



Smoking Cessation Apps and Technology Acceptance Factors: Focusing on the Sense2Quit Application

Samaneh Ghanbarzadeh¹ , Elham Maserat¹

¹Department of Medical Informatics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

*Corresponding Author: Samaneh Ghanbarzadeh, Email: s.ghanbarzadeh@modares.ac.ir

Abstract

Background: Cigarette smoking remains a leading cause of preventable deaths worldwide, with significant health and economic consequences. Mobile health (mHealth) applications such as Sense2Quit, which integrate advanced technologies (e.g., smart watch-based detection of smoking gestures) and leverage technology acceptance theories (TAM, TPB, UTAUT), have emerged as innovative tools for smoking cessation.

Methods: This study employed a Meta-synthesis of 38 studies retrieved from reputable databases to evaluate factors influencing app acceptance at individual organizational and supra-organizational levels. The research adopted an interpretive-critical meta-synthesis approach, following the methodological framework established by Sandelowski and Barroso. Thematic coding was simultaneously applied to extract emerging concepts from qualitative data. The data extraction and coding were performed manually through dual researcher consensus to ensure rigorous interpretation of qualitative content, particularly given the limited number of eligible studies.

Findings: Findings revealed that Sense2Quit excels in high-accuracy detection of smoking gestures, personalized interventions (e.g., progress tracking, Cognitive-behavioral exercises, and social support), and user-centered design, particularly among high-risk populations such as people living with HIV (PWH). Key acceptance factors included perceived usefulness, ease of use, intrinsic motivation (aligned with SDT), and technological infrastructure compatibility.

Conclusion: However, challenges such as limited digital literacy among older adults and chronic patients and socio-economic barriers in developing countries were identified. Proposed solutions include localized user interfaces, collaboration with local institutions, and policy reforms. Ultimately, Sense2Quit exemplifies how blending technical innovation with community-specific interventions can enhance smoking cessation efforts, while underscoring the need to address contextual challenges and strengthen digital infrastructure for broader public health impact.

Keywords: Smoking cessation, Mobile health, Technology acceptance model

Citation: Ghanbarzadeh S, Maserat E. Smoking cessation apps and technology acceptance factors: focusing on the sense2quit application. *Addict Health*. 2026;18:1701. doi:10.34172/ahj.1701

Received: May 21, 2025, **Revised:** September 8, 2025, **Accepted:** December 9, 2025, **ePublished:** January 14, 2026

Introduction

Tobacco use remains one of the most significant preventable causes of mortality worldwide.¹ Statistics indicate that in developed countries, 24% of male deaths and 7% of female deaths are tobacco-related.² Recent studies have confirmed that smoking cessation, even during middle age, can prevent up to 90% of tobacco-associated risks.³

In recent decades, mobile health (mHealth) technologies have emerged as effective smoking cessation tools.⁴ These technologies are developed based on technology acceptance theories like the Technology Acceptance Model (TAM)⁵ and the Theory of Planned Behavior (TPB).⁶ Research demonstrates that perceived usefulness and ease of use play pivotal roles in their adoption.⁷

Applications like Sense2Quit employ a comprehensive approach by integrating wearable sensor data with

psychological interventions.⁸ They utilize Social Cognitive Theory (SCT)⁹ and Self-Determination Theory (SDT)¹⁰ to enhance users' self-efficacy and intrinsic motivation.

Despite their promise, challenges persist, including digital literacy barriers among elderly users¹¹ and privacy concerns.¹² Studies show that organizational factors (e.g., technological infrastructure¹³ and supra-organizational factors (e.g., social norms)¹⁴ also influence adoption.

In developing countries, there are also additional obstacles, such as limited internet access¹⁵ and high device costs.¹⁶ However, solutions such as SMS-based versions¹⁷ and simplified interfaces¹⁸ may improve accessibility. This study bridges current scholarly deficiencies through analysis of these factors.¹⁹

This study employs a systematic Meta-synthesis approach to investigate research gaps in smoking cessation applications. The primary focus centers on identifying



and examining influential factors at three distinct levels: individual (perceived usefulness and intrinsic motivations), organizational (technological infrastructure and training), and supra-organizational (social norms and data security), which have received insufficient attention in previous research on the Sense2Quit application.

Through critical analysis of these factors, the research delineates existing knowledge gaps. The findings enable healthcare administrators and policymakers to develop more precise implementation strategies for Sense2Quit in real-world settings by integrating these multi-level considerations. This approach facilitates customized adaptation of the application to meet specific population needs while addressing technological, cultural, and economic barriers, ultimately establishing a practical action plan to enhance the effectiveness of digital health interventions.

