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Original Research Article

Developing a smartphone-based training strategy for tobacco control in India: a formative study using consolidated framework for implementation research

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ABSTRACT

Background: Tobacco free teachers-tobacco free society (TFT-TFS) is an evidence-based intervention (EBI) for making schools tobacco-free. Because scaling via in-person training has limitations, we conducted a formative study to develop a smartphone-based training strategy for TFT-TFS implementers in Madhya Pradesh (MP), India.
Methods: We conducted key informant interviews (KIIs), focus group discussions (FGDs), and school observation visits in four districts of MP, India. We applied framework analysis guided by the consolidated framework for implementation research (CFIR).
Results: Identified facilitators were from the domains: Innovation (a gamified Android app), outer setting (government campaigns, technological familiarity), inner setting (official permissions, WhatsApp groups, compliance with tobacco control guidelines, training feasibility), and individuals (smartphone access, implementers designated by principals). Barriers were from the outer setting domain, which included additional government tasks, smokeless tobacco use, alcohol consumption, pan masala advertisements by celebrities, and lack of statutory warnings on 'over the top' contents delivered over the internet.
Conclusions: Understanding contextual factors is crucial for successful program implementation. The contribution of CFIR was instrumental in tool development, data analysis, training design, and TFT-TFS implementation.

Keywords: Smartphone, Training, Tobacco control, Schools, Implementation, Contextual factors, CFIR

INTRODUCTION

Tobacco use is the single most avoidable cause of premature death, causing over 8 million deaths per year. About 80% of the world's 1.3 billion tobacco users live in low and middle-income countries (LMICs).[1] Study teams from India and the U. S. (referred to as the study team) developed and tested TFT-TFS, a school-based tobacco control intervention, in a cluster-randomized study in Bihar, India.[2-6] We structured the program around six monthly themes, engaging both users and non-users by positioning teachers as role models. It aimed to help tobacco users quit, provide teachers with knowledge and skills to support others in quitting tobacco, and implement school tobacco control policies. Results showed a 50% cessation rate in intervention schools versus 15% in control schools.[2] The success of any EBI like TFT-TFS depends on the training of the implementers. However, in-person training poses challenges, including time and resource demands, logistical issues, and variations in trainer communication and expertise, potentially compromising content fidelity at scale.[7-10] Smartphone-based training can overcome these barriers by replacing

didactic lectures with flexible, asynchronous learning.[11] This prompted the development of a smartphone-based training strategy for implementing the TFT-TFS program in schools, enabling faster outreach to more trainees, particularly in under-resourced areas with high tobacco use. We will test this smartphone-based training strategy in MP, India, to scale up the TFT-TFS program. This paper assesses contextual factors before developing a smartphone-based training strategy for TFT-TFS implementers in MP, India, using the CFIR.[12,13]

METHODS

An exploratory formative study was conducted to assess the feasibility of developing a smartphone-based training strategy for school principals and teachers (referred to as participants) to train principals to implement the TFT-TFS program in their schools among teachers. The objectives were to explore the facilitators and barriers of ongoing tobacco control activities in schools, understand participants' smartphone usage patterns, technological familiarity, awareness and perceptions of gamification and other game mechanics, and determine how to develop a smartphone-based training strategy to train principals to implement TFT-TFS program in their schools among teachers to achieve better implementation outcomes. CFIR, a determinant and an explanatory framework was used to understand "what works where and why in multiple contexts".[13-15] The four CFIR domains from the CFIR 2.0 guided the questions for the formative study, which are defined as:[12]

Innovation

The duration of smartphone-based training for implementing the TFT-TFS program, time and scope of orienting the principals on the smartphone-based training, design quality/packaging of TFT-TFS components, and complexity in the interactive smartphone-based training strategy.

Inner setting

Alignment of the TFT-TFS program with the schools' processes and tobacco control efforts.

Outer setting

Needs and resources related to tobacco control and leadership support for successful TFT-TFS training and implementation

Individuals

Participants' knowledge and beliefs about the need for effective implementation of the TFT-TFS program.

This study is a collaboration between the Healis Sekhsaria institute for public health in Mumbai, India, the Dana-Farber cancer institute and the Harvard T.H. Chan school of public health, USA; the department of education (DoE) MP and local state partner MP voluntary health association (MPVHA), Indore, India.

