

## Article

# The Technology Adoption Model Canvas (TAMC): A Smart Framework to Guide the Advancement of Microbusinesses in Emerging Economies

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**Abstract:** The socioeconomic contribution of microbusinesses towards emerging economies is undeniable. However, numerous factors have broadened the gap between microbusinesses and their smartification. This conceptual study proposes the Technology Adoption Model Canvas (TAMC) based on theories such as the Unified Theory of Acceptance and Use of Technology (UTAUT2), Diffusion of Innovation (DOI), and the Business Model Canvas (BMC) alongside four new/emerging variables, making it possible to understand technology adoption through both individual/cognitive and organizational/physical perspectives. The framework is developed for food service (FS) microbusinesses to facilitate their adaptability in current and future market conditions. Subsequently, we explain the development of the TAMC, including its significance, limitations, and avenues for future research. The proposed framework can provide a solution for FS microbusinesses towards a ‘smarter’ and more sustainable future. It further guides the evaluation of both microbusinesses’ readiness and the factors driving/impeding them towards/from adopting smart technology.

**Keywords:** food service (FS) microbusinesses; emerging economies; Technology Adoption Model Canvas (TAMC); smart technology; Industry 4.0



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## 1. Introduction

The increasingly competitive and challenging business climate has made it more difficult for small and micro entrepreneurs to survive, particularly in developing economies [1]. Microbusinesses create jobs, alleviate poverty, and provide the community with more affordable goods and services [2,3]. Many hardships that microbusinesses face are attributed to poor product quality, inadequate knowledge of business management, inefficient production processes, and lack of technological innovations [4]. In general, technology adoption is lower among food service (FS) microbusinesses in developing nations, and the number of businesses that have taken steps towards smartification compared to other industries is modest [5]. This is mainly attributed to their traditional operational approaches and low levels of income making them a part of the ‘informal economy’ [6] as well as factors such as resource limitations, inadequate knowledge, and poor confidence in automation [7]. The slow technology adoption rate has hindered the speed of economic development [8]. Hence, this paper identifies and examines the critical factors that shape smart technology adoption for FS microbusinesses. Micro, small, and medium enterprises (MSMEs) constitute a substantial portion of businesses in developing nations worldwide [9]. However, despite the importance of these microbusinesses, most service-oriented microbusinesses have failed to penetrate new and larger markets beyond their cities. The lack of access to such markets is primarily due to technological, financial, and resource limitations and poor orientation towards business growth [10].

Even though smart technology is perceived to be primarily beneficial, Botezatu [11] emphasizes that ‘smartification’ is an uneven process affecting various socioeconomic actors differently. Smartification represents an opportunity for MSMEs to transform innovatively and sustainably as completing the digital transformation can increase an enterprise’s operational efficiency by 8–10 times [12]. The success of a smart strategy can be measured by the level of participation in the process of ‘smartification’, which is driven by the organizational exploitation of digital facilitators, including Information and Communication Technologies (ICT), the Internet of Things (IoT), cloud technology, knowledge automation, and Information Systems (IS) [13]. These technologies potentially drive substantial economic impacts [11]. As smart technology presents opportunities throughout the entire process of value creation and appropriation, it influences the functional and strategic levels of business operations and their ability to generate new value propositions [14]. In FS microbusinesses, the operators have a growing influence on all business decisions due to the overlap between ownership, management and entrepreneurial roles, and a less formal organizational structure [15]. Hence, within these businesses, smart technology can complement the operator’s capabilities, thereby enhancing the firm’s overall capacity to operate efficiently and effectively [16]. This can be achieved by digitizing time-consuming tasks such as order tracking, order distribution, marketing and sales, and revenue management through the help of smart point of sale (POS) systems, wireless queue systems, website and social media marketing, online delivery, and the use of AI for planning and product innovation. Thus, the process of endowing FS microbusinesses with smart technology can radically alter the services provided to the customer and the internal work environment [16]. In addition, smart technology enables operators to engage in better customizations and improvements in product quality and dissemination, which can drive the overall improvement of products and services [9,17]. Furthermore, smart technology can provide operators with access to training and minimize their dependency on external organizations and governmental institutions.

Notwithstanding the identified benefits, FS microbusinesses in emerging economies have fallen short in keeping up with the ‘smartification’ of their nations [5]. The rapid economic growth resulting from external/global economic dynamics often causes emerging economies to be relatively unstable and decline in the short-term [18]. Compared to developed economies, microbusinesses in developing economies face more vulnerabilities and influence from external factors such as economic development, technological infrastructure, education, technological awareness, legal and institutional regulations, and government interference [19,20]. As a result, these external elements create a whole other perspective in understanding the intrinsic factors proposed through four prominent technology adoption models: Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Unified Theory of Acceptance and Use of Technology version 2 (UTAUT2) and Diffusion of Innovation (DOI). As these models have been created in the context of developed economies, more research is needed to understand how the external elements of developing nations influence the constructs of these existing technology adoption models. As a consequence of failing to consider the nature of external influences in developing countries, microbusiness have so far been unable to adapt to the technological changes taking place in the market. As a result, many FS microbusinesses have been closing down due to their inability to face interruptions in the supply chain, delays in operations, and constraints in meeting stakeholder requirements, especially during the COVID-19 pandemic [21]. Limited research on the impact of the pandemic on FS microbusinesses in developing nations currently exists [22], as most studies have been conducted in the UK, New Zealand, Australia, and US [23]. Hence, there is a need for more research regarding how these microbusinesses can adapt and innovate in response to such crises while also realizing the need for more sustainable solutions [24].

Furthermore, most of the available smart technologies for FS businesses cater mainly to small, medium, and large-scale businesses and have failed to consider the limitations of micro FS businesses, especially regarding aspects such as complexity, compatibility,

affordability, resource availability, and financial constraints. Consequently, the lack of digitalization creates a technology problem in terms of data collection and analysis, which also plays a vital role in the adoption of any future digital processes [25]. Hence, there exists a need for a more suitable framework to evaluate the readiness of such microbusinesses alongside the factors driving/impeding them towards/from adopting smart technology, and potentially guiding them towards embracing a smart business model [26]. To achieve this, a greater focus needs to be placed on the entrepreneur and the business, i.e., the central actors at the micro-level, as any other approach may provide incomplete or misleading results [27].

