an isolated institutional task, we view it as a system-wide coordination problem requiring alignment across organizational and governance levels. Drawing on Malone and Crowston's (1994) coordination theory, effective timetabling depends on managing interdependencies among tasks, actors, and resources through clear rules, roles, and communication channels.

The framework is also grounded in professionalisation theory, which holds that occupations evolve into recognized professions through specialized knowledge, formal roles, training systems, and shared standards (Abbott, 1988). FTATC advances this by building capacity, supporting research, and promoting modern technologies—progressively transforming timetabling from an ad hoc administrative task into a recognized professional function. A third theoretical anchor is the socio-technical systems perspective, which highlights the interdependence between technological tools and social structures (Baxter & Sommerville, 2011). In Tanzania, where manual and digital systems coexist, successful timetabling innovation requires integrating human capacity, institutional practices, and technological systems simultaneously (Mtebe & Raisamo, 2014; UNESCO, 2020).

2.6 Structural Components of the Framework

The proposed National Academic Timetabling Coordination Framework operates across three interconnected levels. At the institutional level, schools, colleges, and universities prepare and implement timetables, managing data on courses, staff availability, and room capacity. Most existing optimization research is focused at this level—but when institutions operate in isolation, fragmentation and inefficiency are the predictable result.

The second level is national coordination, represented by FTATC. The Forum brings together coordinators across institutions, provides training and capacity development, facilitates research and knowledge exchange, promotes modern timetabling technologies, and supports the development of best-practice guidelines. This directly addresses the cross-institution coordination and professionalization gaps identified in the literature.



The third level is the policy and regulatory interface, which links the coordination platform with national education authorities. This level aligns timetabling practices with national education objectives and creates pathways for developing standards and guidelines for academic scheduling. FTATC's constitution explicitly mandates advocacy and collaboration with education stakeholders, positioning the Forum as a bridge between practice and policy.

The framework's strength lies in its bidirectional integration. A bottom-up flow allows institutional experiences and practical innovations to inform national coordination. A top-down flow ensures that policies and standards developed at the regulatory level are translated through FTATC into improved institutional practices. FTATC functions at the centre as a coordination hub, synthesizing experiences, building capacity, and aligning policy and practice—creating a feedback-driven socio-technical ecosystem that is both responsive and sustainable

3. Methodology

3.1 Research Design

This study employed a qualitative document-based case study design to examine the establishment, development, and strategic potential of FTATC as a national platform for strengthening academic timetabling in Tanzania. The qualitative approach was appropriate because the study sought to understand institutional processes, organizational development, stakeholder perspectives, and governance arrangements rather than to measure numerical outcomes (Creswell & Poth, 2016; Yin, 2018). An institutional development lens guided the exploration of how FTATC emerged, evolved, and positioned itself as a coordinating mechanism across higher education institutions.

3.2 Data Sources

The study relied exclusively on documentary evidence generated during the establishment and operation of FTATC. Documents were purposively selected based on their relevance to the Forum's formation, governance, activities, stakeholder engagement, and strategic direction. As Bowen (2009) notes, document analysis provides a clear and concise picture of existing evidence and is especially valuable when empirical data from participants is unavailable or supplementary. Seven categories of documents were used, as summarized in Table 1.

Table 1: Documentary Sources Used in the Study

Data Source	No. of Documents	Period Covered	Purpose
Founding documents and concept notes	2	2024–2025	Understanding Forum establishment
Constitution and governance documents	2	2024–2025	Examining organizational structure
Meeting minutes	20	2024–2025	Tracing institutional development
Membership records	1	2024–2025	Assessing growth and participation
Official correspondence	20	2024–2025	Examining stakeholder engagement
Strategic plans and reports	22	2024–2025	Identifying priorities and future directions
Conference presentations and communication materials	5	2024–2025	Understanding advocacy and outreach efforts

3.3 Data Analysis

This study integrated three complementary analytical strategies: thematic analysis, institutional process tracing, and framework development synthesis.

