



DOES LOCATION MATTER? TRACK AND TRACE (TnT) ADOPTION BY PRIMARY SCHOOL DIRECTORS IN CAMBODIA

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ABSTRACT

Cambodia's textbook supply chain experienced challenges with shortages, late deliveries, and inaccurate forecasting, impacting student learning. Track and Trace (TnT), a digital solution that streamlines the supply chain, was introduced in 2022. However, TnT was not implemented equally across schools. Therefore, this paper aims to (1) investigate school directors' challenges with TnT in urban versus rural areas and (2) examine the cause of those challenges. Sixteen semi-structured interviews were conducted with primary school directors and the District Office of Education across five provinces. An issue faced by all school directors is the disparities in acquiring digital tools and literacy. Connection issues are more prevalent among rural schools. Limited competency, inadequate training, and infrequent use of TnT contributed to the challenges. Further training should be provided, and the government should invest in improving digital infrastructure and technical support to assist the schools.

KEYWORDS

Technological Adoption,
Track and Trace (TnT),
Primary Education, Urban
and Rural, Cambodia

Introduction

While technology and diversified learning methods are gaining traction, textbooks remain indispensable in education, offering structured guidance and in-depth subject-specific content that fuels student learning and fosters critical thinking skills. Studies have demonstrably linked textbook availability to improved academic performance, particularly for students from developing countries and lower socioeconomic backgrounds (Oakes and Saunders, 2002). Research indicates that textbooks can significantly enhance classroom performance, reading comprehension, and knowledge retention. Echoing these impacts, Cambodia's Ministry of Education, Youth and Sport (MoEYS) has commendably prioritised improving textbook supply and utilisation, viewing it as a key pathway towards achieving inclusive and equitable education and empowering all students with lifelong learning opportunities (MoEYS 2019).

However, Cambodia's traditional textbook supply chain, encompassing planning and forecasting, title development, publishing and printing, procurement and purchasing, and distribution management, has faced challenges (Global Book Alliance 2022). Notably, the pre-existing system involved primary school directors manually forecasting and requesting textbooks for their schools, a process which was often time-consuming and prone to human errors. Printed textbooks were also not packed and delivered to each requested school on time (or occasionally at all), the consequences of which left students receiving textbooks late, and with errors in the order. Cambodia's limited infrastructure further slows the textbook delivery and distribution process from weeks to months. These delays have left rural schools struggling to provide textbooks to students at the start of the academic year (Bun et al. 2022; World Education 2020). In response to these issues,

a digital textbook management intervention, Track and Trace (TnT), was piloted. After initial success in increasing the efficiency of forecasting, real-time tracking, and post-delivery verification the system was then scaled up nationwide (World Bank 2020). Nevertheless, the adoption of such a complex digital intervention in a developing country like Cambodia also raises some concerns, especially whether the Kingdom has adequate capacity to utilise such innovative resources.

Technology adoptions in education: A path toward equity or disparity?

Globally, the adoption of digital technology has been rapidly increasing in all of Cambodia's key sectors, including education. Its integration has bridged the gaps (Burns 2023), offering students personalised learning (Alisauskiene et al. 2020), and fostering engaging learning environments (Otto et al. 2024). Technology has also increased the efficiency, transparency, and effectiveness of governance and performance within the education sector (UNESCO 2023). Similar to other countries, Cambodia has continuously tried to digitalise elements of the country's operations, including governance, economics, and finance. Evidently, in 2019, MoEYS introduced policies and strategies on information and communication technology (ICT), which emphasised five key strategic areas, including infrastructure and equipment, ICT support, human resource development, governance and management, and financing for ICT. An example of this policy implementation is the adoption of TnT in 2018 to help manage textbook supply nationwide. Utilising the emergence of internet coverage and Telegram (a mobile communication application), TnT helped MoEYS to successfully collect all textbook requests from 416 piloted primary schools within two weeks, a process which previously took months (World Education 2021). Impressed by its efficiency, MoEYS operationalised TnT nationwide in 2020 and entrusted Publishing and Distribution House (PDH) with system upgrades (MoEYS 2022). TnT's adoption was rapid. Over 95 percent of school directors had registered by 2020, and 50 percent used it to confirm deliveries in 2021 (World Education 2021).