Study design

We used qualitative methods comprising-KIIs with principals, FGDs with school teachers; and direct school observations. We selected these three methods to triangulate the data points, enhancing the depth and reliability of our understanding of the context in which the TFT-TFS program's smartphone-based training and implementation will occur. We got permission from the MP State DoE and district-level officials to allow schools to participate in this study. The Harvard T.H. Chan school of public health's office of regulatory affairs and research compliance and the Healis-Sekhsaria institute for public health's institutional ethics committee approved all study procedures.

Study setting

MP is India's second-largest state, with approximately 72 million people in 2011.[16] We chose four districts comprising rural, urban, and tribal populations that had high tobacco use prevalence (over 33%).[17] For the formative study, we visited 36 schools across four districts, where principals were the head authority. We conducted 17 KIIs with principals (15 males, 2 females) as potential TFT-TFS implementers in their schools. Additionally, we interviewed a DoE-the administrative authority of his district for educational activities.

Data collection

We conducted 14 FGDs with male and female teachers (group size ranges between 3-22 teachers), as they are the recipients of the TFT-TFS program. We conducted all FGDs and KIIs in Hindi. They were audio recorded after obtaining consent from participants, moderated by trained staff, and assisted by a trained note-taker. We conducted each FGD for 20-30 minutes in June-July and November 2022. Participants ranged in age from 27 to 60 years.

In addition, we visited 36 schools during 2022 (June-July and November) and 2023 (January). We observed the presence of tobacco control signs and policy, spit marks, stains, and wrappers from chewing tobacco; leftover ashes, cigarette/bidi butts, and discarded packages of smoking tobacco; any shops or kiosks selling tobacco within 100 yards of the schools, electricity; wi-fi; mobile network coverage using a standardized and pre-tested checklist.[3]

Data analysis

The data were analyzed following a five-step iterative process (Figure 1) of the framework analysis.[18-21] (i) Two trained staff from the India team independently transcribed all FGDs and KIIs verbatim in Hindi and then translated them into English. One researcher from the

India team (the lead author) independently listened to the audio recordings and matched them with the transcripts and translations to familiarize herself with the data. (ii) She then analyzed the transcripts using qualitative content analysis, a deductive-directed approach, and identified initial themes. (iii) She indexed codes relevant to CFIR in the transcripts. (iv) She charted the transcripts into themes in excel. (v) The study team repeatedly reviewed the codes and transcripts, matching them to the CFIR domains to ensure appropriate interpretation.[21]