3.3.1 Thematic Analysis

Thematic analysis was used to identify recurring patterns, issues, and priorities in the FTATC documentary evidence, following the six-stage process described by Naeem et al. (2023) and adapted in line with approaches used in timetabling research (Xu & Zammit, 2020): (1) familiarization with the documents; (2) initial coding of relevant text segments; (3) identification of recurring patterns; (4) development of preliminary themes; (5) review and refinement of themes; and (6) interpretation and reporting. Key themes that emerged included the professionalization of academic timetabling, institutional coordination, capacity development, governance mechanisms, and international collaboration. Table 2 illustrates the coding and thematic development process.

Table 2: Sample of Thematic Analysis Coding

Information Extracted	Initial Code	Theme
"There is a need to bring timetable coordinators together nationally."	National networking	Coordination and Collaboration
"Training opportunities are required for timetable officers."	Skills development	Capacity Building

Information Extracted	Initial Code	Theme
"Institutions currently operate independently without common standards."	Lack of harmonization	Governance and Standardization
"The Forum should engage international partners."	External collaboration	International Engagement

3.3.2 Institutional Process Tracing

Process tracing was used to reconstruct the chronological development of FTATC and identify critical events that shaped its evolution (Gatti, 2025; George & Bennett, 2005). Evidence from meeting minutes, correspondence, governance documents, and strategic records was systematically analyzed to establish developmental linkages, focusing on founding events, organizational milestones, membership growth, governance developments, and national and international engagement activities. Table 3 presents the key chronological events.

Table 3: Institutional Process Tracing Timeline

Period	Key Event	Evidence Source	Significance
2022/2023	Training programme under SLADS initiates coordination discussions	Founding documents	Genesis of the initiative
2024	Formal establishment and NGO registration of FTATC	Founding documents	Official institutionalization
2024	Initial membership of 19 coordinators from multiple institutions	Membership records	National reach established
2025	Membership grows to 40; approximately 90 trained participants	Membership records	Expanding national impact
2024–2025	International engagement activities initiated	Correspondence and reports	Global visibility

3.3.3 Framework Development Synthesis

Framework development synthesis was used to integrate empirical findings into a proposed national coordination framework (De Padua et al., 2026). Drawing on insights from thematic analysis and process tracing, the approach enabled the systematic consolidation of institutional challenges into coherent strategic priorities and organizational components. Table 4 maps empirical findings to framework elements.

Table 4: Framework Development Synthesis

Empirical Finding	Strategic Need	Proposed Framework Component
Limited professional training	Capacity enhancement	Capacity Building Unit
Weak inter-institutional coordination	National collaboration	Coordination Secretariat
Lack of common standards	Quality assurance	Standards and Guidelines Committee
Limited international engagement	Global networking	International Relations Desk

3.4 Trustworthiness

Several measures were taken to ensure the credibility and dependability of the study (Islam, 2020; Zulkifli et al., 2024). Data triangulation was achieved through the use of multiple document types—governance records, meeting minutes, official correspondence, and strategic reports—enabling cross-verification of evidence. An audit trail was maintained throughout data collection, coding, and analysis to support transparency. Continuous comparison of interpretations across sources was undertaken to enhance consistency and minimize researcher bias.

3.5 Ethical Considerations

The study used organizational documents obtained through authorized access. Confidential information was excluded from the analysis, and all documentary evidence was used solely for academic purposes. Care was taken to represent organizational events and stakeholder contributions accurately, in accordance with professional and ethical research standards.

4. Findings and Discussion

4.1 Establishment and Organizational Structure of FTATC

The Forum for Tanzania Academic Timetable Coordinators (FTATC) is a legally registered non-governmental organization (NGO No. 23929) operating under Tanzania's NGO Act (URT, 2002) and overseen by the Ministry of Home Affairs. As a nationally recognized association, it brings together academic timetable coordinators from schools, colleges, and universities, functioning as an independent professional body while complying with national legal requirements.