When looking at the context of service industry microbusinesses, it is important to define the characteristics that set these businesses apart from the large, medium, and small businesses in the context of emerging economies. Regarding the operational scope, microbusinesses usually operate with a narrower scope and less complex infrastructure compared to larger businesses. This means that the adoption of new technology is generally less multifaceted, but the barriers due to limited resources and expertise are often greater. With regard to resource constraints, what distinguishes microbusinesses from larger businesses is the lack of resources, both in terms of financial and human capital. The proposed framework acknowledges these constraints by considering them under the sections of 'budget cost' and 'key resources'. With regard to the influence of human capital, decisions in microbusinesses are often made individually or by a very small team. The proposed constructs of the framework account for this dynamic by emphasizing on individual cognitive factors such as 'trust', 'habit', and 'hedonic motivation', which play a more pronounced role in microbusiness settings.

This paper concerns the employment of a study that aims to acknowledge this gap by critically reviewing the past literature and investigating both the cognitive and physical factors responsible for assessing readiness and guiding microbusinesses towards smartification. This research offers a more nuanced conceptualization of smart technology adoption for FS microbusinesses by integrating individual/cognitive and organizational/physical attributes. It develops a more robust technology-driven smart framework based on the widely accepted theories of the UTAUT2, DOI, and the Business Model Canvas (BMC). Importantly, four emerging constructs are also discussed, notably 'perceived risk', 'perceived security', 'trust', and 'government support', all of which have been identified to influence smart technology adoption among MSMEs in recent years. The proposed framework brings together cognitive and physical attributes influencing technology adoption and further extends the underpinned theories/models by including new/emerging constructs, making them more suitable to be applied within the post-pandemic era of smart technology adoption research. Furthermore, the framework provides a foundation for both qualitative and quantitative research that can help explore each of the constructs in greater detail and test the co-relationships between each of the constructs along with their degree of influence on smart technology adoption.

The objective of this study is the conceptualization of several factors influencing smart technology adoption within FS microbusinesses. Hence, it does not provide empirical evidence at this point in time. However, researchers can utilize the conceptual framework proposed to carry out empirical studies, and in doing so, further establish the relevance and validity of the proposed framework developed especially for FS microbusinesses in emerging economies.

## 2. Literature Review

When assessing the readiness of microbusinesses for technology adoption, one may argue that the process is often based on self-assessment instruments such as the TAM and the UTAUT, which focus on individual/cognitive attributes and less on organizational/physical attributes. Reviewing such models indicated that the dimensions of assessment of most technology acceptance models solely focus on the cognitive attributes influencing an individual's decisions, for instance, perceived usefulness, perceived ease

of use, performance expectancy, and effort expectancy. However, the theory of DOI is an exception as it considers the attributes that (physically) support an organization to operate effectively, for instance, the compatibility, complexity, and trialability of new technological innovations within an organization. Nevertheless, the TAM, UTAUT2 and DOI models arguably fail to offer a generic framework for evaluating the readiness of microbusinesses in embracing Industry 4.0, i.e., the digitalization of businesses, from both individual/cognitive and organizational/physical attribute perspectives [28].

The current technology adoption models such as the TAM, TRA, UTAUT2, and DOI fall short in considering the external factors influencing technology adoption, and the authors advise to take precautions when applying such theories in developing countries [29,30]. Factors such as economic conditions, education, technological awareness, technological infrastructure, legal and institutional regulations, and government interference need to be accounted for in order to fully understand the intrinsic factors influencing technology adoption. Hence, there is an even greater concern when applying these models in the context of developing nations as the external influences are more severe in their influence on technology adoption in these economies [29,31,32]. As a result, the proposed framework acknowledges the need to consider key external factors influencing technology adoption when applying the framework to microbusinesses in developing countries.

Most research in the realm of technology adoption considers a one-directional approach by adopting quantitative methods that hypothesize variables as constructs to predict outcomes [9,33]. Researchers argue that traditional approaches fail to consider MSMEs in their design and, thus, call for broader and robust frameworks that include vital aspects of small and microbusiness characteristics [34] to investigate and address issues related to technology adoption within MSMEs. Even though academics are focused on digitalization, there is still much to be understood regarding the drivers of digital transformation [35]. Hence, theories such as the UTAUT2 [36], DOI [37], and BMC [38] will be adopted to develop the Technology Adoption Model Canvas (TAMC) framework. We apply a ‘hybrid-forming’ model that intersects with two already extant traditions and related processes, a notion initially put forward by Thomas Kuhn (1974) (cited in [39], p. 162). Kuhn argues that all theories can be modified with the help of a majority of ad hoc adjustments that do not necessarily stem from the main lines of the theory itself. Doing so is important because scientific knowledge grows to challenge existing observations and adjust established theories (cited in [39], p. 71).

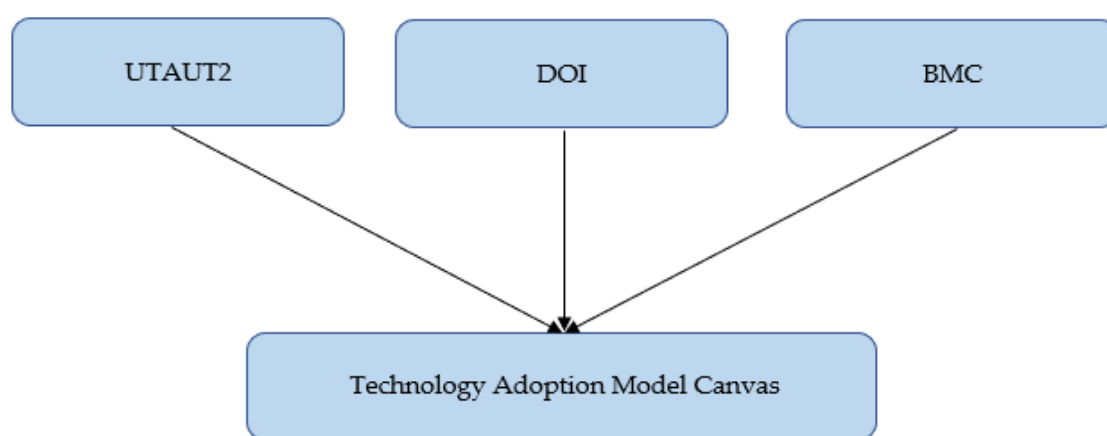
Hence, this study adopts the UTAUT2 as a basis for the proposed framework because the UTAUT2 when compared to other technology adoption theories and models (TRA, TAM, Technology Organization and Environment (TOE)) provides a more complete approach for exploring technology adoption from a user-centric perspective. Other technology adoption theories such as the TRA, TAM, and TOE entail limitations for which the UTAUT2 accounts for. The TRA has been criticized for focusing solely on the attitudes and behaviours within human actions without considering technological and external elements [40]. Similarly, the TAM is criticized for being weak in its predictive power and its limitation of acceptance intention to the typical ‘perceived use’ (PU) and ‘perceived ease of use’ (PEOU) [41]. As a result, the TAM needs to consider ‘trust’ (T), ‘perceived risk’ (PR), ‘social influence’ (SI), ‘hedonic motivation’ (HM), psychological ownership, personality traits, and the external environment [31]. The TOE, on the other hand, is limited in its ability to provide specificities in the technological determinants related to innovations in ‘information and communication technology’ and creates the need for integration with additional variables and theories [42].