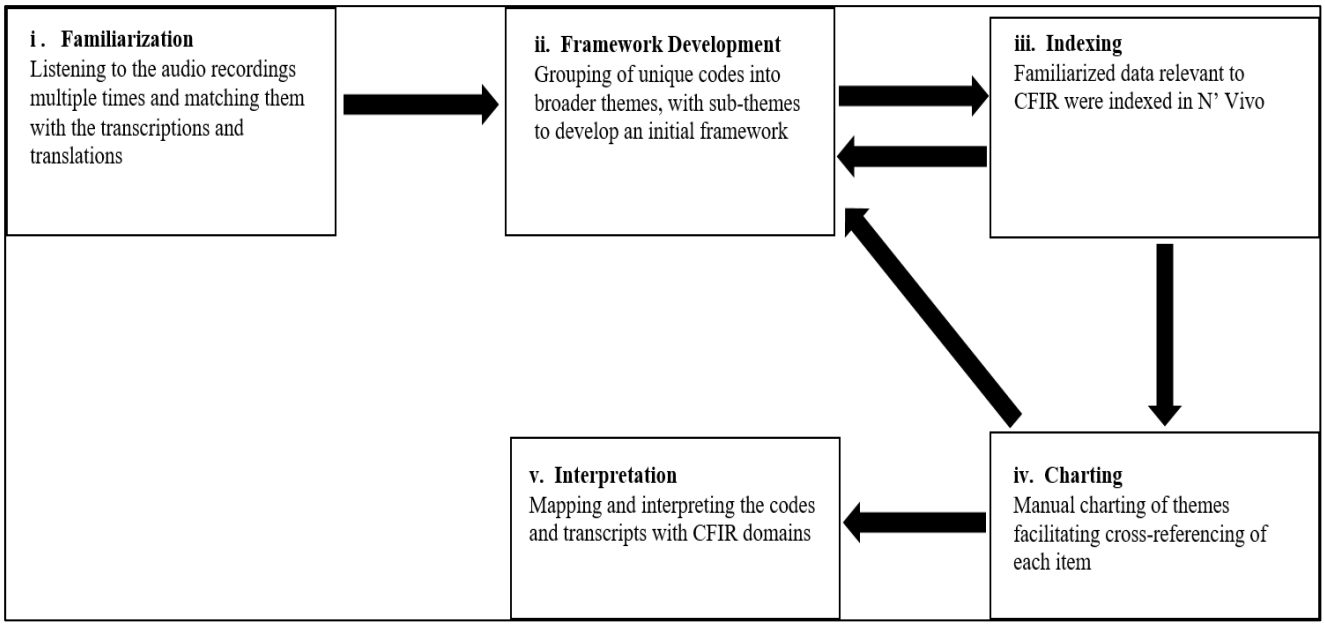

Figure 1: The iterative process of data analysis using the framework analysis.[43]

RESULTS

Facilitators and barriers based on CFIR domains

Figure 2 outlines positive influences that were more likely to act as facilitators and negative influences that were more likely to create barriers in the TFT-TFS program training and implementation.

Relevant quotes were categorized thematically as facilitators or barriers and mapped them to four CFIR domains in Table 1.

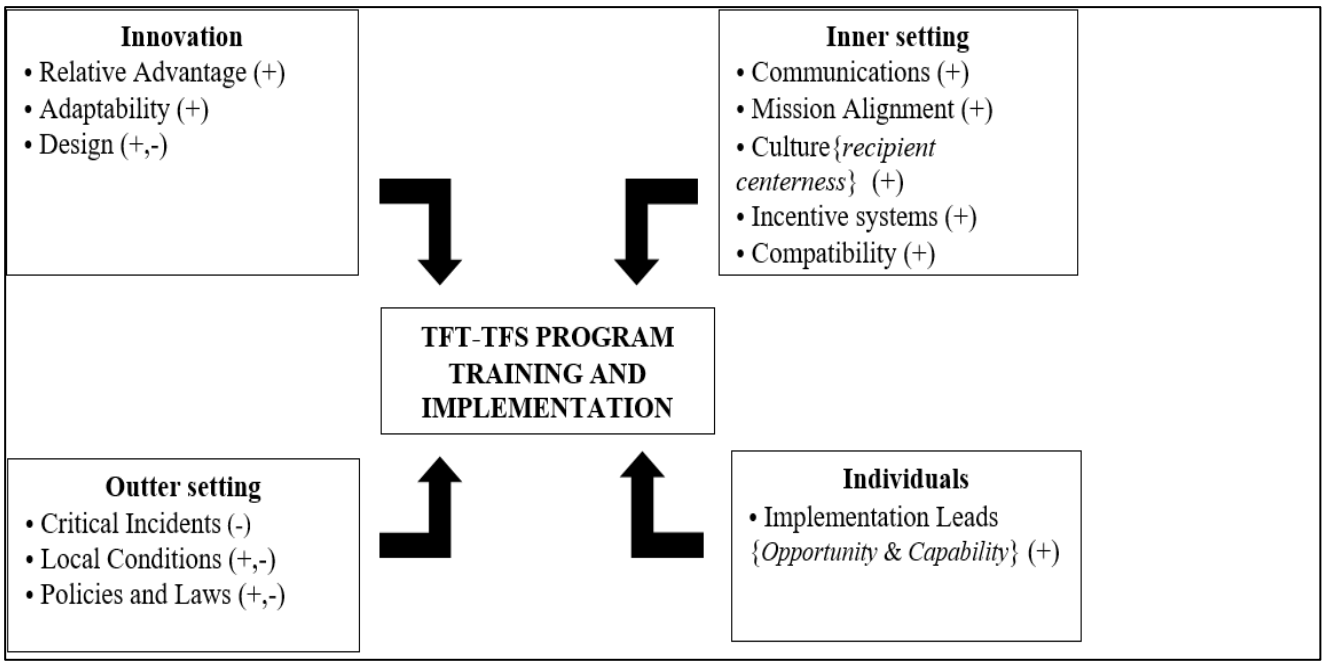

Figure 2: Outline of the main influential factors on TFT-TFS training and implementation based on CFIR domains and constructs (and sub-constructs).