Methods

A Meta-synthesis study was conducted on the implementation of the Sense2Quit application. This research identified factors relevant to the technology, potential modifications needed for its use, as well as its limitations and challenges. The conducted Meta-synthesis is of the interpretive-critical type, which aligns with the objectives of the research:

- a. Interpretation of findings within technology acceptance theories
- b. Systematic critique of practical challenges (e.g., the digital divide in developing countries)
- c. Presentation of context-specific solutions based on data synthesis

This interpretive-critical meta-synthesis was conducted following the methodological framework outlined by Sandelowski and Barroso for the synthesis of qualitative research.²⁰ This approach was selected for its rigorous, systematic process that facilitates not only the summary but also the interpretive and critical analysis of findings across studies, allowing for the generation of new insights and practical knowledge.

This study employed a mixed-method (thematic-theoretical) approach. Data analysis was grounded in a predefined theoretical structure, which included factors at individual, organizational, and extra-organizational levels, alongside technology acceptance theories (e.g., TAM, TPB, SDT). Thematic coding was simultaneously applied to extract emerging concepts from qualitative data, such as user feedback, challenges, and recommendations.

Our analytical approach employed a multi-theoretical framework (TAM, SDT, RAT, TPB) as sensitizing concepts to guide the thematic analysis. This hybrid approach combined both theory-driven and data-driven coding processes. Initially, we developed a preliminary coding framework based on key constructs from each theoretical model. During iterative coding cycles, we

actively identified and delineated overlapping constructs across theories (e.g., differentiating between ‘perceived behavioral control’ in TPB and ‘autonomy’ in SDT) while remaining open to emergent themes from the qualitative data. This process allowed us to create a nuanced understanding of how these theoretical constructs manifested in the context of smoking cessation apps while maintaining theoretical integrity.”

Data analysis and process

The data extraction and coding were performed manually to ensure in-depth interpretation of the qualitative content. This method has provided a controlled volume of data (a limited number of reviewed studies) and highlighted the need for nuanced analysis beyond mechanical classification.

The analysis followed an iterative process of thematic synthesis. After manual coding of the findings from the included studies, similar codes were grouped into descriptive themes. These themes were then refined and abstracted into analytical themes through discussion and consensus among the research team. To ensure validity, the emergent themes were constantly checked against the original data (going back to the source studies). The multi-theoretical framework (TAM, SDT, RAT, and TPB) was used as a sensitizing device throughout this process; the themes were actively mapped onto and interpreted through the lens of these theoretical constructs.

Role of Quantitative Data: Any quantitative data (e.g., counts of studies) presented are purely descriptive in nature. Their purpose is to provide context and an overview of the study characteristics. They did not inform the qualitative synthesis process itself, which was based entirely on an in-depth analysis of qualitative themes and patterns.

We aimed to investigate the factors influencing the acceptance of Sense2Quit technology to address limitations in prior research, including: 1) The limited scope of earlier studies, particularly concerning the application of this technology across diverse communities, especially in developing regions. 2) The absence of comprehensive strategies for adapting the technology to different societal contexts, with a focus on evaluating intervention methods, mobile applications, and their efficacy in supporting smoking cessation efforts.

Study selection and criteria

Six core thematic criteria were established to guide the selection of literature on Sense2Quit applications: 1. Removal of duplicate entries, 2. Exclusion of studies unrelated to the research goals, 3. Focus on smoking cessation as the primary outcome, 4. Incorporation of technology acceptance frameworks (e.g., TAM, UTAUT, SDT), 5. Restriction to mobile-based interventions (excluding web-only platforms), 6. Requirement of

empirical quantitative/qualitative data.

A comprehensive search was conducted across multiple academic databases, including Google Scholar, Semantic Scholar, Scopus, and Web of Science (WOS), to identify relevant publications.

According to Table 1, out of 750 initial articles selected for review, only 38 articles were approved, and the other articles were rejected. Other articles were excluded because they didn't match the objectives of the present research.

The final 38 studies were analyzed through: 1. Interpretive-critical Meta-synthesis (the integrated methodology involves three key phases: Open coding (Theme identification); 2. Manual coding; Theory-driven (TAM/UTAUT/SDT integration), Data-driven (emerging themes); 3. Validation (Independent review by two researchers, Consensus meetings for discrepancies).

The literature screening process was conducted by two independent reviewers based on the predefined inclusion/exclusion criteria (detailed in Table 1). Initially, both reviewers screened a small pilot sample (30 articles) together to ensure a consistent understanding of the criteria. Following this calibration, each reviewer screened the remaining titles, abstracts, and full texts independently. All disagreements between the reviewers were discussed in detail during consensus meetings until a unanimous decision was reached for every study. No third arbitrator was needed as all conflicts were resolved through discussion. This rigorous process ensured the reliability and objectivity of the study selection.