This study also adopts the DOI as a basis for the proposed framework because when compared with all the other established technology adoption theories such as the UTAUT, UTAUT2, TRA, TAM and TOE, the DOI theory remains to be the only adoption theory that considers the factors influencing technology adoption at the organizational level [43]. However, in previous studies, the DOI theory has been combined with the TAM [44] and TOE [42] theories to provide a more integrated approach in understanding technology adoption. Hence, as the UTAUT2 is more effective than the TAM and TOE theories,

integrating the DOI theory with the UTAUT2 will arguably provide a holistic understanding of smart technology adoption.

The BMC is also adopted as a basis for the proposed framework because it provides a complete model for evaluating businesses and their capacity for innovation. When compared with the City Model Canvas (CMC), the CMC focuses on a public service context [45]. When compared with the Triple Layered Business Model Canvas (TLBMC), the TLBMC focuses on sustainable practices [46], and when compared with the Meta Business Model (MBM), the MBM focuses on technical and economic domains [47]. However, these models can still be utilized to further extend and apply the initial BMC to different research settings as these models have been created based on the elements of the BMC.

Therefore, the theoretical underpinning of the ‘Technology Adoption Model Canvas (TAMC)’ will be based on the UTAUT2, the DOI theory, and the BMC (Figure 1), which provide the necessary constructs and guidelines for developing the proposed framework.



**Figure 1.** Theoretically underpinned models.

### 2.1. Technology Adoption Model Review

Standard models associated with technology acceptance and adoption are the TRA, TAM, Theory of Planned Behaviour (TPB), UTAUT, UTAUT2, and DOI [41]. Even though these models indicate a growth in research trends on digitalization, a clear gap in the use of such models to explore actual technology adoption continues to exist [28]. The evaluation criteria, dimensions, and constructs are different for various models, and a standardized model is currently absent [48]. Such a model would help understand the actual technology adoption by considering both individual and organizational attributes influencing technology acceptance and use, especially among FS microbusinesses, as such businesses rely mostly on the decisions of individuals and the capacities of their physical resources. Given the current trends in technology adoption, this paper identifies the UTAUT2 and the DOI theory as the two most prominent theoretical models, within the realm of technology acceptance/use, capable of assessing and understanding technology adoption at present, as previously discussed.

#### 2.1.1. Unified Theory of Acceptance and Use of Technology Version 2 (UTAUT2)

The UTAUT2 introduced by Venkatesh and associates in 2012 [36] is an adoption theory for analysing the determinants of intention to use new technology [49,50]. UTAUT2 was developed to capture and understand the acceptance and use of technology from a consumer perspective by incorporating factors such as ‘hedonic motivation’, ‘price value’ and ‘habit’, thus highlighting seven core factors that influence technology adoption [51]. The UTAUT2, compared to UTAUT, focuses on consumer cognitive aspects, henceforth, classified as controllable or semi-controllable constructs in this study. The UTAUT2 has been proven to be 18 percent more effective in describing the variability of behavioural intention and 12 percent more effective in describing use behaviour than the UTAUT ([51],

p. 4). However, the UTAUT2 has its limitations. The most significant criticism of the UTAUT2 is that the model was advanced and was frequently applied in the context of developed economies (with already established technological-based infrastructure) rather than advanced or applied within the developing world [29]. In addition, the UTAUT2 needs to include important indicators covering awareness-raising and low-tech learning when applied within developing economies [29].

#### 2.1.2. Theory of Diffusion of Innovation (DOI)

The DOI theory, introduced by Rogers in 1962 [37], addresses numerous aspects of innovation by emphasizing the generation (idea), diffusion (movement), and adoption (uptake) of innovations ([52], p. 3). It seeks to explain at what rate and how and why new ideas and technology spread through cultures and the process through which innovation is relayed throughout time to the members of the social system [53]. The DOI theory further investigates the process of diffusion and offers valuable insights into understanding the adoption of various technologies by having variables that account for both the cognitive attributes of individuals and the physical attributes of organizations (consequently classified as semi-controllable constructs hereafter) [44]. However, the theory has been criticized for disregarding external environmental influences such as the economy, the society, and the political arena [43]. A limitation may result from its intention to focus on internal organizational attributes solely. However, this limitation is accounted for in the proposed framework by considering governmental and societal influences and by integrating the theory with the UTAUT2.

#### 2.2. New/Emerging Variables

Recent studies have proposed new variables and improvements to the UTAUT, UTAUT2, and DOI models concerning technology acceptance and adoption [31,32,49,50]. These studies suggest the inclusion of exogeneous variables, namely, ‘trust’ [54], ‘perceived risk’ [32], ‘perceived security’, and ‘government support’ [49,50], to examine the determinants of the intentions of technology acceptance and adoption by consumers in an era of pandemic recovery and Industry 4.0. Thus, similar to most of the constructs of the UTAUT2, the constructs of ‘trust’, ‘perceived risk’, and ‘perceived security’ will be classified as controllable constructs due to their individual/cognitive nature, while ‘government support’ will be classified as an uncontrollable construct as individuals and their businesses cannot influence it.