Innovation domain

Three (Relative advantage, adaptability, and design) out of eight Innovation constructs emerged from the study. The three constructs acted as facilitators, while only the design construct presented a barrier.[12]

Relative advantage

Participants reported shorter videos, ranging from 10 to 15 minutes, as helpful for training to implement the TFT-TFS program in their schools. They also recommended incorporating quizzes after each video to assess their learning.

Adaptability

In Indian society, successful kite flying requires skill and symbolizes communal harmony, achievement, and freedom. Participants recommended using the kite-flying concept as of leaderboards to resonate as a positive and culturally relevant influence to foster fun and healthy competition among schools while implementing the TFT-TFS program. They also noted that their previous educational apps, like Diksha and m-Shiksha, showed progress bars after uploading photos of each completed activity, motivating them to complete training.

Design

The widespread use of Android smartphones, training, and apps, especially during COVID-19, positively influenced receiving TFT-TFS training through a smartphone-based Android app. Most participants had basic smartphones with older Android versions and limited mobile space with existing apps for professional and personal use. They preferred an app that would be easy to navigate, consuming less mobile space and data while installing and operating it. They recommended using push notifications, similar to those in shopping apps, to remind them of monthly activities in the TFT-TFS app and enhance engagement.

Outer setting domain

Three (Critical incidents, local conditions, policies and laws) out of ten outer setting constructs emerged under this domain.[12] The local conditions and policies and laws had both positive and negative influences, while critical incidents had only negative influences.

Critical incidents

Participants perceived other administrative tasks like training, elections, and the census duties as barriers to smartphone-based TFT-TFS training, overburdening them and distracting from teaching. However, a KII with the district collector (administrative official) revealed that elections happen every three years, census happen every ten years, and not all teachers participate in every program, suggesting that other administrative tasks may not be significantly hinder smartphone-based TFT-TFS training and implementation.

Local conditions

The 'clean India mission' (government cleanliness campaign) was a facilitator for the TFT-TFS program, aligning with its goal of maintaining tobacco-free schools.[22] In addition, participants' familiarity with WhatsApp, Google forms, and Zoom also supported the TFT-TFS smartphone-based training. School observations confirmed these findings. They also reflected that all schools had electricity but no Wi-Fi connections, with teachers using personal mobile data for routine activities.

A few key barriers included the widespread consumption of smokeless tobacco (SLT) as pouches (branded sachet of flavored mouth fresheners supplemented with a transparent, not-branded/not labeled sachet containing tobacco to be mixed with the mouth freshener before consumption) among teachers and endorsements of pan masalas (blend of betel nut/areca nut, and other aromatic flavors like cardamom seeds, cloves, sandalwood oil, and catechu) by celebrities through the advertisements. These advertisements do not depict tobacco in pan masalas, as it is provided separately in a complimentary packet, similar to those given with pouches at shops or kiosks. They only give these complimentary tobacco packets to known customers or those who ask for them. Participants argued it becomes difficult for parents and teachers to teach the young generation not to consume those products as the young generation considers those celebrities as 'ideals'.

School observations revealed only one of 36 schools had a 'No Smoking' sign, while 16 had visible spit marks, stainings, and wrappers from chewing tobacco; leftover ashes, butts, and discarded packages from smoking tobacco. Additionally, high alcohol consumption in rural and tribal areas was a challenge to the smartphone-based TFT-TFS training and implementation, perceiving tobacco as a low priority.

Policies and laws

Participants viewed tobacco free educational institutions (ToFEI) the 9-point government-initiated tobacco-control program as a facilitator under this construct.[23] Few schools complied with only one of the nine points: 'No sale and purchase of tobacco within 100 yards of educational institutions.

Further, the participants responded that web series content shown on any of the 'over the top' (OTT) platforms is becoming popular in the Indian context, which has no statutory warnings on the harmful effects of tobacco and alcohol use. They believed it was negatively influencing ongoing tobacco control activities and would act as a perceived barrier to implementing the TFT-TFS program.

Inner setting domain

Five (Communications, mission alignment, culture (Recipient-centeredness), incentive systems, and compatibility) out of 11 inner setting constructs emerged under this domain. All five constructs are found as facilitators.[12]

Communications

Participants opined the strong communication network within school WhatsApp groups, connecting districts, blocks, principals, and teachers as a facilitator.

