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Challenges and Insights from Remote Construction Administration in a Developing African Country: The Case of Malawi

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Through a case study utilizing qualitative data, this paper investigates the challenges of remote construction administration and the communication barriers between the EWB-KSU student chapter, local contractors, and community stakeholders that led to structural non-conformance in a Malawi, Africa two-classroom school building project. The purpose of this study is to evaluate the specific technical failures, such as improper soil compaction, incorrect steel reinforcement placement, and faulty truss splicing, while demonstrating how navigating these setbacks provides essential professional and technical growth for future architecture, engineering, and construction (A/E/C) practitioners. The results of the case study indicate that these setbacks served as a critical source of lessons learned to improve the management of not only future EWB-KSU projects but also any international project in a developing country.

Keywords: Remote Construction Administration, Developing Country Construction, Engineers Without Borders

Introduction

Effective communication is the key to a successful construction project, a truth that became especially vital during remote construction administration (CA) for a two-classroom school building in a remote northern region of Malawi, Africa. The Engineers Without Borders – Kansas State University (EWB-KSU) student chapter led the design and fundraising effort for this new school building. The chapter's remote CA model relied heavily on weekly photographic updates and brief written summaries from both the local contractor and village representatives. However, a persistent lack of timely, consistent communication with both the contractor and the village representatives presented significant challenges during the construction process. In addition, the village's dire need for a new school, combined with the lack of in-person oversight, compounded challenges, and led to systemic failures in remote quality control and verification. This paper aims to address the specific administrative and technical problems the chapter encountered and the subsequent lessons learned by the 10–15 active student members, all of whom were enrolled in programs within the College of Engineering. By navigating these multifaceted global challenges, the students successfully worked toward the full range of ABET Student Outcomes 1 through 7 (ABET, 2024). These efforts were supported throughout the project by a dedicated Responsible Engineer in Charge (REIC) who mentored the students and accompanied the travel teams, consisting of five students in May 2023 and four in May 2025, on both international trips.

Methodology

The research followed a qualitative case study design to investigate the complexities of the EWB-KSU project, utilizing diverse data sources to identify the root causes of construction non-conformance. The methodology involved a systematic review of project archives, including electronic correspondence, meeting minutes, and field reports, supplemented by a comprehensive site visit for first-hand observation and physical assessment. These qualitative insights were analyzed alongside photographic evidence to compare the original construction documents with the as-built conditions. Through this interpretive analysis of communication logs and structural deviations, the study identified critical administrative "points of failure" and synthesized these findings into a set of lessons learned. This process not only documented the technical setbacks, such as soil compaction and steel reinforcement errors, but also evaluated the pedagogical impact of the project, establishing a framework of best practices to guide the management and communication strategies of future international student-led engineering initiatives.

Literature Review

This literature review examines key academic and organizational findings across three distinct, yet highly relevant, areas of project management: the challenges inherent in remote CA, the specific systemic difficulties encountered during CA in developing countries, and the cumulative lessons learned from other Engineers Without Borders (EWB) projects. The synthesis of these sources is critical for contextualizing the administrative and technical failures experienced by the EWB-KSU student chapter. This review was conducted to determine if the observed communication and quality control issues were unique to this project or reflected broader systemic hurdles inherent in remote construction within developing nations.

Remote Construction Administration

Remote construction projects are inherently complex due to the extensive physical distance between stakeholders, which frequently leads to a significant loss of control over communication and management (Sidawi, 2012). This complexity is evidenced in communication and coordination challenges, where the vast and dispersed nature of worksites compounds logistical risks and escalates the consequences of minor errors, such as miscalculating material needs (Usman & Ibrahim, 2015). Furthermore, remote management often suffers from information overload caused by the excessive use of unorganized tools like email, leading to decreased transparency; therefore, effective management requires concise communication focused on critical correspondence rather than a simple increase in overall contact (PBSRG, 2021). Quality and cost control also present significant hurdles, as quality assurance is frequently compromised when the owner’s representative cannot provide frequent monitoring, and the scarcity of local resources often limits competitive bidding (Usman & Ibrahim, 2015). These infrastructure and technology gaps are particularly prevalent in sub-Saharan African countries (as was the case for this EWB project), where high costs and unreliable power supplies hinder the adoption of digital management tools (Ibrahim et al., 2024).