The construct of ‘trust’ is added to the proposed model as it was identified to have a strong influence on technology adoption in the study conducted by Ariwati [54]. The users’ trust in smart technology can be seen to play a vital role in their adoption decisions as it can shape their overall perception of smart technologies and also inform other constructs such as ‘perceived risk’ and ‘perceived security’. Hence, ‘trust’ is an important construct in understanding users’ perceptions towards smart technology and in identifying the factors contributing to their reasons to trust or distrust smart technology, which can later influence their motivation to adopt smart technology.

The construct of ‘perceived risk’ is added to the proposed model as its influence on technology adoption was identified to be of great significance in a recent study conducted during the pandemic [32]. With the increase in use of smart technology throughout the pandemic, it was evident that the risk of scammers and hackers too had increased, and people have become increasingly aware of these risks. Hence, moving forward, it is important to consider the risk perceptions of the users when looking at smart technology adoption.

The construct of ‘perceived security’ is added to the proposed model as it coincides with the construct of ‘trust’ and ‘perceived risk’. Similar to the construct of ‘perceived risk’, ‘perceived security’ is a construct that emerged as important during the pandemic. The construct was found to be of importance in recent studies conducted by Moorthy et al. [49] and Najib et al. [50], where it was made evident that people have become increasingly

concerned about the safety of using smart technology and now factor in the security associated with the technology when deciding whether or not to adopt smart technology.

The construct of ‘government support’ is added to the model as the influence of the authorities on microbusiness operators to adopt technology has been increasing [49,50], especially after the impact of the pandemic. In developing nations, in particular, the local authorities can be seen to have a greater influence on the (in)ability of microbusinesses to engage in innovation. Hence, the influence of the government via (in)actions in providing financial support, training, infrastructure support, etc., needs to be considered when studying smart technology adoption, especially in developing economies.

### 2.3. Business Model Canvas (BMC)

The BMC is touted as one of the most suitable models to measure business potential. It broadly applies to new businesses, existing businesses, and non-profit organizations [55]. The BMC is an intuitive and easy-to-use visual chart for representing a firm’s logic and its way of organizing its operations for creating, delivering, and capturing value and shows how a firm creates and delivers value for customers and how it captures profits [45]. The BMC comprises nine crucial elements (Table 1) that should be considered when evaluating business performance and readiness for change [55,56]. The BMC has been frequently used to address/explain three phenomena: (a) e-business and the use of information technology in organizations; (b) strategic issues, such as value creation, competitive advantage, and firm performance; and (c) innovation and technology management [57].

**Table 1.** List of constructs.

| UTAUT2                            | DOI                          | New/Emerging                    | BMC                    |
|-----------------------------------|------------------------------|---------------------------------|------------------------|
| Performance Expectancy (PE) [36]  | Compatibility (CM) [37]      | Perceived Risk (PR) [32]        | Value Proposition [38] |
| Effort Expectancy (EE) [36]       | Complexity (CX) [37]         | Perceived Security (PS) [49,50] | Key Partners [38]      |
| Societal Support (SS) [36]        | Relative Advantage (RA) [37] | Government Support (GS) [49,50] | Key Activities [38]    |
| Facilitating Conditions (FC) [36] | Observability (OB) [37]      | Trust (T) [54]                  | Key Resources [38]     |
| Habit (HA) [36]                   | Trialability (TR) [37]       |                                 | Budget Cost [38]       |
| Hedonic Motivation (HM) [36]      |                              |                                 |                        |
| Price Value (PV) [36]             |                              |                                 |                        |

However, the model has been criticized for its sole focus on creating economic value and neglecting social and environmental values [45,46]. The model has been revised numerous times to facilitate various forms of research. Timeus et al. [45] created a CMC, Diana [46] developed the TLBMC, and Ghazinoory et al. [56] utilized the PEST framework and Porter’s Market Forces to incorporate an environmental dimension into the BMC. Similarly, as the TAMC focuses on technology acceptance and adoption, specific components of the BMC (customer segments, customer relationships, distribution channels, and revenue streams) have been omitted as they are considered to have little to no influence on technology adoption. Nevertheless, since the BMC focuses on the organization’s overall structure [46],

it enables the incorporation of the constructs of technology adoption theories and other emerging constructs in the formulation of a cumulative framework focused on exploring and assessing the readiness of FS microbusinesses towards smart technology adoption.

### 3. Methodology

This conceptual paper evaluates the most critical components of existing knowledge on the factors influencing smart technology adoption within FS microbusinesses and proposes new constructs and relationships between the broader concepts of technology adoption and business models. This study utilizes a narrative literature review approach, enabling the investigation of the current state of knowledge on technology adoption while recognizing research gaps in promoting future investigation and knowledge advancement [58]. Such an approach assists in developing a theoretical structure and a research perspective. Narrative reviews are valuable instructional materials that condense a large volume of information into one understandable package to provide a general overview of a subject [59]. This approach was utilized to identify theories and models associated with technology adoption and business frameworks within the MSME context, along with understanding the current situation/problems of FS microbusinesses in developing nations. The narrative literature review approach is adopted from recent studies [60,61], especially to holistically appraise and synthesize the relevant literature on technology adoption and business model innovation. Therefore, this research enquiry develops discussions allowing for the consolidation of viewpoints by comparing with the previous literature and developing more nuanced ways of viewing the phenomenon being studied [62]. This step was then pursued through an analysis of FS microbusinesses, business model frameworks such as the BMC, and technology adoption frameworks such as the UTAUT2 and the DOI theory. In a critical endeavour, we identify gaps in the knowledge base and avenues for developing more robust frameworks concerning the factors influencing the actual acceptance and use of smart technology within FS microbusinesses.

Research databases such as Scopus, ScienceDirect, ProQuest, and Google Scholar were utilized. Results were limited to only peer-reviewed publications in the English language from 2018 to 2022, to understand how the models evolved in recent years and as a result of the pandemic by studying their applications in both pre- and post-pandemic eras. The search terms included ‘microenterprises’, ‘MSMEs’, ‘technology adoption theories’, ‘UTAUT’, ‘UTAUT2’, ‘DOI’, ‘sustainable business models’, ‘BMC’, ‘business model canvas’, ‘technology adoption AND business models’, ‘technology adoption AND microbusinesses’, and ‘smart technology AND microbusinesses’. Although literature reviews have been criticized for their innate bias in knowledge generation and lack of scientific rigor [63], the narrative review navigates evolving knowledge and concepts much easier and, thus, offers greater flexibility and broader coverage of the literature than the more standardized literature reviews [64]. In addition, narrative reviews play an essential role in advancing learning as they provide readers with up-to-date knowledge regarding specific topics or themes [65] and are irreplaceable when tracking the development of scientific principles and concepts [66].