Official communication, whether through WhatsApp or hard copy letters, holds significant value, especially when sent from higher authorities to school principals. Participants indicated that permission letters from DEOs or District Collectors would facilitate the smartphone-based TFT-TFS training and implementation.

Mission alignment

Participants perceived posters within the school premises depicting 'No sale or purchase of tobacco products within 100 yards' (one of the 9 points from the ToFEI guidelines) and government cleanliness campaigns as facilitators.[22,23]

Furthermore, the schools' existing system of holding rallies, events, or cleaning entire school grounds on special occasions like India's Independence Day (August 15th), the birthdays of national heroes like Mahatma Gandhi (October 2nd), Pandit Jawaharlal Nehru (November 14th), or the teachers' day (September 5th), etc., are perceived as positive influencers in the promoting and implementing tobacco control programs in schools.

Culture (Recipient-centeredness)

Participants reported the sub-construct recipient-centeredness under the construct of culture as a facilitator. Participants from almost all schools commented that about 30% of the population are tobacco users within the community and in other schools of the block; however, no teachers in their schools consume tobacco during school hours.

Hence, they perceived that the TFT-TFS might be a suitable program addressing the needs and welfare of the teachers from other schools where the tobacco problem is high.

Incentive systems

Participants recognized tangible rewards and incentives, such as certification, as facilitators for the training and implementation of the smartphone-based TFT-TFS program. They believed that awarding certificates to top-performing schools and implementers by the district officials or the study team after implementing of the TFT-TFS program would further motivate and encourage participation in the smartphone-based training and implementation.

Compatibility

We defined compatibility as how the TFT-TFS smartphone-based training and implementation fit the workflows, systems, and processes of the schools. Participants stated that the most suitable time for TFT-TFS training and implementation in the schools is between June and December.

They also asserted that 45 to 60-minute monthly implementation activities, if conducted during lunchtime in the presence of all staff, would proceed smoothly and generate more meaningful discussions on TFT-TFS themes.

Individuals' domain

One (Implementation leads) out of nine inner setting constructs emerged under this domain.[12] We defined implementation leads as those who put efforts into implementing the TFT-TFS program. We found that two sub-constructs-opportunity and capability, positively influenced on the training and implementation of the TFT-TFS program.

Implementation leads (Opportunity)

Participants viewed teachers as most suitable for TFT-TFS smartphone-based training and implementation, citing their success in government programs and smartphone access. Principals highlighted that because to heavy administrative workloads, they might not be available to serve as the TFT-TFS program implementer in their schools.

However, they would designate any teacher as 'program in-charge' (implementers) for smartphone-based TFT-TFS training and implementation in their schools. Principals stated that designated teachers would follow their instructions and inform them about the progress in TFT-TFS training and implementation.

Implementation leads (Capability)

This sub-construct refers to having prior knowledge and skills of getting trained and implementing other government programs as a facilitator to fulfill the role of implementation leads.

Participants perceived that exposure to previous school-related training through Android apps provided them with the skills needed to continue to get the trained for the TFT-TFS program through a smartphone-based Android app.

Table 1: Detailed quotes arranged thematically and mapped against four CFIR domains.

Domains	Constructs (Subconstructs)	Facilitators (+)	Barriers (-)	Sample quotes
Innovation	Relative advantage	Smaller videos followed by a quiz	NA	*"Videos should be at least 10 to 15 minutes long" (One participant from an FGD)* *"After watching the whole video, we should solve the questions related to the content of the video shown" (One participant from an FGD)* *"A video of training comes in it, and as we take training, after that its questions also come, then we have to give answers on the same app itself and after that it shows how much score you have got, it also gives complete information on whether you have given the wrong answer or given the correct answer" (One participant from an FGD)*
	Adaptability	Leaderboard Communal harmony Progress bar	NA	*"If this (leaderboard) happens, then another competition will run in them, and there will be motivation too... and competition will also be there, I can see how much other teachers achieved in (other) schools, then I would also try to do something. If this (leaderboard) happens then all the participants should be able to see each other's progress" (One participant from an FGD)* *"It is that feeling of competition that if they (some other school) have done it then we can also do it, why can't we do it, we can do it too" (One participant from an FGD)* *"The symbol of the kite in the TFT-TFS smartphone training will be good, it will depict our local culture of color, fun and healthy competition" (One principal in a KII)* *"It (the kite symbol) will help us (teachers) link with the local festival where we enjoy the competition" (One principal in a KII)* *"...In the other training that we took, the progress showed that 80% of the course was completed, 70% was complete for one module until it was completed, and then we uploaded pictures of activity completion. It gave certificates only after 100% completion of the program" (One participant from an FGD)* *"We had to upload pictures of our activities completion to get 100% completion" (1 participant from an FGD)*
	Design	Android phones Push notifications Easy to use	Larger size of the application Less data consumption	*"They didn't use Android phones earlier, but now due to the coronavirus they bought new Android smartphones and started using them" (One HM in a KII)* *"Notifications come in for other apps and we think of doing activity that has been notified. Similarly, we will be motivated to complete activities in this app also if you provide notifications" (1 participant from an FGD)* *"The mobile app should be easy to use" (One participant from an FGD)* *"Sometimes other apps have large file sizes that they do not open on our mobile" (1 participant from an FGD)* *"We have even other apps to use from the government for attendance, salary, etc. and some apps are for personal use like YouTube, WhatsApp, amazon, etc. so if the app sizes are more then we tend to not install them or delete them to save space in our smartphones" (One participant from an FGD)* *"I have limited data packs and no wifi at home, and it is the same almost with the majority of teachers. So, if the apps consume a lot of data and then we don't like to use them" (One participant from an FGD)*