Construction Administration in Developing Countries

The challenges of remote projects are often exacerbated in the context of developing nations, where systemic socio-economic factors introduce further complexity (Ofori, 2000). Financial and managerial issues consistently emerge as critical causes of delay, including late progress payments by the owner or client, as well as contractors' persistent cash flow problems, improper planning, and poor site management (Saiful Islam & Trigunarsyah, 2017). These issues are further compounded by institutional weaknesses, chronic resource shortages, and a lack of skilled workforces (Ofori, 2000; Saiful Islam & Trigunarsyah, 2017). Furthermore, regulatory structures and project management systems in these regions are often inherited from former colonial administrators, which may bear no relation to local culture or administrative systems, leading to a significant lack of cultural appropriateness in procurement and management (Boadu & Sunindijo, 2020). Finally, intense pressure from the owner or community to complete projects quickly often forces contractors to compress timelines without adequately prioritizing quality (Abu Aisheh, 2021). This broader industry trend and the preceding issues were directly reflected in the EWB-KSU project, where the community's urgent need for the school facility led them to overlook significant construction flaws.

Existing EWB Projects

Engineers Without Borders (EWB) organizations maintain extensive databases of lessons learned, confirming that sustainable outcomes require a heavy focus on non-technical, administrative, and relational project aspects. A primary pillar of success is community partnership and ownership, as projects must be community-driven and require local stakeholders to contribute a portion of construction costs, typically 5%, alongside in-kind contributions to ensure long-term accountability (EWB-USA, n.d.-b). The literature emphasizes that building local expertise through hands-on training and shared problem-solving is essential so that the community can independently adapt and maintain the solutions (EWB-USA, n.d.-b). While EWB-KSU attempted to introduce alternative construction efficiencies, the contractor remained committed to established local practices, frequently asserting, ‘This is how we build in Malawi.’

Knowledge transfer and training are deemed critical when they address non-technical issues like planning and community expectations, yet a frequent lesson learned is the failure to thoroughly consider in-country variables before the design and travel phases (EWB-USA, n.d.-a). This underscores the necessity of training local partners, such as NGOs and community leaders, on proper documentation methods and project standards so they can serve as effective on-site monitors (EWB-USA, n.d.-a). Finally, project success depends on structured communication and vetting to mitigate risk early, ensuring that designs are feasible and materials are locally available (EWB-USA, n.d.-b; PBSRG, 2021). The lack of involvement with contractor vetting, as experienced by the EWB-KSU chapter, directly contradicts these established needs for early and careful risk management.

EWB Project

Background Information

In 2021, the village of Ifumbo (a remote region of northern Malawi, Africa, near the Tanzanian border) applied to EWB-USA for assistance to address severely degraded primary school facilities that had left nearly 700 children learning in deteriorated structures. The original school structures (two of them), built in 1947 with fired clay brick walls and metal roofing, remain in use today and are shown in Figure 1. Compounding the issue, all three current school buildings, including a block constructed in 2012 for grades 7 and 8, lack critical basic components such as functional doors, window shutters, electricity, and paint due to persistent funding barriers. Furthermore, two of the buildings lack serviceable desks for students, forcing them to sit on the ground. These existing buildings do not provide enough space, so classes are often taught outside, weather permitting, in rotating shifts, or canceled entirely when the weather is troublesome. As enrollment increases, the need for safe, spacious, and effective learning environments is a high priority.

EWB-KSU adopted the request in September 2022, partnering with the Ifumbo Village Development Committee, the Chitipa District Council, and the NGO Make a Difference Africa (MADAF). Although the village successfully selected a local contractor in Spring 2023, this occurred before the chapter's May 2023 assessment trip to gather site data and discuss needs with the village in person. Following this assessment trip, the chapter spent the period from July 2023 to October 2024 designing a two-classroom school building with an integrated staff room and raising the necessary funds for labor and materials.

Figure 1. Deteriorated exterior and interior condition of the 1940s school building

Construction officially commenced in January 2025, marking the beginning of a challenging four-and-a-half-month period of remote CA. During this phase, the vast distance and discrepancies between local construction norms and the provided documents made enforcing design specifications difficult. Although a six-day implementation trip was conducted in May 2025 to perform an in-person evaluation of the work, communication barriers with village leadership and the local contractor persisted as a significant obstacle, as remote oversight resumed for the project's duration following the site visit. This paper examines the systemic failures in remote quality control that emerged from these conditions and the subsequent technical and professional lessons learned by the student chapter. The results of the case study indicate that these setbacks served as a critical source of lessons learned to improve the management of not only future EWB-KSU projects but also any international project in a developing country.