The narrative review applied to this research provided a set of emerging technology adoption theories and constructs to formulate a framework classifying the factors influencing technology adoption in the context of business model innovation presented in Section 4. Accordingly, this research provides a subtle understanding of smart technology adoption within FS microbusinesses by distinguishing, categorizing, and justifying the main (and intersecting) conceptual constructs. This study presents a set of emerging technology adoption constructs alongside a list of improvements suggested for enhancing existing technology adoption models for future empirical consideration (Table 2). The subsequent section discusses each of the identified constructs, their properties, and co-relationships.

**Table 2.** Suggested/applied improvements to UTAUT, UTAUT2, and DOI models.

| Source                                | Theoretical Model | Suggested/Applied Improvements                                                                                                                                                                                                                                              |
|---------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reyes-Mercado and Barajas-Portis [30] | UTAUT             | Combined the UTAUT and TR models to assess the extent to which technology and individual-specific dimensions affect technology use.                                                                                                                                         |
| Thongsri et al. [67]                  | UTAUT             | Integrated the UTAUT and the Uses and Gratification Theory (UGT) from the field of mass communications to increase the understanding about the factors affecting m-learning in developing countries.                                                                        |
| Shiferaw et al. [68]                  | UTAUT             | Extended the model and proposed that the intention to use technology is influenced by people's attitude towards the technology, the performance expectancy, and the level of social influence. Both the constructs 'self-efficacy' (SE) and 'attitude' (ATT) were included. |
| Chen et al. [31]                      | UTAUT             | Two variables of 'personal innovativeness' (PI) and 'perceived risk' (PR) were newly added to enhance the applicability of the model.                                                                                                                                       |
| Gunawan et al. [69]                   | UTAUT             | Extended the model by incorporating the emerging variable of 'perceived risk' (PR).                                                                                                                                                                                         |
| Apfel and Herbes [29]                 | UTAUT2            | Extended the model with insights from the DOI theory to investigate the UTAUT2 framework in the context of SMEs and identified that important indicators, those which cover awareness-raising and low-tech learning, need to be accounted for.                              |
| Najib et al. [50]                     | UTAUT2            | Proposed a modified model by adding 'knowledge' (K) and 'perceived security' (PS) variables and illustrated that the two variables had a significant effect on FinTech adoption by small food business owners.                                                              |
| Moorthy et al. [49]                   | UTAUT2            | Presented a simple model by eliminating several determinants ('price value' (PV), 'habit' (HA), experience, age, and gender) and added in 'perceived security' (PS).                                                                                                        |
| Leong et al. [51]                     | UTAUT2            | Improved the model by incorporating the personality traits of 'technology readiness' (TR) by interrelating them with 'performance expectancy' (PE) and 'effort expectancy' (EE).                                                                                            |
| Nguyen and Borusiak [32]              | UTAUT2            | Proposed a customized conceptual research model derived from the UTAUT2 including two other factors: 'personal innovativeness' (PI) and 'perceived risk' (PR).                                                                                                              |
| Mookerjee & Chattopadhyay [70]        | UTAUT2            | Suggested the need to extend the model by considering public opinion, perceived usefulness, and accepted practices                                                                                                                                                          |
| Yawised et al. [71]                   | UTAUT2            | Extended the model by including three new constructs, 'business transformation capabilities' (BTC), 'digital transformation capabilities' (DTC), and 'personal innovativeness' (PI)                                                                                         |
| Rahman et al. [72]                    | UTAUT2            | Extended the model by including 'trust' (T) and 'purchase behaviour' (PB) as predictors of technology adoption.                                                                                                                                                             |
| Lu [44]                               | DOI               | Drew upon TAM and IDT to incorporate 'perceived usefulness' (PU), 'perceived ease of use' (PEU), 'compatibility' (CM), 'result demonstrability' (RD), 'observability' (OB), and 'trialability' (TR), and tested their effects on the users' intention toward IoT adoption.  |
| Ngongo et al. [42]                    | DOI               | Integrated the DOI theory with TOE to analyse the technological attributes of m-health adoption.                                                                                                                                                                            |
| Salah et al. [43]                     | DOI               | Adopted both the TOE and DOI theories and created a more holistic model to examine the moderating effects of the firm size in the adoption of customer relationship management (CRM) within Palestinian SMEs.                                                               |
| Mookerjee & Chattopadhyay [70]        | DOI               | Suggested the need to extend the model by considering people's desire to utilize technology, accessibility, perceived worth, and perceived simplicity.                                                                                                                      |

#### 4. Towards a New Theoretical Framework: The Technology Adoption Model Canvas (TAMC)

The proposed TAMC consists of five main thematic sections, (1) value proposition, (2) key activities, (3) key resources, (4) key partners, and (5) budget cost, which have been adopted from the BMC. All 16 constructs (Figure 2) stem from the UTAUT2, the DOI theory, and the recent research regarding technology adoption (Table 2). These constructs have been categorized according to their degree of controllability based on their cognitive and/or physical attributes, comprising seven controllable, seven semi-controllable, and two uncontrollable constructs. They have thus been attributed to each of the five BMC sections based on their composition and degree of controllability.

| Key Partners                                                                                                                                                                                                                                   | Value Proposition       | Key Activities          | Key Resources                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|------------------------------|
| Government Support (GS)                                                                                                                                                                                                                        | Perceived Risk (PR)     | Hedonic Motivation (HM) | Complexity (CX)              |
| Societal Support (SS)                                                                                                                                                                                                                          | Perceived Security (PS) | Habit (HA)              | Compatibility (CT)           |
|                                                                                                                                                                                                                                                | Performance Exp. (PE)   | Observability (OB)      | Facilitating Conditions (FC) |
| Budget Cost                                                                                                                                                                                                                                    | Effort Expectancy (EE)  | Relative Advantage (RA) | Trialability (TR)            |
| Price Value (PV)                                                                                                                                                                                                                               | Trust (T)               |                         |                              |
| <div> <div>Controllable (flexible)</div> <div>: PR PS PE EE T HM HA</div> </div> <div> <div>Semi-Controllable (semi-flexible)</div> <div>: PV OB RA CX CT FC TR</div> </div> <div> <div>Uncontrollable (fixed)</div> <div>: GS SS</div> </div> |                         |                         |                              |