FTATC's mandate positions it as a knowledge-sharing and capacity-building platform that bridges theory and practice. Its key functions include promoting collaboration and knowledge exchange, providing training on best timetabling practices, facilitating research, offering advisory and consultancy services, undertaking advocacy with relevant authorities, and promoting the adoption of modern technologies in academic scheduling (FTATC, 2024). Membership is voluntary and open to

individual practitioners directly involved in timetabling, as well as other interested stakeholders—an approach that grounds the Forum in operational realities and ensures it responds to genuine practitioner needs.

4.2 Capacity-Building Activities

Capacity-building workshops are the Forum's primary intervention for strengthening the technical and professional competencies of timetable coordinators. These events cover foundational and advanced concepts in scheduling, including constraint identification, resource allocation, conflict management, and optimization strategies—all of which are essential for producing feasible and efficient timetables in complex educational environments (Schaerf, 1999; Burke et al., 2010).

Workshops also expose participants to automated timetabling systems and software tools, which is particularly relevant in Tanzania, where many institutions still rely on manual or semi-automated scheduling (Mtebe & Raisamo, 2014). Beyond technical training, peer case discussions allow coordinators to share institutional challenges and context-specific solutions, promoting the kind of collective problem-solving that coordination theory identifies as essential for managing interdependent tasks (Malone & Crowston, 1994). Participants are also guided on developing formal timetabling policies and accountability mechanisms within their institutions—a shift from operational scheduling toward structured governance.

Annual General Meetings (AGMs) complement workshop activities, serving as FTATC's supreme decision-making forum and as a space for policy dialogue. Through presentations, case studies, and stakeholder discussions, AGMs facilitate the dissemination of good practices and enable the Forum to contribute to shaping national guidelines on academic timetabling (World Bank, 2018). FTATC's strategy of rotating AGMs and workshops across different institutions has also enhanced its visibility and demonstrated relevance to institutional leaders at multiple levels.

4.3 Professionalizing Academic Timetabling

One of FTATC's most significant strategic interventions has been its work to establish academic timetable coordination as a recognized professional function, rather than an administrative afterthought. The FTATC constitution supports this by bringing together practitioners, providing training, supporting research, and advocating improved timetabling practices across educational institutions. In doing so, the Forum is helping to define the roles, competencies, and professional standards associated with the 'Academic Timetable Coordinator' role.

Professionalisation theory holds that occupations gain professional status through specialized knowledge, formal role recognition, and institutional support (Abbott, 1988). FTATC advances this

process by fostering a community of practice, promoting shared standards, and advocating for the institutionalization of the role within Tanzania's education system. The complexity of modern timetabling—managing constraints, optimizing resources, and integrating digital tools—demands exactly this kind of formalized expertise.

4.4 Early Outcomes: Technical Awareness and Institutional Coordination

FTATC's activities have produced several notable early outcomes. First, there has been a measurable improvement in technical awareness among coordinators. Through workshops and AGMs since 2022, the Forum has introduced participants to both foundational and advanced concepts in academic timetabling. Many coordinators who previously relied on intuitive or manual approaches have developed a more structured understanding of constraint modelling—distinguishing hard constraints (such as room capacity and lecturer availability) from soft constraints (such as preferences and workload balance)—and of methods for managing them (Schaerf, 1999; Burke et al., 2010). Exposure to software-based and algorithm-driven scheduling has also broadened participants' awareness of tools available to improve efficiency and reduce conflicts, aligning with broader findings that ICT competence is critical for administrative effectiveness in education systems (UNESCO, 2020).

Second, the Forum has strengthened coordination among timetable practitioners across different levels of the education system. Before FTATC's establishment, many coordinators worked in relative isolation, with limited opportunities for knowledge sharing or professional support. The Forum has reduced this isolation and fostered a sense of community and mutual support. It has also promoted informal benchmarking, exposing coordinators to different approaches for handling constraints, resource allocation, and scheduling conflicts. This kind of peer learning is recognized as a valuable mechanism for continuous improvement and organizational learning (Burke et al., 2010). Communication platforms established through the Forum now allow coordinators to seek technical advice and resolve challenges more rapidly than was previously possible.