Results

The integration of technology acceptance theories, including TAM, TPB, and RAT, into smoking cessation applications enables the development of tools that are both technologically advanced and psychologically effective. By combining these theories, applications like Sense2Quit can facilitate meaningful behavioral change while ensuring user-friendly design and personalized support.

Sense2Quit exemplifies this approach by leveraging TAM principles to enhance usability while employing data-driven strategies to deliver tailored interventions. This dual focus addresses both the practical and psychological aspects of smoking cessation, creating a more comprehensive solution.

The acceptance of such technologies is influenced by factors spanning individual, organizational, and supra-organizational levels. Individual adoption depends on perceived usefulness and ease of use, while organizational and broader societal factors, such as institutional support and social norms, play equally critical roles. Together, these elements highlight the importance of a multifaceted approach in designing effective digital health interventions.

Table 2 represents the factors related to technology acceptance theories and smoking cessation applications, such as individual, organizational, and supra-organizational factors. This table systematically illustrates the interconnectedness between intervention strategies, their theoretical foundations, and expected outcomes. Each column is logically linked to the next, demonstrating how practical measures are rooted in technology acceptance theories (e.g., TAM, UTAUT, SDT) to yield specific results. By integrating qualitative insights with established theories, it provides a clear roadmap from design to implementation and outcome evaluation. This table aims to demonstrate links between theoretical concepts and field observations, not to quantify relationships. The synthesis of theories was not intended to reduce them to a single framework, but rather to extract complementary patterns across different levels of analysis.

Overview of Sense2Quit features and advantages

Sense2Quit is a mobile application that integrates wearable device data with behavioral interventions to provide personalized smoking cessation assistance. By monitoring user behavior through sensors and self-reports, it offers tailored feedback and employs evidence-based techniques like cognitive-behavioral therapy and

Table 1. Literature screening process

Screening Phase	Initial Records	Excluded	Exclusion Reasons (Code)	Remaining	Remarks
Identification	750	-	-	750	Databases: Scopus, Scholar, semantic Scholar, WOS (web of science)
Duplicate Removal	750	210	DU	540	Automated tools: EndNote X9
Title/Abstract Screening	540	360	IR: 340 NS: 20	180	IR: Irrelevant to tech acceptance NS: Not smoking
Full-Text Assessment	180	142	EX1: 67 EX2: 46 EX3: 29	38	EX1: No tech acceptance model EX2: Non-mobile interventions EX3: Insufficient empirical data
Final Included Studies	38	-	-	38	Includes 5 Direct Sense2Quit studies

Exclusion code keys of Table 1:

DU: Duplicate records.

IR: Irrelevant to research objectives, NS: Not focused on smoking cessation.

EX1: Lacks technology acceptance theories (TAM/UTAUT/SDT/etc).

EX2: Non-mobile interventions (e.g., web-based only).

EX3: Lacks quantities/qualitative empirical data.

Table 2. Multilevel determinants of smoking cessation app adoption: Theory-practice integration

Analysis Level	Key Factors (from qualitative findings)	Theoretical Support	Intervention (Operational action)	Expected Outcomes	References (related to the theory)
Individual	Perceived usefulness/ease of use	TAM			21
	Expectation- performance gap	ECT			22
	Mental norms	TPB	<ul style="list-style-type: none"> •Reward systems •Gamification elements 	<ul style="list-style-type: none"> •Higher adoption rates •Sustained user engagement 	23
	Self-efficacy	PCUT			24
	Intrinsic/extrinsic motivation	SDT			25
Organizational	Technological infrastructure	RAT			26
	Management support	UTAUT	<ul style="list-style-type: none"> •Staff training programs •Online support systems 	<ul style="list-style-type: none"> • Improved organizational adoption •Reduced resistance 	27
	Training/resources	SCT			28
	Social/cultural norms	DOI			29
Supra-Organizational	Government policies/general culture	DTPB			30
	Media and advertising	DTPB	<ul style="list-style-type: none"> • NGO partnerships • Financial incentives 	<ul style="list-style-type: none"> •Supportive ecosystem •Equitable access 	31
	Security/privacy (for health data)	TPB			32
	Economic barriers (e.g., internet costs)	UTAUT			33

mindfulness training to help users manage cravings and modify habits. The platform includes motivational alerts, progress tracking, and educational resources to support the quitting process.

This research evaluates the effectiveness of digital cessation tools like Sense2Quit across diverse populations. Through comparative analysis of implementation data, the study examines how such technological solutions can be optimized for different user groups, focusing on real-world efficacy and behavioral outcomes in smoking cessation efforts.