Design and Construction Documents

The new school building is a single-story, 23,100 mm by 8,000 mm structure, housing two classrooms and a central headmaster's office (see Figure 2 for layout). The classrooms, located on opposite ends, will collectively accommodate 120 students. Each classroom measures 9,240 mm by 7,600 mm and will be fully enclosed with doors and windows, and equipped with a blackboard and electric lighting. Entry to the building is via a covered porch, providing a small sheltered gathering space while protecting the three exterior doors (two classrooms, one office) from inclement weather. The structure's walls were built using 200 mm x 200 mm x 400 mm blocks with vertical reinforcing bars spaced throughout, supported by a concrete strip footing and finished with a concrete floor slab. The top portion of the walls features a reinforced concrete ring-beam that supports timber trusses. The roof is constructed with inverted box rib (IBR) corrugated metal sheets that bear on the trusses.

Interior and exterior finishes include wall plaster and paint, while the functional components of the building consist of external boarded doors, blackboards, and a simple electrical system for lighting and outlets.

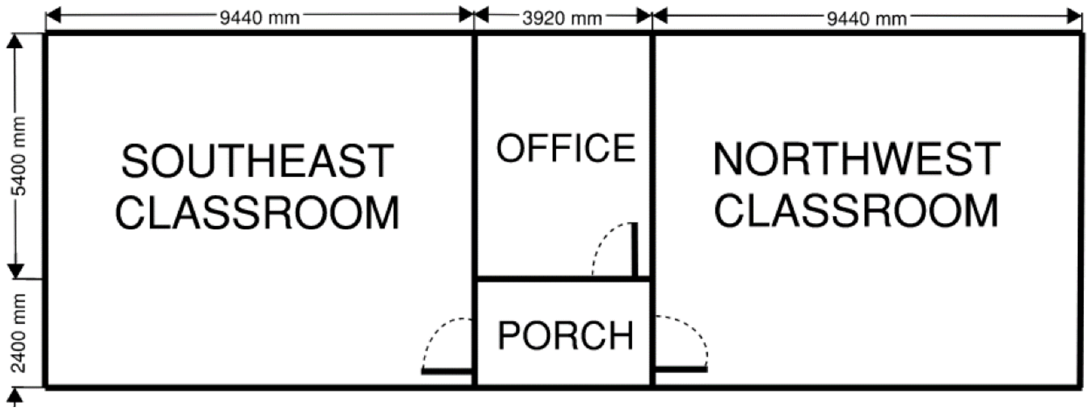

Figure 2. Layout of the new school building

The structural design closely adhered to the 2021 International Building Code, utilizing the allowable stress design method (ASD) for code checks. Specific structural codes referenced included ASCE 7-16, ACI 318-14, TMS 402/602-16, and the 2018 NDS. To ensure local compliance and resilience against natural disasters, the design also fully integrated local references, including the 'Safer School Construction Guidelines' and the 'Guidelines for Safer House Construction,' both produced by Malawian government departments. All drafting and quantity estimations were completed using Autodesk applications, with 3D-frame structural models developed in RISA.

The construction was systematically broken down into five distinct phases, as follows:

1. Site preparation
2. Foundation stem walls and concrete slab on grade
3. CMU walls and concrete ring beam
4. Roof trusses and metal roofing
5. Doors, windows, electrical, and interior finishes

Challenges Faced

Throughout the project, EWB-KSU faced numerous challenges with remote CA, many of which were exacerbated by a critical organizational decision made before the chapter's involvement. Specifically, EWB-KSU did not have input into the selection of the contractor, as the village and the NGO finalized this partnership before the chapter’s assessment trip in May 2023. This fundamental lack of control over the contractual relationship complicated all subsequent remote oversight efforts. The following list details the primary administrative and technical challenges encountered during construction:

- Financial Administration: The contractor was paid in full before the start of each construction phase, significantly limiting EWB-KSU's financial leverage for quality control and enforcement.
- Communication: Difficulty in receiving timely progress reports from the contractor, village representatives, or the NGO.