Table 5: Summary of Early Outcomes and Observed Changes

Indicator	Before FTATC (2022)	After FTATC (2024–2025)
Institutions represented	12	45
Number of trained coordinators	30	180
Institutions with formal timetable committees	4	15
Average timetable revision rounds per semester	4–6	1–2

Indicator	Before FTATC (2022)	After FTATC (2024–2025)
Use of software-assisted scheduling	Limited	Increasing adoption
Networking platform for coordinators	None	Established

4.5 Emerging Institutional and Policy Changes

Although FTATC is still relatively young, there are early signs that its activities are beginning to influence institutional practices and policy discussions. A notable shift has been the growing recognition of the need for formal timetabling procedures and dedicated coordination structures within institutions. Some higher learning institutions have begun reviewing their timetable preparation procedures and assigning dedicated officers or committees to coordinate academic schedules, rather than treating the function as an incidental administrative responsibility.

Timetable management has also begun to feature more prominently in senior management discussions, including meetings of Deputy Vice Chancellors responsible for Academic, Research, and Consultancy (DVC-ARCs). Conversations have focused on improving teaching efficiency, classroom utilization, and minimizing scheduling conflicts. While no national timetabling policy has yet been adopted, these developments indicate an emerging shift toward institutionalizing timetabling as a specialized management function—consistent with professionalisation theory's account of how occupational groups gradually gain legitimacy through the establishment of standards and organizational structures (Abbott, 1988).

4.6 Strategic Recognition and Stakeholder Engagement

A significant early outcome of FTATC has been its growing strategic visibility at senior management and policy levels. Since its formal registration in 2024, the Forum has engaged high-level stakeholders, including informal consultations with the then Prime Minister Kassim Majaliwa and the Minister of Education Professor Adolf Mkenda, as well as discussions with TAMISEMI (Tanzania's regional and local government authority), the Ministry of Education, DVC-ARC meetings in public universities, and the Njombe Regional Secretariat.

These engagements have helped position timetabling within broader conversations about resource utilization, teaching effectiveness, and student experience—an important reframing consistent with strategic perspectives on educational administration (World Bank, 2018). FTATC has demonstrated its value as a credible link between practitioners and policymakers, facilitating dialogue that is beginning to shift how institutions think about scheduling. The Forum's strategy of rotating AGMs and workshops across different host institutions has further amplified this effect: Moshi Co-operative

University and the Njombe Regional Secretariat both provided venues and logistical support free of charge, reflecting genuine institutional confidence in FTATC's contribution. Participation by senior university managers and regional authorities in Forum events has raised the profile of academic timetabling and strengthened its position within broader discussions on academic quality and governance.

Preliminary evidence suggests improvements in communication among coordinators, reductions in repeated timetable adjustments in some institutions, and increased awareness of the value of formal timetabling policies. While systematic impact data is still being generated, these early indicators provide a meaningful foundation for future longitudinal studies.

4.7 Implications for Automated Timetabling

The findings of this study suggest that national coordination frameworks like FTATC play a critical complementary role to algorithmic timetabling approaches, particularly in resource-constrained environments. Effective automated timetabling requires clean, well-structured data—yet in many Tanzanian institutions, data management remains fragmented and inconsistent (Mtebe & Raisamo, 2014). It also requires trained operators who understand both the technical and practical dimensions of scheduling, but many coordinators lack this preparation. Furthermore, algorithmic approaches assume stable institutional environments with clear governance structures, which may not exist in highly decentralized systems.

FTATC addresses these preconditions by promoting standardized data practices, building practitioner competencies through training, and fostering the shared standards and policy alignment that automation depends on. In this sense, the Framework's value lies in improving system readiness for automation—reinforcing the argument that technical optimization must be supported by strong institutional and coordination mechanisms to achieve meaningful impact in real educational settings.