The Table 3 presents key comparisons:

Table 3 presents a comparative analysis of studies evaluating the Sense2Quit application, organized by key demographic and acceptance factors. The columns demonstrate important relationships; age ranges correlate with specific acceptance factors (e.g., older users emphasized ease of use), while challenges and limitations directly informed improvement suggestions. The feedback column validates how well the app addressed the identified factors. This structured comparison reveals how demographic differences influence both the app's effectiveness and needed adaptations.

Previous research on smoking cessation has explored mobile health (mHealth) interventions incorporating elements like social support monitoring, mindfulness exercises, and customized messaging. While some of these studies have demonstrated the effectiveness of mHealth over time, the Sense2Quit app stands out by addressing discrepancies between user and expert feedback, identifying knowledge gaps, and enhancing the program with professional graphic design to boost visual appeal. Additionally, it tracks smoking patterns, expenditures, and offers distractions like games and videos through reminders. Unique to this app is its specific focus on people with HIV (PWH) alongside general smokers.

Discussion

This Meta-synthesis reveals that Sense2Quit represents a significant advancement in smoking cessation technology, particularly through its integration of wearable sensors, psychological interventions, and community features. The application's effectiveness stems from its alignment with established technology acceptance theories.

Our findings demonstrate the value of a multi-theoretical approach in understanding complex health technology adoption. Rather than applying these theories in isolation, we found them to be complementary lenses that address different aspects of the adoption process. For instance, while TAM effectively captured utilitarian aspects (perceived usefulness), SDT provided deeper insights into motivational mechanisms (autonomy, competence). The identified overlaps between constructs (e.g., between TPB's perceived behavioral control and SDT's autonomy) were not contradictions but rather represented different dimensions of user experience that could be leveraged for more holistic intervention design.

The relationship between qualitative findings and theoretical frameworks

The qualitative findings of this study clearly support and, in some cases, extend the employed theoretical frameworks. For instance, the theme "High accuracy in gesture detection (Table 3)," extracted from user data, maps directly onto the "Perceived Usefulness" construct in the TAM model (Table 2), as users identified this accuracy as a key factor for the app's usefulness in monitoring their behavior. Simultaneously, this same theme is also linked to the "Objective Feedback" construct in SCT, as this capability allows users to clearly see their progress, thereby enhancing their self-efficacy. On the other hand, the theme "Privacy concerns," which was particularly prominent among individuals living with HIV (Table 3), while related to the "Perceived Control" construct in TPB

Table 3. Studies related to the Sense2Quit application and factors related to technology acceptance

Age groups (year)	Factors affecting app acceptance	Challenges & limitations	Improvement Suggestions	Feedback (Key Findings)	Ref
27-73 (avg.: 53)	<ul style="list-style-type: none"> Ease of use Real-world relevance Aesthetic design 	<ul style="list-style-type: none"> Post-cessation weight gain Inaccurate daily smoking count 	<ul style="list-style-type: none"> Weight management strategies Meditation for distractions 	<ul style="list-style-type: none"> Positive user evaluations Need for expert involvement 	34
30-76 (avg.: 54)	<ul style="list-style-type: none"> Trigger identification (post-meal, coffee) Motivational messages 	<ul style="list-style-type: none"> Substance substitution Smoking as a stress coping mechanism 	<ul style="list-style-type: none"> Support chatrooms Personalized tools (family photos) 	<ul style="list-style-type: none"> Effective for chronic disease management 	35
All age groups; (HIV focus)	<ul style="list-style-type: none"> Contextual reminders Distraction tools (games, videos) 	<ul style="list-style-type: none"> Lack of HIV-specific features Privacy concerns 	<ul style="list-style-type: none"> Online motivational counseling Stress-reduction therapies 	<ul style="list-style-type: none"> Adaptable for PWH 	36
All age groups	<ul style="list-style-type: none"> Easy access to motivational content Cessation reminders 	<ul style="list-style-type: none"> Digital literacy barriers (especially the elderly) 	<ul style="list-style-type: none"> Reward systems Peer support features 	<ul style="list-style-type: none"> Positive health behavior changes 	37
34-71 (avg.: 59)	<ul style="list-style-type: none"> Complex hand movement detection (high accuracy) 	<ul style="list-style-type: none"> Inaccurate cigarette counting in other apps (user trust decline) 	<ul style="list-style-type: none"> Integration of CNN models (for higher accuracy) 	<ul style="list-style-type: none"> Reliable cessation tool 	38

(Table 2), demonstrates that this construct can become a barrier in sensitive contexts, suggesting a need to extend the theory.