**Figure 2.** The TAMC.

‘Controllable’ constructs represent the cognitive (individual) constructs (‘habit’, ‘trust’, ‘hedonic motivation’, etc.) that influence an individual’s attitude and perception towards adopting a new technological innovation. These constructs can be easily influenced by intrinsic (experience and knowledge) and extrinsic factors (friends and family, etc.) and are unique from each individual, thus making them quite flexible. Most of these constructs are derived from the UTAUT2, which focuses on the individual consumer perspective.

‘Semi-controllable’ constructs comprise cognitive and physical attributes (‘complexity’, ‘compatibility’, ‘trialability’, etc.) that influence an individual’s attitude and perception towards adopting a new technological innovation. These constructs comprise both a controllable (cognitive) and an uncontrollable (physical) component. Accordingly, the technological component and its features are often uncontrollable or unchangeable in the adoption process and need to be incorporated as they are. However, an individual’s attitudes and perceptions towards those features can be influenced/changed and hence can be easily controlled, making these constructs semi-flexible. Thus, most of these constructs are derived from the theory of DOI, which focuses on measuring organizational and technological attributes.

‘Uncontrollable’ constructs are beyond the control of the individuals and their businesses. They exist in the organization’s external environment (family, competitors, private and public organizations, etc.). Still, they have a considerable influence on the attitude and

perception of individuals towards adopting technology. These constructs remain fixed as both individuals and their businesses cannot influence these constructs.

#### 4.1. Value Proposition

‘Value proposition’ refers to the combination of products and services a firm offers to create value [73], enabling individuals to determine the value of a particular technology they intend to adopt. This section deals with all aspects of digital technology that need to be fulfilled to provide value to a customer [74]. It provides users more insights into how the technology connects with the business and drives innovation [55]. Hence, this first section of the TAMC introduces controllable dimensions associated with the cognitive aspects of an individual. This section provides a guideline for evaluating the value placed by the operators of the microbusinesses on adopting a particular new technology or even evaluating the performance of an existing technology. It measures the PE and EE dimensions stemming from the UTAUT2 alongside the new/emerging dimensions of PR, PS, and T. Furthermore, when looking at the constructs of this dimension of the TAMC, external factors such as the education level and technological awareness of microbusiness operators need to be considered when applying the framework in developing nations.

##### 4.1.1. Perceived Risk (PR)

‘Perceived risk’ refers to an individual’s perception of risks associated with the performance, time, and monetary aspects of adopting a particular technology [32]. PR is considered a useful construct in exploring a user’s perception of accepting a particular new technology [41] and is often indicated by performance risk, financial risk, social risk, psychological risk, and time risk [75]. In addition, the construct of PR can also be used to assess individuals’ sensitivity towards risk, i.e., their risk sensitivity, which is derived from the Risk Sensitivity Theory (RST) where a value-based approach is utilized to predict a shift in a subject’s response to risk [76]. As a result, while looking at individuals’ perception of the risks in adopting smart technology, their sensitivity towards those risks and any changes taking place regarding their risk sensitivity can be understood and further explored through their awareness and their level of concern regarding the risks of using smart technology. Risk perception can act as a barrier by dampening consumers’ behavioural intention towards the acceptance and adoption of smart technology, especially in the context of a developing country perspective [77]. Thus, from a FS microbusiness perspective, the operators may feel less inclined to adopt smart technology as they may not necessarily be aware of the benefits that they can gain through such an adoption. Operators may also be concerned about how technology would change their products and their usual way of operating their businesses. For example, using a smart Point of Sale (POS) system may slow down the operations and cause errors if the staff do not understand how to use it. The operator’s experience and/or social network could also influence their perception of and sensitivity towards technological risks. Hence, exploring the influence of PR on smart technology adoption within FS microbusinesses will help identify and understand the factors making operators reluctant to adopt smart technology.

##### 4.1.2. Perceived Security (PS)

‘Perceived security’ refers to an individual’s perceptions of the (un)certainly that a particular technological system can carry out activities safely via online platforms, especially if the individual is unfamiliar with the technology being adopted [50,78]. Studies have pointed out significant correlations between PS and behavioural intention [49]. PS is characterized by the nature of security associated with a particular technology. For example, operators could be reluctant to adopt smart technology such as a website or online banking due to their fear of online information security regarding banking details, product details, and unique product offerings. Although PS focuses on the level of security associated with smart technology, it can also have a lasting impact on ‘trust’ (T) and ‘perceived risk’ (PR).

Exploring the influence of PS on smart technology adoption within FS microbusinesses will help identify and understand operators' concerns.

#### 4.1.3. Performance Expectancy (PE)

'Performance expectancy' refers to the extent to which an individual believes that using a particular form of technology would increase the business's profitability or help them attain gains in job performance [36,54]. PE represents expectations regarding the use of technology to assist with faster marketing, reduced costs, increased profits via e-commerce, and increased outputs [29,79]. For FS microbusinesses, this is associated with the extent to which using a smart technology such as a smart POS system would help create a smoother flow of operations concerning order tracking, improving production accuracy, maintaining consistency in product portioning and packaging, order preparation and distribution, etc. As a result, PE could also be closely associated with 'relative advantage' (RA) and 'observability' (OB). Exploring the influence of PE on smart technology adoption within FS microbusinesses will help identify and understand the operator's expectations regarding the use of smart technology, along with how significant the benefits of using smart technology need to be in order to convince them of adoption.