Continued.

Domains	Constructs (Subconstructs)	Facilitators (+)	Barriers (-)	Sample quotes
Outer settings	Critical incidents	Occasional commitments	Other duties	*"The government should recruit more staff, then the work gets divided, now there is less staff, then there are a lot of problems in the work" (One HM in a KII)* *"Administrative tasks of the government are more" (One participant from an FGD)* *"Election duties take place once in 3 years, census duties come once in 10 years and not all teachers are being appointed for all programs that being implemented in schools" (DoE from KII)*
	Local conditions	100 yards rule Clean India Mission (government cleanliness campaign) Technological familiarity	Use of pouch Pouch advertisements by lead actors Alcohol consumption	*"There is no shop near the school premises (100 yards)" (One participant from a mixed group FGD)* *"Such a circular had come from the government that no wine (alcohol), or tobacco shops would run within 100 yards of the school" (One participant from an FGD)* *"If this program is implemented here through the app, then 100% it will be helpful in Tobacco Free Schools and Swachha Bharat Mission (Clean India Mission)") (One participant from an FGD)* *"There is our WhatsApp group, information is put in that group if anything has happened" (1 participant from an FGD)* *"If you create a Google form, we will do it on that… our meetings are also conducted through Zoom meetings" (One participant from an FGD)* *"Nowadays is the era of social media, so it comes only on WhatsApp, the hardcopy-based manual has become very less, that is, if any program is to be held, then immediately it comes on WhatsApp that today we have to do this program or activity" (One HM in a KII)* *"The pouch is more in comparison to all tobacco products" (One participant from an FGD)* *"Film actors of the film industry whom the new generation follows, advertisements are shown that pouches are being eaten" (One participant from an FGD)* *"They (teachers) drink a lot of alcohol but, consume these two (pouch and cigarette) things comparatively less" (One participant from an FGD)*
	Policies and laws	NA	No statutory warnings in OTT platforms	*"There are different platforms …, no warnings or disclaimers on the Web series that run on them" (One participant from an FGD)*
Inner settings	Communications	WhatsApp groups within schools Permission letters	NA	*"There are a lot of video clips of 3 to 4 minutes, that small children also watch now, it has become a trend now and children also like it, then they will watch it at home because we have added them in WhatsApp groups, all the children or their parents" (One participant from an FGD)* *"Yes, we have a WhatsApp group at the school level" (One participant from an FGD)* *"If you get permission letters from higher level officials then be sure that the program will be implemented" (One participant from an FGD)* *"When the letter comes from the higher authority, then we do it collectively" (One participant from an FGD)* *"Now if we want to get something done, then a permission letter from our higher authority will be effective" (One participant from an FGD)*

Continued.