- Quality Control and Enforcement: Enforcing the construction documents proved challenging, resulting in non-conformance on key structural elements, including:
    - Site grading and soil compaction beneath the concrete slab
    - Proper placement of reinforcing steel in the CMU walls
    - Achieving the required depth of the concrete ring beam
    - Correct installation of splice plates on roof trusses

A significant challenge was the contractor's demand for full payment before the start of each phase to procure materials. This upfront payment structure immediately eliminated EWB-KSU's financial leverage for enforcing conformance to the construction documents. Compounding this, the transfer of funds was a lengthy process involving multiple institutions. While EWB-KSU intentionally delayed wiring funds until phases were verified, the resulting construction interruptions led the village to fear the project would stall. This anxiety eroded community confidence in EWB-KSU's timeline, causing local partners to expedite approvals based solely on the contractor's assurances and further deepening their distrust of EWB-KSU in favor of the more accessible contractor.

The administrative failures were worsened by intense community pressure. The dire need for the new school building led the community to prioritize speed over structural quality, often overlooking construction flaws and trusting the contractor's assurances to accelerate completion. Furthermore, local partners, the village, and the NGO, lacked the technical training and technology to identify problematic construction or prepare adequate progress reports. Updates were neither timely nor detailed; photos often provided broad site overviews but lacked the granular detail required to verify specific components or evaluate potential non-conformances. This lack of focused visual evidence prevented EWB-KSU from remotely identifying key issues and verifying that phases were completed, conforming to the construction documents.

Ultimately, enforcing the construction documents was the project's most significant hurdle. The contractor repeatedly claimed compliance with local Malawian building standards, but EWB-KSU could neither locate supporting documentation nor reconcile these claims with the actual construction. This non-conformance led to specific, high-risk technical failures, particularly in the substructure. The design required a berm to direct water runoff around the foundation, which the contractor omitted, risking negative long-term effects on the footings. More critically, the contractor's decision to use unverified infill on the low side (right side in Figure 3) inadvertently created a non-uniform and excessive lateral soil pressure load on the foundation stem walls. These deviations, combined with unverified compaction techniques, significantly increase the risk of differential settlement of the concrete slab and potential cracking of the foundation walls, posing a serious threat of structural failure if the surrounding soil is not properly placed and maintained. The original design called for the high side of the site to be completely cut down with no fill on the low side.

Figure 3. Locations where fill was needed

The superstructure exhibited the same non-conformance issues as the substructure. The contractor failed to follow proper placement techniques for reinforcing steel (rebar). As illustrated in Figure 4, rebar was often improperly installed between the CMU blocks rather than within the core of the masonry, a critical error observed at multiple locations.

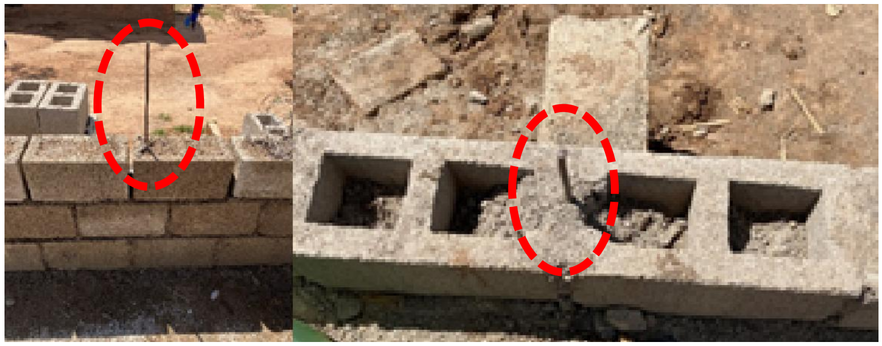

Figure 4. Examples of improperly placed vertical rebar

A key requirement of the Malawian building codes, supported by the 'Safer Building Construction Guidelines', is a concrete ring beam near the roof line to ensure the structure maintains a 'box-like shape.' Although the construction documents specified a depth of 300 mm, which would be 50% taller than the CMU's, photographic evidence (Figure 5) shows the contractor constructed the beam at a depth of only 200 mm (the same depth as the CMU blocks). When questioned, the contractor insisted that 200 mm was the standard depth.

Figure 5. Concrete ring beam depth is not 300 mm, but rather 200 mm

Finally, the contractor incorrectly installed the splice plates for the wooden roof trusses (Figure 6), suggesting a misunderstanding of this critical structural connection. Thus, tension forces in the bottom chords will not be transferred correctly. These cumulative shortcomings point to contractor negligence, which may stem from inadequate technical knowledge, a distinction difficult to resolve given the differences in cultural and standard building practices. Regardless of the root cause, these many fundamental failures are likely to compromise the building's long-term structural integrity and necessitate repairs much sooner than anticipated.