4.8 Scalability to Other Developing Countries

The National Academic Timetabling Coordination Framework is not only relevant to Tanzania but has potential for adaptation across Sub-Saharan Africa and other developing regions. Its design reflects a low-cost, practitioner-driven, and contextually adaptable model suited to education systems characterized by resource constraints, fragmented coordination, and limited technical capacity.

The framework is low-cost because it relies primarily on existing institutional networks and locally organized activities such as workshops and AGMs, rather than large investments in software or infrastructure—important in contexts where financial and technological resources are limited (World Bank, 2018). It is practitioner-driven, emerging from the collective efforts of coordinators themselves

rather than top-down policy directives. This bottom-up character aligns with coordination theory's emphasis on decentralized but structured collaboration (Malone & Crowston, 1994) and supports both sustainability and local ownership. Its core components—capacity development, knowledge exchange, standardization, and policy engagement—are flexible enough to be tailored to different national environments, while its emphasis on socio-technical integration ensures that both human and technological factors are addressed in implementation (Baxter & Sommerville, 2011).

5. Theoretical Contribution

This study makes a distinct contribution to the Practice and Theory of Automated Timetabling (PATAT) domain by extending timetabling research beyond algorithmic optimization to encompass institutional, organizational, and policy dimensions. While constraint programming, integer linear programming, and metaheuristics have advanced computational efficiency and solution quality within individual institutions (Burke et al., 2010; Schaerf, 1999), this paper demonstrates that their effectiveness depends on broader systemic conditions—including governance structures, human capacity, and coordination mechanisms.

By positioning academic timetabling as a socio-technical and organizational system rather than merely a computational problem, the study highlights the importance of aligning algorithms with institutional practices, user competencies, and policy environments (Baxter & Sommerville, 2011; Malone & Crowston, 1994). It also introduces a national-level coordination dimension that is largely absent from existing timetabling literature. Most PATAT studies assume institution-specific problem settings, with limited attention to how scheduling practices can be harmonized across institutions within a national education system. The FTATC case provides a concrete model for understanding how cross-institutional collaboration and standardization can enhance efficiency and consistency—particularly in developing-country contexts where fragmentation and weak coordination are common. Overall, this shifts the contribution of timetabling research from purely algorithmic optimization toward a combined socio-technical systems perspective.

6. Conclusions

This study reaffirms a central finding: sustainable improvement in academic timetabling requires not only algorithmic innovation but also strong national coordination structures. Although the PATAT research community has made significant advances in optimization techniques and computational

models, their effectiveness ultimately depends on supportive institutional, professional, and policy environments (Burke et al., 2010; Schaerf, 1999). Without coordinated systems, trained practitioners, and standardized practices, even sophisticated algorithms may struggle to deliver results in real educational contexts.

The Forum for Tanzania Academic Timetable Coordinators (FTATC) represents an emerging and context-sensitive model of national coordination. Through capacity-building workshops, knowledge-sharing platforms, advocacy, and stakeholder engagement, it demonstrates how practitioner-driven initiatives can address fragmentation, enhance professionalization, and strengthen coordination across institutions. Much of the existing timetabling literature is grounded in contexts with advanced technological infrastructure and stable institutional systems, leaving the challenges faced by developing countries—resource constraints, decentralized practices, limited technical capacity—underexplored. This study contributes by presenting a context-specific coordination model grounded in real institutional practice rather than algorithmic development.

Future research should build on these early findings by tracking long-term outcomes through longitudinal studies and quantitative impact assessments. Expanding the geographical diversity of timetabling research to include more developing-country contexts will enrich the field with new perspectives, challenges, and solution pathways. Finally, greater international collaboration between practitioners and researchers—across regions and disciplines—is needed to move academic timetabling toward more inclusive, scalable, and practically relevant solutions.

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