While technology offers exciting possibilities for education, harnessing its full potential demands a balanced approach. Equity of access remains a critical challenge, with disparities in infrastructure, affordability, and digital literacy creating barriers for certain groups, especially those living in rural areas and having poor socioeconomic backgrounds (Phel et al. 2023; Choung and Manamela 2018; Fong 2009). This is also palpable throughout Cambodia's education system. Studies have consistently highlighted persistent problems with technology integration in Cambodia's education sector. Richardson (2011) found that the biggest challenges to integrating technology in Cambodian education were hardware incompatibilities, user complexity, language barriers, limited digital resources, insufficient training, and unclear understanding of the benefits of adopting digital technologies. Another recent study by Chea, Bo, and Minami (2022) on digital readiness at the secondary school level also highlighted similar challenges, including a lack of digital devices, limited digital literacy, and inadequate internet infrastructure. Corrado et al. (2019) and Meas et al. (2023) also echoed such findings in their studies. Taking such problems into account with the new adoption of TnT nationwide, a persistent concern reappeared for users, especially the school directors, regarding whether they are sufficiently prepared for such a digital adoption. This study aims to contribute to the current scarcity of literature on TnT and technology integration in Cambodia's textbook supply chain by capturing and comparing the experience of TnT users in urban and rural areas. Particularly, the paper will address the following questions:

- What were the challenges in using TnT? Did TnT users in urban and rural areas encounter those challenges similarly or differently?
- What are the factors that led to those challenges?

Methodology

The data collected for this study were retrieved from 16 semi-structured interviews, 6 of which were with the District of Education (DoE) officials and 10 were with primary school directors. Using

criterion sampling, interviews were conducted in both urban and rural areas (11 urban, 5 rural) across Phnom Penh, Banteay Meanchey, Monduliri, Prey Veng, and Sihanoukville province. Rural and urban distinctions were based on the 2011 Royal Sub-decree in Cambodia, the latest classification specifying the criteria for a place to be urban (NIS, 2012). All interviews were conducted in Khmer, translated and transcribed to English, and then analysed inductively via the qualitative analysis software, Nvivo, to generate themes in response to the two research questions.

Findings and discussion

Challenges

All participants reported encountering two major challenges in using TnT: limited understanding of the TnT system and inadequate digital access. Such findings corroborated the findings of Richardson (2011), Corrado et al. (2019) and Meas et al. (2023). However, this study found that the intensity of these challenges varied between schools in urban and rural areas.

Limited understanding of the TnT system

For the school director level, TnT is operated via Telegram chatbot, which has nine main features. These are (1) Registration for the School Directors, (2) Make Textbook Requests, (3) Confirm Textbook Receipts, (4) Check the Approved Number of Textbooks, (5) Register for a Class Inspector, (6) Inspect Classroom, (7) Learn How to Use TnT, (8) Report Problems, and (9) Delete an Account from TnT. Despite having many functions, all interviewed participants unanimously agreed that primary school directors from both urban and rural areas have a limited understanding of using all of the nine features in TnT. Besides the textbook request and confirmation, no other functions were well-understood or frequently used by the primary school directors from both areas. In some cases, school directors also requested other people who have better digital knowledge to help enter data or information into TnT on their behalf. For example,

I usually ask the teachers who gave me a link to me via Telegram, and then they explain to me how to do it. [School Director-Urban]

I have used the textbook request and confirmation function. That's it. [...] I don't really know much about how to use other functions. As I had mentioned, I usually go to the school cluster to fill it in for me. When they open it for me, I can fill it in because I'm not skilled in that area. [School Director-Rural]

To date, there are also a few school directors who do not understand what TnT is. When questioned about TnT, some said it is a mobile application, some did not know the full name or meaning, and some said that TnT was a program that used Google Forms.

Disparity in digital access

TnT is operated online, and therefore, an internet connection and a smartphone are prerequisites. Despite progress in Cambodia's digital infrastructure, there remains a disparity in digital access between urban and rural schools, the latter of which experience more challenges in accessibility.

Internet connection issues: this issue is threefold, including: the total absence of internet connection; slow internet, and; unstable connection status, all of which were reported to challenge the effective use of TnT. Both urban and rural primary school directors have raised the issue of an unstable and slow internet connection, which prolongs their data entry into the TnT system. Interestingly, none of the urban primary school directors were confronted with the issue of internet connection, but there were still rural primary school directors facing such challenges. This problem forced the directors to travel to other locations that had proper internet connection.

The problem that I face is the Internet. In my area, the Internet is slow, but unlike other schools, they have Wi-Fi. When the Internet is slow, it is difficult to send data and documents, which interrupts the flow of work. [School Director-Rural]

Lack of digital devices: In addition to the lack of access to the Internet, primary school directors from rural areas mentioned a lack of smartphones and laptops needed to access TnT. However, there was no mention from urban primary school directors regarding this issue.

Interviewed participants suggested some underlying factors that led to such challenges.

Underlying factors

Limited digital literacy, users' commitment, training on TnT, and the nature of TnT usage itself were attributed as the underlying causes of school directors' limited understanding of TnT. In addition to these, the disparity in digital infrastructure development was deemed as the main cause of inadequate digital access.