Our analysis demonstrates that Sense2Quit systematically incorporates principles from technology acceptance theories, including TAM and SDT. Within the TAM theory, perceived usefulness is achieved through accurate gesture detection, while perceived ease of use is ensured via a simplified user interface. The SDT components are implemented through: autonomy (enabled by personalized goal-setting features like gradual reduction targets), competence (reinforced through visual progress tracking with charts and daily challenges), and relatedness (facilitated by support communities). These theory-driven implementations establish a robust foundation for the program's effectiveness.²¹⁻²⁵ Our findings both corroborate and extend prior evidence on multidimensional interventions.^{22,23,24} The observed variations appear to be influenced by demographic factors, particularly when comparing urban versus rural populations, along with differences in assessment methodologies and socio-cultural contexts. While existing studies reported optimal outcomes in controlled settings, our more diverse sample revealed significant implementation challenges across different community contexts. These results highlight how intervention effectiveness depends substantially on contextual adaptation, suggesting the need for more flexible program designs that account for population-specific needs and circumstances.²¹⁻²⁵

Individual, organizational, and supra-organizational barriers and strategies

Organizational adoption barriers identified in prior research^{26,27}, including technological infrastructure and staff training, are addressed through Sense2Quit's built-in psychological support systems and user-friendly design.^{28,29} The application particularly shows promise for underserved populations like people living with HIV (PWH), where its confidentiality safeguards and

tailored motivational interviews overcome stigma and literacy barriers. The supra-organizational dimension reveals critical cultural and infrastructural challenges in developing countries. While social norms and data privacy concerns present obstacles,³⁰⁻³³ Sense2Quit's adherence to security standards and community features helps mitigate these issues. However, limitations persist regarding technology access among older adults and low-income populations, necessitating SMS-based alternatives and offline functionality.

Comparative analysis demonstrates Sense2Quit's technical superiority over conventional cessation tools, particularly in gesture detection accuracy and customizable features. Yet behavioral barriers like post-cessation weight gain and technology literacy gaps remain challenges requiring future design improvements. The study confirms that successful digital cessation programs must balance theoretical rigor with practical adaptability. Sense2Quit's holistic approach—combining sensor technology, psychological principles, and community support, positions it as an evidence-based solution capable of addressing diverse demographic needs while advancing public health objectives.³⁴⁻³⁸

Comparative analysis of Sense2Quit and other smoking cessation applications

Compared to established smoking cessation apps, Sense2Quit demonstrates unique advantages but also faces methodological limitations. While apps like *Smoke Free* rely on robust randomized controlled trial (RCT) evidence and *Quit Now* emphasizes financial motivation, our approach integrates accurate sensor-based detection with psychological theory (SDT/TAM), offering a novel behavioral tracking method. However, unlike *Flamy*, which has been validated in diverse populations, our current evidence comes from smaller pilot studies, primarily focusing on high-risk groups (e.g., PWH). This limits generalizability compared to broader trials supporting other apps.

Our comparative analysis not only describes different

features but also provides insight into why their effectiveness varies. For example, the feature “Easy setup and simple user interface” is not a secondary characteristic but rather a fundamental prerequisite for specific populations such as the elderly or individuals with low digital literacy. This feature directly impacts the “Perceived Ease of Use” construct in TAM and is a necessary condition for initial engagement (Table 2). In contrast, the feature “Synchronization with wearable gadgets,” while attractive to younger populations, can have an inverse effect on older or low-income users due to economic barriers and technical complexity, thereby weakening their “Perceived Control.” Therefore, the effectiveness of a feature is not intrinsic but rather a function of its fit with the user’s needs, abilities, and cultural context (Table 3).

However, several challenges were identified, including individual barriers (such as post-cessation weight gain and using smoking as a coping mechanism), technological limitations (inaccurate consumption tracking and complexity for elderly users), and contextual concerns (particularly privacy issues among specific groups like HIV patients). In response to these challenges, various solutions were proposed. Individual-focused approaches included integrating meditation and weight management strategies, technological solutions involved improving motion detection accuracy and simplifying user interfaces, while contextual solutions featured secure support systems and specialized online counseling. User feedback consistently emphasized the importance of user-friendly design, support features, and motivational content.³⁴⁻³⁸

Future research and recommendations

The findings of this study demonstrate that Sense2Quit’s primary distinction from conventional smoking cessation programs lies in its intelligent integration of technological and psychological approaches. While most existing applications focus either on hardware aspects (e.g., consumption tracking) or rely solely on behavioral interventions, this program combines objective data from wearable sensors with theories like SDT and TAM,^{5,10} enabling the design of more personalized interventions. Such a comprehensive approach not only facilitates a deeper understanding of consumption patterns but also creates greater flexibility in designing solutions tailored to users’ cultural and individual differences.^{8,19} However, implementation experiences across different contexts reveal that even such advanced systems face significant adoption challenges without consideration of infrastructural limitations and generational gaps in digital literacy.^{11,15} These findings emphasize the necessity of developing locally adapted versions and investing in user digital education, and future large-scale studies should validate these technological advantages against traditional self-report methods used in most cessation apps.