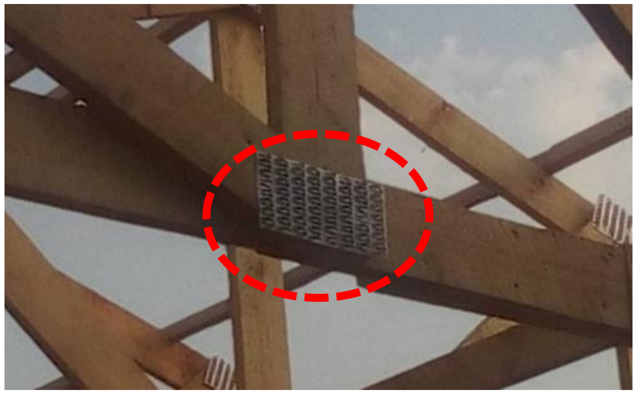

Figure 6. Improperly installed splice plates are not even connected to the tension member

Conclusions

To ensure the long-term safety of the facility, EWB-KSU is scheduling a final Monitoring & Evaluation (M&E) trip after May 2026. This trip is critical for an in-person investigation of all recorded construction flaws, allowing the team to plan and implement repairs for safety hazards and structural defects. To mitigate the immediate structural risks identified, specifically the long porch span combined with the shallow ring beam, EWB-KSU implemented a mitigation strategy by requiring a central masonry column at mid-span to reduce failure potential. Ultimately, while the research highlights significant administrative and technical setbacks, these challenges provided student members with career-shaping lessons directly applicable to the global architectural, engineering, and construction (AEC) industry. The following lessons learned are intended for anyone doing remote construction in a developing country. Hopefully, the results of the case study can improve the experience that others have with their remote CA.

Discussion

Lessons Learned for Future Projects

The EWB-KSU student chapter gained invaluable experience throughout the project, particularly by addressing the core research problem: the failure of remote CA and communication breakdowns that resulted in significant structural non-conformance. The student chapter experienced similar issues to those documented in the Literature Review section. The overriding lesson learned centered on the necessity of robust, proactive communication among all parties starting at the project's inception. Based on these experiences, the chapter has developed the following strategic suggestions for improving future project administration and avoiding the systemic failures encountered in Malawi that not only future EWB-KSU projects can use, but anyone can:

- Contractor Vetting and Selection: EWB-KSU must have direct input in the selection process, as the lack of early involvement was a root cause of downstream quality control issues.
- Phased Payment and Leverage: A staged payment model (e.g., 50% upfront, 50% upon verified completion) should be negotiated alongside quicker fund transfer systems to maintain the financial leverage necessary for quality enforcement.
- Local Oversight and Training (NGO): Projects should explicitly budget for the NGO to conduct periodic site visits and provide them with comprehensive training on technical documentation and reporting methods.

- Village Technical Education: The Village Development Committee (VDC) requires training on prioritizing structural quality over speed, including instruction on compiling detailed progress reports that focus on critical construction milestones.
- Pre-Construction Review: A mandatory, in-depth technical review of construction documents must be conducted with the contractor before breaking ground to align on details and adapt to local methodologies.

Lessons Learned to Attain Assessment Outcomes

Engagement in the EWB-KSU project provided a comprehensive platform for students to attain all seven ABET Student Outcomes (SO 1-7) by navigating the complexities of a real-world international assignment. Students solved complex engineering problems (SO 1) and applied engineering design (SO 2) as they adapted school structures to meet the specific environmental and logistical constraints of rural Malawi. The persistent communication barriers with the local contractor and village leadership required students to develop effective communication strategies for a variety of technical and non-technical audiences (SO 3). Because the project involved structural safety, international development ethics, and socio-economic sensitivity in a developing nation, students had to recognize ethical and professional responsibilities and judge the global impact of their engineering solutions (SO 4). The multidisciplinary nature of the task, integrating fundraising, logistics, and design, demanded effective teamwork and leadership within a collaborative environment (SO 5). Furthermore, the structural non-conformances identified during the May 2025 site visit and provided photographs forced students to develop and conduct appropriate experimentation and data analysis to troubleshoot as-built conditions (SO 6). Ultimately, by identifying and synthesizing the 'lessons learned' from remote administration failures, students demonstrated the ability to acquire and apply new knowledge as needed, fulfilling the requirement for ongoing, self-directed learning (SO 7).

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