Limited digital literacy

The school directors in both urban and rural areas admitted that their digital illiteracy was limited, which may hinder their comprehension and usage of the TnT system. In the interviews, it was stated in both locations that senior school directors tend to struggle to retain digital information that they are taught or trained. Language barriers have also added complexity for using TnT among school directors in both areas. Although TnT's default language is Khmer, some initial steps to use TnT (plus other embedded features) are in English. Most of the primary school directors do not understand English. As was reported in Richarson's (2011) study, this digital literacy gap, particularly in terms of the language barrier, has left some end users frustrated and unable to utilise the full benefits of the digital intervention.

Lack of commitment

Lack of commitment to learning and using TnT is also an underlying factor leading to challenges in using TnT. Interviewed participants revealed how they themselves, and some other primary school directors, accept the fact that they are becoming seniors and perceived that it is difficult for them to learn something new or prepare for any digital adaptation. Thus, they would prefer to ask other people in the school to perform the digital tasks on

their behalf. Some school directors only use certain functions of TnT when there is a proper order or request from the ministry (MoEYS); otherwise, they will neither use nor explore other functions of TnT.

Honestly, I do only what they [MoEYS or printing house] demand. [School Director-Rural]

Other directors admitted that they usually receive messages about TnT in the Telegram group chat, but they did not get to visit them or read them in detail. Due to their busy schedule and other responsibilities, exploring more about TnT functions is considered by the school directors to be a burden.

Lack of training

The interviewed participants commented that since the operationalisation of TnT nationwide, only one training session has been conducted. Most of the participants were invited to the in-person training by PDH and MoEYS at their respective DOE and POE. However, some schools have only received online training for TnT via Zoom. Interestingly, while all the primary school directors from the rural schools had received some sort of training, either in-person or virtual, some directors from the urban areas mentioned that they did not receive any training at all. Those urban primary school directors only received instruction messages in Telegram.

I haven't received any training anywhere. I follow what the teacher on Telegram advises me to do. [School Director-Urban]

In addition, it was mentioned that the conducted training was more like a brief introduction to TnT rather than proper training. It was neither easy to keep up with content nor easy to understand the purpose and functions of TnT. The participants also commented that even the TnT trainers did not understand the system. This is well captured in the following quote.

There's been only one training so far, in which the trainer (DOE) presented to us via slideshow. They did not have a good understanding on TnT at the time. [School Director-Urban]

Guiding documents and videos on how to use different functions of TnT are available online. Nevertheless, there is little promotion or dissemination of the accessibility of these resources at the school level.

Lack of frequency in using TnT

ICT skills, indeed, can be acquired through proper training, but they can only be improved through investing time to use or practice those skills with relevant digital tools or systems (Richardson, 2011). Using TnT is no different. Nevertheless, most of the interviewed participants or school directors, in general, were only asked to use TnT once or twice per year to do textbook requests or confirmations. Hence, it is not only easy for them to forget how to use those two functions, but it is also not mandatory for them to either explore or use other functions in TnT.

I almost forgot (how to use TnT) because we only do it once a year unless the DoE reminds us that it is time to fill in the data for TnT again.
[School Director-Urban]

Lack of digital infrastructure

The majority of school directors identified that the cause of the disparity in digital access is due to the inadequate development of digital infrastructure throughout the country. In some rural areas, there is no electricity or phone antenna nearby; hence, connecting to the Internet to use TnT is not viable. Furthermore, there is no direct support from the government for schools to be equipped with digital devices or internet connections. Therefore, all related expenses for using TnT are the personal responsibility of the school directors. Notably, this situation is exacerbated by the different socioeconomic backgrounds of the school directors and the geographical locations of the schools.

Conclusion and recommendations

In conclusion, a limited understanding of TnT is a common obstacle for both rural and urban primary school directors in effectively utilising the system. However, in terms of digital access, rural primary school directors face a significantly more significant disadvantage due to the lack of digital infrastructure. This disparity includes limited or non-existent internet connection and limited support for obtaining digital devices required to use TnT. Addressing both the current challenges and root causes is crucial.

Based on the identified challenges and their underlying factors, it is recommended that a multifaceted approach be adopted to improve the usage of TnT among primary school directors in Cambodia. Firstly, comprehensive training programs should be developed to address the limitations in digital literacy and understanding of the TnT system. These programs should be tailored to the specific needs of rural and urban school directors, ensuring accessibility and effectiveness. Secondly, initiatives to strengthen digital infrastructure in rural areas are crucial. This includes expanding internet access and providing schools with an adequate number of necessary digital devices. Finally, fostering a culture of continuous monitoring and evaluation is essential to track progress, identify areas for improvement, and ensure the sustained and effective use of the TnT system across all Cambodian primary schools.

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