Overall, the analysis of studies reveals that the most significant acceptance factors are ease of use, appealing design, personalization features, and content relevance to users’ real-world needs. This implies that the success of these applications requires integrating technical, psychological, and social aspects.

Although this Meta-synthesis provides valuable insights into the acceptance of Sense2Quit, it has several limitations: 1. The limited number of direct studies, 2. Focus on specific populations, and 3. Lack of data from developing countries. These limitations highlight the need for future research to generalize the findings across different contexts.

Conclusion

Sense2Quit represents a paradigm shift in smoking cessation technology by merging technical innovation with community-specific intervention. Its success in engaging PWH highlights the importance of tailored mHealth solutions, setting a benchmark for future applications at underserved populations.

While Sense2Quit shows promise as an advanced tool for smoking cessation, its success in developing countries depends on addressing systemic barriers through localized adoptions, community engagement, and policy support. By leveraging technology acceptance theories and prioritizing contextual needs, this application can bridge gaps in smoking cessation efforts and contribute to public health advancement in this region.

Acknowledgements

We sincerely thank the researchers whose valuable studies were included in this meta-synthesis, and also appreciate the insightful feedback from our peer reviewers.

Authors’ Contribution

Conceptualization: Elham Maserat.

Formal analysis: Elham Maserat, Samaneh Ghanbarzadeh.

Investigation: Elham Maserat, Samaneh Ghanbarzadeh.

Methodology: Elham Maserat, Samaneh Ghanbarzadeh.

Resources: Samaneh Ghanbarzadeh.

Supervision: Elham Maserat, Samaneh Ghanbarzadeh.

Validation: Elham Maserat, Samaneh Ghanbarzadeh.

Writing—original draft: Samaneh Ghanbarzadeh.

Writing—review & editing: Samaneh Ghanbarzadeh.

Competing Interests

There was no conflict of interest.

Ethical Approval

Not applicable.

Funding

This work did not receive any funding.

References

1. Peto R, Lopez AD, Boreham J, Thun M, Heath C Jr, Doll R. Mortality from smoking worldwide. *Br Med Bull.* 1996;52(1):12-21. doi: 10.1093/oxfordjournals.bmb.a011519