Domains	Constructs (Subconstructs)	Facilitators (+)	Barriers (-)	Sample quotes
Inner settings	Mission alignment	No tobacco within 100 yards poster Celebrations at the school level	NA	*"It was also made mandatory in the school that you should have hoardings, posters, etc., warning boards, etc. were also made, within 100 meters or around the school premises any tobacco shop shouldn't be a product seller" (One participant from an FGD)* *"There are programs under the Swachh Bharat Abhiyan, such as in cleanliness, we clean our own places together with the children, we clean our school campus, example- if we get any time before August 15" (One participant from an FGD)* *"From October 2nd to November 30th, the de-addiction campaign. We carry out rallies by student…" (One participant from an FGD)*
	Culture: (Recipient-centeredness)	Tobacco is a problem in other schools		*"We do not have any tobacco users in our school, however, there are tobacco user teachers in other schools." (One participant from an FGD)* *"Approximately 30% of teachers are tobacco users but not in my school, they belong to other schools in the block" (One principal in a KII)*
	Incentive systems	Certification	NA	*"Headmasters should get some certificate. they should be encouraged that they have done good work in this field app" (One participant from an FGD)* *"Certificates (with Harvard and Healis logo can be motivational" (One participant from an FGD)* *"Certificates (with Harvard and Healis logo) definitely will motivate. It will absolutely." (One participant from an FGD)* *"To motivate them, you will also give them some reward, like a certificate, it is a big deal for that school" (One principal in a KII)*
	Compatibility	Fit with schools' processes	NA	*"We can conduct the group discussions during our lunchtime, at that time all teachers sit together in the staff room and we generally discuss social issues. So, it is a good time" (One participant from an FGD)* *"Investing one hour monthly for six months for a good cause that will help our community is not a big deal, we can do and we will do" (One principal in a KII)*
Individuals	Implementation leads (Opportunity)	Teachers as role models Access to smartphones Training and implementation during school hours	NA	*"The best thing is that no matter what the work is, only the teacher can make it successful, whether it is social work or smoking cessation interventions" (One participant from an FGD)* *"Everyone has smartphones" (One participant from an FGD)* *"All the teachers have smartphones" (One participant from an FGD)* *"Giving 45-60 minutes a month for the (TFT-TFS Smartphone) training and implementation during school hours is not a big deal" (One participant from an FGD)*
	Implementation leads (Capability)	App based training		*"All the training was done through the … app, it was done online only" (One participant from an FGD)*

DISCUSSION

Findings suggest that the domains of innovation, inner setting, and individuals have strong facilitators (+) while the domains of outer setting have strong barriers (–) (Figure 2). This pattern is similar to that found in other implementation studies from the healthcare context.[14,24,25] Studies suggest that using enjoyable and effective game mechanics, such as adding points, badges, or leaderboards to an activity, and incorporating game-like challenges and feedback into a process to monitor implementation can help increase engagement, intrinsic motivation, and participation in the task or activity achieving the intended learning or behavior change outcomes.[26-29] Gamification, defined as using game design features in non-game settings, can enhance the engagement of daily repetitive work while providing motivational and cognitive advantages.[30] A systematic review on serious games and gamification done in 2023 found that the most common game mechanics and design elements used in serious games and gamification for health include points, badges, leaderboards, storytelling and narratives, virtual rewards, incentives, and game-based assessments, which corroborates with our formative study findings.[31]

Our findings highlight the acceptability and accessibility of Android-based apps (Innovation design) post-COVID-19 as a facilitator for the TFT-TFS app. This aligns with a 2022 study reporting increased smartphone use among adults because of COVID-19.[32] Participants suggested that push notifications would enhance engagement and act as reminders to complete monthly activities on time. Research supports push notifications (texts, emails, etc.) as effective intervention prompts for increasing engagement and motivation in smartphone-based health behavior change interventions, thus improving health outcomes, and poorly designed notifications may lead to app uninstallation.[33,34] The impact of notification frequency remains unclear-Pham et al warned of negative effects, while Morrison et al found that frequent notifications increased engagement.[33] Participants also recommended minimizing app size and mobile data usage from the users' smartphones. Considering these innovation facilitators, the study team did the following to enhance engagement and implementation: (1) developed the TFT-TFS Android-based smartphone app with gamified features to enhance engagement and implementation, (2) created push notifications for each of the monthly TFT-TFS themes, (3) designed gamified features, as described above for the lowest possible Android version, and (4) ensured the TFT-TFS Android app and training related audio-visuals consume minimal space and data. Users can access videos and other features within the app without requiring them to download it (Innovation design). We also optimized TFT-TFS app for mobile data efficiency.