#### 4.1.4. Effort Expectancy (EE)

'Effort expectancy' refers to the degree of ease associated with using a particular form of technology [36,54]. EE is indicated through user-friendliness, ease of use, understanding, maintenance, installation, learning to use, and accessing of information [29,80]. Within FS microbusinesses, this refers to how the operators perceive the effort they need to exert to understand and familiarize themselves with the technology. EE further relates to the various operational components of the business (such as order tracking, sales tracking, menu, and pricing updates). Hence, EE can also be closely associated with 'habit' (HA), 'price value' (PV), and 'relative advantage' (RA). Exploring the influence of EE on smart technology adoption within FS microbusinesses will help understand the operator's perception towards the amount of effort required to use smart technology and how they associate effort with their expectations.

#### 4.1.5. Trust (T)

'Trust' is the degree of confidence to which the promise and reliability of using a particular technology will be fulfilled [54]. Trust in the brand and what the technology promises to deliver has been predicted to affect the behavioural intention of technology use. It has been indicated by the reliability and accuracy of the technology being adopted [54]. For FS microbusinesses, this refers to the level of trust that operators have towards the type of smart technology being adopted, the providers/suppliers of the technology, the features of the technology, and the outcomes the technology promises to deliver. Furthermore, trust can also be closely associated with 'perceived risk' (PR), 'perceived security' (PS), 'trialability' (TR), 'societal support' (SS), and 'complexity' (CX). Exploring the influence of trust on smart technology adoption within FS microbusinesses will help identify and understand the extent to which the operators are (un)willing to rely on smart technology.

#### 4.2. Key Activities

'Key activities' refer to the set of activities a firm may perform to create and deliver the business model elements [55,73]. The activities associated with using a particular smart technology provide the guidelines to measure how well technological innovation fits into the firm's business model. Hence, this second section of the TAMC consists of controllable and semi-controllable dimensions associated with cognitive and physical attributes. It provides a guideline for evaluating the interest and benefit associated with the adoption and/or evaluation of a new/existing technological innovation by measuring the HM, HA, OB, and RA dimensions stemming from both the UTAUT2 and the DOI theory.

#### 4.2.1. Hedonic Motivation (HM)

‘Hedonic Motivation’ refers to the joy or excitement derived from using a particular form of technology that helps persuade an individual to continue using that particular technology [29,36]. HM is indicated by fun, interest, entertainment, and satisfaction [79–81]. For FS microbusinesses, this would indicate the extent to which the operators will be interested in utilizing smart technology throughout the day across various operational departments, such as constantly checking for online orders, updating applications, and maintaining online business profiles. Thus, HM can also be closely associated with ‘complexity’ (CX) and ‘habit’ (HA) because if the technology is too complex, it can demotivate the user, and similarly, if the user is not motivated to use the technology, it can lead to inconsistencies in daily usage. Accordingly, exploring the influence of HM on smart technology adoption within FS microbusinesses will help understand how motivated operators are towards using smart technology and how using smart technology will make them feel.

#### 4.2.2. Habit (HA)

‘Habit’ is how an individual tends to perform behaviours automatically because of learning [29,36]. Regarding technology adoption, an operator’s HAs can arise through the current use of similar technology and by being already actively interested and involved in using technology [80,81]. Within FS microbusinesses, HA refers to operators using smart technology daily across various operational departments, for example, activating the online store each morning, updating the product list, and making end-of-day calculations. As a result, HA can be closely associated with ‘hedonic motivation’ (HM) as a driver to use technology and can influence the rate at which practice evolves into habit. Exploring the influence of HA on smart technology adoption within FS microbusinesses will help comprehend how operators feel about using smart technology in their daily business operations and if they are interested in making long-lasting changes.

#### 4.2.3. Observability (OB)

‘Observability’ is the extent to which an innovation is visible to the users and their social and business networks. It further refers to the extent of ease associated with observing and communicating the benefits of using a particular technology [82]. Thus, OB consists of two sub-constructs, namely, visibility and result demonstrability. These form a vital component in facilitating adoption as they help users gain knowledge about the performance of the particular technology [37]. For FS microbusiness, this means seeing the impact of using smart technology within the business operations, for example, a smoother flow of handling orders, preparing meals, tracking sales, and ultimately an improved business performance. As a result, OB can also be closely associated with ‘relative advantage’ (RA) and ‘trust’ (T). Accordingly, exploring the influence of OB on smart technology adoption within FS microbusinesses will help determine the operator’s perception of the extent to which the benefits of using smart technology need to be clear if they are to proceed with an adoption.

#### 4.2.4. Relative Advantage (RA)

‘Relative advantage’ is the extent to which an innovation is perceived to provide more benefits than its predecessor [82]. Here, RA is measured by comparing the change to the output of a specific function when performed with the help of a smart technological innovation to when the same function is performed using traditional means (free of technological influence). According to Rogers [37], the RA of using smart technology rests in improved efficiency, economic benefits, and status and can significantly impact the adoption rate of a particular technology [83]. For FS microbusinesses, this refers to the extent of improvement in areas such as order management, business exposure, operational efficiency, or finance management. As a result, RA can also be closely associated with ‘observability’ (OB) and ‘performance expectancy’ (PE). Exploring the influence of RA on smart technology adoption will help understand how much of an improvement the operators expect to see and in which areas of operations.

#### 4.3. Key Resources

‘Key resources’ are the resources the firm already possesses or requires to create and deliver value to its customer segment [73]. They serve to support the current and future business activities/developments [55] for facilitating the adoption of a new technology. This third section of the TAMC consists of semi-controllable dimensions associated with the physical attributes of the firm. It provides a guideline for evaluating how well a new/existing technological innovation fits in with the existing resources of the business. It offers the potential to identify the resources needed for adoption, if unavailable, by evaluating the CX, CT, FC, and TR dimensions stemming from both UTAUT2 and the DOI theory. In addition, when looking at the constructs of this dimension of the TAMC, external factors such as the technological infrastructure of the developing nation in which the framework is being applied need to also be considered.

##### 4.3.1. Complexity (CX)

‘Complexity’ is the extent to which an innovation is difficult to understand and use [82]. Factors such as the complexity of using a particular technology, technical infrastructure, and the design of the technology itself influence technology adoption. Users can be inhibited from using a particular technology if it requires additional mental effort and is time-consuming or frustrating to use [83]. For FS microbusinesses, this would refer to operators’ understanding of how smart technology works with minimal effort, for example, the required steps to update online menu items in a smart POS system. As a result, CX can be closely associated with ‘effort expectancy’ (EE), ‘trialability’ (TR), and ‘compatibility’ (CT). Exploring the influence of CX on smart technology adoption within FS microbusinesses will help understand the importance of factors such as simplicity, understandability, and user-friendliness, in enabling operators to be more effective in producing positive outcomes.