2. Peto R, Lopez AD, Boreham J, Thun M, Heath C Jr. Mortality from tobacco in developed countries: indirect estimation from national vital statistics. *Lancet*. 1992;339(8804):1268-78. doi: [10.1016/0140-6736\(92\)91600-d](https://doi.org/10.1016/0140-6736(92)91600-d)
3. Peto R, Darby S, Deo H, Silcocks P, Whitley E, Doll R. Smoking, smoking cessation, and lung cancer in the UK since 1950: combination of national statistics with two case-control studies. *BMJ*. 2000;321(7257):323-9. doi: [10.1136/bmj.321.7257.323](https://doi.org/10.1136/bmj.321.7257.323)
4. Regmi K, Kassim N, Ahmad N, Tuah NA. Effectiveness of mobile apps for smoking cessation: a review. *Tob Prev Cessat*. 2017;3:12. doi: [10.18332/tpc/70088](https://doi.org/10.18332/tpc/70088)
5. Chiu YL, Chang HT, Lin CL, Chang YW, Yen LC, Kao LT, et al. Determining the continuance intention of military volunteers to use the quit and win smartphone app using the technology acceptance model. *J Med Sci*. 2020;40(6):265-71. doi: [10.4103/jmedsci.jmedsci_24_20](https://doi.org/10.4103/jmedsci.jmedsci_24_20)
6. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q*. 1989;13(3):319-40. doi: [10.2307/249008](https://doi.org/10.2307/249008)
7. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *J Appl Soc Psychol*. 2002;32(4):665-83. doi: [10.1111/j.1559-1816.2002.tb00236.x](https://doi.org/10.1111/j.1559-1816.2002.tb00236.x)
8. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: toward a unified view. *MIS Q*. 2003;27(3):425-78. doi: [10.2307/30036540](https://doi.org/10.2307/30036540)
9. Fallon M, Spohrer K, Heinzl A. Deep structure use of mHealth: a social cognitive theory perspective. In: *Proceedings of the 27th European Conference on Information Systems (ECIS)*. Stockholm: Research in Progress; 2019.
10. Hooker SA, Crain AL, Muegge J, Rossom RC, Pronk NP, Pasumarthi DP, et al. Applying Meaning and Self-Determination Theory to the Development of a Web-Based mHealth Physical Activity Intervention: Proof-of-Concept Pilot Study. *JMIR Form Res*. 2024;8:e55722. doi:[10.2196/55722](https://doi.org/10.2196/55722)
11. Bhattacharjee A. Understanding information systems continuance: An expectation-confirmation model. *MIS Q*. 2001;25(3):351-70. doi: [10.2307/3250921](https://doi.org/10.2307/3250921)
12. [ClinicalTrials.gov](https://clinicaltrials.gov). Feasibility Study of the Sense2Quit App for Smoking Cessation in PWH. Identifier: NCT05609032; 2024. Available from: <https://clinicaltrials.gov/ct2/show/NCT05609032>.
13. Bradway M, Carrion C, Vallespin B, Saadatfard O, Puigdomènech E, Espallargues M, et al. mHealth Assessment: Conceptualization of a Global Framework. *JMIR Mhealth Uhealth*. 2017;5(5):e60. doi:[10.2196/mhealth.7291](https://doi.org/10.2196/mhealth.7291)
14. Al-Emran M, Griffy-Brown C. The role of technology adoption in sustainable development: overview, opportunities, challenges, and future research agendas. *Technol Soc*. 2023;73:102240. doi: [10.1016/j.techsoc.2023.102240](https://doi.org/10.1016/j.techsoc.2023.102240)
15. Anwar F, Shamim A. Barriers in adoption of health information technology in developing societies. *Int J Adv Comput Sci Appl*. 2011;2(8):40-5. doi: [10.14569/ijacsa.2011.020808](https://doi.org/10.14569/ijacsa.2011.020808)
16. Hurt K, Walker RJ, Campbell JA, Egede LE. mHealth interventions in low and middle-income countries: a systematic review. *Glob J Health Sci*. 2016;8(9):54429. doi: [10.5539/gjhs.v8n9p183](https://doi.org/10.5539/gjhs.v8n9p183)
17. Déglise C, Suggs LS, Odermatt P. Short message service (SMS) applications for disease prevention in developing countries. *J Med Internet Res*. 2012;14(1):e3. doi: [10.2196/jmir.1823](https://doi.org/10.2196/jmir.1823)
18. Hébert ET, Ra CK, Alexander AC, Helt A, Moisiuc R, Kendzor DE, et al. A mobile just-in-time adaptive intervention for smoking cessation: pilot randomized controlled trial. *J Med Internet Res*. 2020;22(3):e16907. doi: [10.2196/16907](https://doi.org/10.2196/16907)
19. Vilardaga R, Rizo J, Palenski PE, Mannelli P, Oliver JA, McClernon FJ. Pilot randomized controlled trial of a novel smoking cessation app designed for individuals with co-occurring tobacco use disorder and serious mental illness. *Nicotine Tob Res*. 2020;22(9):1533-42. doi: [10.1093/ntr/ntz202](https://doi.org/10.1093/ntr/ntz202)
20. Sandelowski M, Barroso J. *Handbook for Synthesizing Qualitative Research*. New York: Springer Publishing Company; 2007.
21. Adnan A, Irvine RE, Williams A, Harris M, Antonacci G. Improving acceptability of mHealth apps-the use of the technology acceptance model to assess the acceptability of mHealth apps: systematic review. *J Med Internet Res*. 2025;27:e66432. doi: [10.2196/66432](https://doi.org/10.2196/66432)
22. Wu C, Zhou Y, Wang R, Huang S, Yuan Q. Understanding the mechanism between IT identity, IT mindfulness and mobile health technology continuance intention: an extended expectation confirmation model. *Technol Forecast Soc Change*. 2022;176:121449. doi: [10.1016/j.techfore.2021.121449](https://doi.org/10.1016/j.techfore.2021.121449)
23. Wang H, Zhang J, Luximon Y, Qin M, Geng P, Tao D. The determinants of user acceptance of mobile medical platforms: an investigation integrating the TPB, TAM, and patient-centered factors. *Int J Environ Res Public Health*. 2022;19(17):10758. doi: [10.3390/ijerph191710758](https://doi.org/10.3390/ijerph191710758)
24. Rudhumbu N, Du Plessis E, Matyokurehwa K, Gombiro C. Using the personal computer utilisation model to predict students' technology user behaviour in universities in Botswana. *Int J Learn Technol*. 2021;16(3):225-45. doi: [10.1504/ijlt.2021.119467](https://doi.org/10.1504/ijlt.2021.119467)
25. Tao D, Chen Z, Qin M, Cheng M. Modeling consumer acceptance and usage behaviors of mHealth: an integrated model of self-determination theory, task-technology fit, and the technology acceptance model. *Healthcare (Basel)*. 2023;11(11):1550. doi: [10.3390/healthcare11111550](https://doi.org/10.3390/healthcare11111550)
26. Fletcher-Brown J, Carter D, Pereira V, Chandwani R. Mobile technology to give a resource-based knowledge management advantage to community health nurses in an emerging economies context. *J Knowl Manag*. 2020;25(3):525-44. doi: [10.1108/jkm-01-2020-0018](https://doi.org/10.1108/jkm-01-2020-0018)
27. Hoque R, Sorwar G. Understanding factors influencing the adoption of mHealth by the elderly: an extension of the UTAUT model. *Int J Med Inform*. 2017;101:75-84. doi: [10.1016/j.ijmedinf.2017.02.002](https://doi.org/10.1016/j.ijmedinf.2017.02.002)
28. Martín CA, Rivera DE, Hekler EB, Riley WT, Buman MP, Adams MA, et al. Development of a control-oriented model of social cognitive theory for optimized mHealth behavioral interventions. *IEEE Trans Control Syst Technol*. 2020;28(2):331-46. doi: [10.1109/tcst.2018.2873538](https://doi.org/10.1109/tcst.2018.2873538)
29. Ndayizigamiye P, Kante M, Shingwenyana S. An adoption model of mHealth applications that promote physical activity. *Cogent Psychol*. 2020;7(1):1764703. doi: [10.1080/23311908.2020.1764703](https://doi.org/10.1080/23311908.2020.1764703)
30. Li W, Guo J, Liu W, Tu J, Tang Q. Effect of older adults willingness on telemedicine usage: an integrated approach based on technology acceptance and decomposed theory of planned behavior model. *BMC Geriatr*. 2024;24(1):765. doi: [10.1186/s12877-024-05361-y](https://doi.org/10.1186/s12877-024-05361-y)
31. Dwivedi A, Mir MA. e-Health adoption in India: SEM analysis using DTPB approach. *Int J Manag*. 2020;11(7):333-8. doi: [10.34218/ijm.11.7.2020.032](https://doi.org/10.34218/ijm.11.7.2020.032)
32. Arkorful VE, Shuliang Z, Lugu BK, Jianxun C. Consumers' mobile health adoption intention prediction utilizing an extended version of the theory of planned behavior: the moderating role of internet bandwidth. *ACM SIGMIS Database*. 2022;53(2):96-114. doi: [10.1145/3533692.3533699](https://doi.org/10.1145/3533692.3533699)
33. Garavand A, Samadbeik M, Nadri H, Rahimi B, Asadi H. Effective factors in adoption of mobile health applications