From the inner settings domain, the study team added tangible incentives to enhance implementation through gamified features, such as certificates for top-performing schools. Findings from the culture (Recipient-centeredness) domain showed about 30% of tobacco users in schools and communities, a close match to the global adult tobacco survey-round 2 (28.6%).[35] Participants reported that other schools had tobacco users but not theirs, likely because of social desirability bias, as the government is encouraging schools to implement ToFEI guidelines.[23] This under-reporting mirrors findings from a study on women of reproductive age, which showed that the odds of women under-reporting SLT use were higher in Central and Western India because of social desirability or the presence of a third person during the survey interview.[36] Participants perceived that existing strong communication via WhatsApp and official permissions can ensure timely implementation, which goes in line with another study, which was conducted to identify facilitators and barriers that affect the implementation of three EBIs to improve colorectal cancer. The study incorporated 16 semi-structured interviews guided by the CFIR to describe diverse stakeholders' implementation experience found poor communication as one of the implementation barriers.[25] Additionally, mission alignment was another perceived facilitator, as schools already follow ToFEI guidelines and the government cleanliness campaign.[22,23]

In the outer setting domain, findings highlighted teachers' limited time spent in the school because of administrative overload, affecting their primary role of teaching. Delhi schools reported similar concerns in 2019.[37] To address this, the study team designed the TFT-TFS Android app for training and implementing monthly activities to last for 45-60 minutes each month for six months. Local conditions also emphasized government initiatives like the 100-yard tobacco ban (ToFEI) and government cleanliness campaign as key facilitators for successful TFT-TFS implementation via Android app-based training.[22,23] Participants suggested that the TFT-TFS Android app-based training would also be effective by raising awareness of SLT and alcohol use. They noted the lack of statutory warnings in OTT web series depicting tobacco/alcohol consumption. We conducted this formative research in 2022, before India's revised OTT rules (Sept 1, 2023) aimed at countering tobacco promotion, though compliance remains weak.[38] Acknowledging these factors, the study team developed audio-visual content with relevant stories and characters.

Incorporating the individuals domain ensures the TFT-TFS app-based training is engaging and effective. Under implementation leads, participants emphasized teachers' key role in activities benefiting children and communities, supporting their involvement in TFT-TFS. They also confirmed that all teachers own smartphones and can receive app-based training, boosting confidence in TFT-TFS app development. Participants saw training during school hours as a facilitator. Despite challenges, they expressed interest in TFT-TFS app-based training and implementation, aligning with studies from India, where teachers made painstaking efforts to stay

committed and teach effectively in their schools despite the simultaneous allocation of additional responsibilities, either non-academic or requiring travel outside school.[39]

The study had several strengths. First, we used the CFIR framework to develop data collection tools, analyze data, and design training and implementation strategies. This helped us assess the MP context before developing the TFT-TFS app, ensuring the incorporation of local insights. This approach helped address locally perceived facilitators and barriers to enhance implementation. Second, the use of multiple analysts in the study team to repeatedly reviewed the codes and transcripts and matched them with the CFIR domains ensured greater conceptual clarity, rigorous analysis, and appropriate interpretation. Third, we conducted the study across multiple districts in MP, covering a broad spectrum of rural, urban, and tribal cultures. This diversity strengthened the study by integrating varied contextual information and optimizing TFT-TFS Android app-based training and implementation needs. Fourth, the study employed triangulation by integrating data from FGDs, KIIs, and direct school observations. This comprehensive approach provided a holistic understanding of local contexts, reinforcing the reliability of the findings.

Despite these strengths, the study had a few limitations. Four out of 14 FGDs had fewer than eight participants, and eight of 10 FGDs had over 10 participants, which does not meet the formal FGD criterion of 8-10 participants.[40] However, this reflects the natural school setting, since some schools had only two or four appointed teachers to run the entire school. Other schools having more teachers present on the day of FGDs wanted to participate despite inviting 8-10 teachers, as they found TFT-TFS a novel program. So, we did not prohibit them from participating in the formative study.

CONCLUSION

Understanding contextual factors is crucial for successful program implementation. CFIR was invaluable in framing data collection tools, analyzing data, and designing training and implementation strategies. Applying CFIR domains revealed the inner setting as a strong facilitator, while the innovation, outer setting, and individual domains presented mixed facilitators and barriers. This emphasized the need to focus on innovation design, critical incidents, local attitudes, and policies when developing the TFT-TFS smartphone-based training app for schools.

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