- between medical sciences students using the UTAUT model. *Methods Inf Med.* 2019;58(4-5):131-9. doi: [10.1055/s-0040-1701607](https://doi.org/10.1055/s-0040-1701607)
34. Brin M, Trujillo P, Huang MC, Cioe P, Chen H, Xu W, et al. Development and evaluation of visualizations of smoking data for integration into the Sense2Quit app for tobacco cessation. *J Am Med Inform Assoc.* 2024;31(2):354-62. doi: [10.1093/jamia/ocad162](https://doi.org/10.1093/jamia/ocad162)
35. Schnall R, Trujillo P, Alvarez G, Michaels CL, Brin M, Huang MC, et al. Theoretically guided iterative design of the Sense2Quit app for tobacco cessation in persons living with HIV. *Int J Environ Res Public Health.* 2023;20(5):4219. doi: [10.3390/ijerph20054219](https://doi.org/10.3390/ijerph20054219)
36. Brin M, Trujillo P, Jia H, Cioe P, Huang MC, Chen H, et al. Pilot testing of an mHealth app for tobacco cessation in people living with HIV: protocol for a pilot randomized controlled trial. *JMIR Res Protoc.* 2023;12:e49558. doi: [10.2196/49558](https://doi.org/10.2196/49558)
37. Brin M, Fontalvo S, Hu D, Cioe P, Huang MC, Xu W, et al. Validating the information technology (IT) implementation framework to Implement mHealth technology for consumers: a case study of the Sense2Quit app for smoking cessation. *Int J Med Inform.* 2025;202:105977. doi: [10.1016/j.ijmedinf.2025.105977](https://doi.org/10.1016/j.ijmedinf.2025.105977)
38. Das A, Feng J, Brin M, Cioe P, Schnall R, Huang MC, et al. A robust cross-platform solution with the Sense2Quit system to enhance smoking gesture recognition: model development and validation study. *J Med Internet Res.* 2025;27:e67186. doi: [10.2196/67186](https://doi.org/10.2196/67186)