##### 4.3.2. Compatibility (CT)

‘Compatibility’ is the extent to which an individual perceives a product or service to be consistent with their existing products, items, values, and experiences [82]. CT plays a vital role in innovation because conformance with an individual’s lifestyle can impact the rate of adoption [37]. Furthermore, CT has been found to be influential in the adoption of new technology [83]. For FS microbusiness, this relates to how closely the smart technology will fit into the operator’s lifestyle (e.g., their dependency and frequency of using smart technology in their own lives). Moreover, CT relates to the extent products, services, and preparation procedures would allow for the incorporation of smart technology without any disruptions or interferences to the authenticity of the products or processes involved. CT can also be closely associated with ‘facilitating conditions’ (FC), ‘trialability’ (TR), and ‘complexity’ (CX). Thus, exploring the influence of CT on smart technology adoption within FS microbusinesses will help understand how the operators perceive the compatibility of smart technology and how they feel about merging conventional approaches with technology-driven approaches.

##### 4.3.3. Facilitating Conditions (FC)

‘Facilitating conditions’ refer to the degree to which an individual believes that the organizational resources, i.e., the factors owned and controlled by the firm ([84], p. 104) such as devices (smartphones, tablets, routers, POS systems, etc.), the ability to access the internet, and other facilities exist to support the use of a particular technology [36]. FCs are often indicated by the business’s resources and equipment, the operator’s knowledge and lifestyle fit, and any support and instructions available [29,85]. Within FS microbusinesses, this refers to the business having the necessary facilities such as stable internet connectivity, power outlets for charging, mobile devices compatible with the smart technology, and the operator’s familiarity with smart technology in general. As a result, FC can also be closely associated with ‘compatibility’ (CT), ‘complexity’ (CX), and ‘price value’ (PV). Accordingly,

exploring the influence of FC on smart technology adoption within FS microbusinesses will help identify and understand the areas that are ready or in need of improvement or change.

#### 4.3.4. Trialability (TR)

‘Trialability’ refers to the ability to experiment with new technology before its adoption. It has been shown to influence the adoption of new technology as it will make potential adopters feel more comfortable [37,83]. Furthermore, TR is important as it helps minimize unknown fears while simultaneously motivating potential adopters to use the technology being trialled [86]. To FS microbusinesses, this indicates whether the smart technology can be tested before incorporating it into their business. For example, a two-week or one-month free trial period to run an online store of the business on a third-party platform prior to paying any form of subscription fee or making any similar financial commitment. As a result, TR can also be closely associated with ‘complexity’ (CX), ‘compatibility’ (CT), and ‘trust’ (T). Exploring the influence of TR on smart technology adoption within FS microbusinesses will help understand how important operators consider the ability to test smart technology prior to adoption and how being able to do so would influence their perceptions and decisions.

#### 4.4. Key Partners

‘Key partners’ refer to the external relations that influence the running of the business by helping to minimize existing risks and/or by facilitating the supply of essential materials [55,73]. These business networks, comprising local authorities, non-competitors, competitors, suppliers, and buyers, represent strategic opportunities for firms to embrace innovations, reduce costs, acquire knowledge, and enter new markets [87]. Such networks can also influence a firm’s ability to adopt technological innovations. For FS microbusinesses, such partnerships extend to family and friends, ethnic groups, and religious organizations as well. Hence, this section considers two key parties that have a direct influence on a FS business’s technology adoption decisions and covers the uncontrollable dimensions associated with the firm’s external environment. It provides a guideline for assessing and understanding the influence of key external actors on adopting new technological innovations, accounting for the GS and SS dimensions. Further, it is worth noting that when looking at the constructs of this dimension of the TAMC, other external factors such as legal and institutional regulations and interferences taking place within the developing nation in which the framework is being applied need to also be considered.

##### 4.4.1. Government Support (GS)

‘Government support’ refers to the assistance provided by the local authorities to individuals to ease the burden associated with adopting a particular technology in the form of financial or infrastructural aid [88]. Chew et al. [89] found that the operator’s perceptions of government policies significantly moderated specific values and business decisions. Hence, in the context of FS microbusinesses, this would include access to support programs (microentrepreneur development programs and workshops), subsidies, tax relief, and technological infrastructure (internet access). Furthermore, unregistered microbusinesses could also be influenced to resist smart technology due to their perceived risk of needing to formalize in order to partake in governmental support programs. As a result, GS can be closely associated with ‘perceived risk’ (PR) and ‘facilitating conditions’ (FC). Exploring the influence of GS on smart technology adoption within FS microbusinesses will help understand how operators perceive the influence of external authoritative bodies on their businesses alongside their expectations of those authorities towards enabling smart technology adoption within their businesses.

##### 4.4.2. Societal Support (SS)

‘Societal support’, introduced initially as social influence in UTAUT, was redefined to include any form of assistance received from an individual’s social network (e.g., family

or friends) [36] and is indicated through the people who are important to and have an influence on the user, the prestige of people already using a particular technology, and media and community encouragement [79]. Therefore, SS remains a vital construct, especially in relation to family businesses, as it can cause an individual's commitment towards entrepreneurship and innovation to diminish when faced with adversity [90]. Thus, from the perspective of FS microbusinesses, SS refers to how the operator's family and friends influence the business decisions and processes by sharing information, emotional and financial support, etc. [91], and how competitors' actions and practices influence the operator's products and processes. Hence, SS can also be associated with 'trust' (T), 'performance expectancy' (PE), and 'hedonic motivation' (HM). Thus, exploring the influence of SS on smart technology adoption within FS microbusinesses will help understand the extent to which an operator's social network influences their acceptance and use of smart technology.

#### 4.5. Budget Cost

'Budget cost' refers to the firm's cost structure and the cost associated with each element of a firm's business model and is a crucial aspect of the firm's operations [73,85]. The structure of the firm's costs is measured as fixed and variable costs and provides an important guideline for the firm's decision-making [55]. Hence, this fifth section introduces a semi-controllable dimension associated with the cost (fixed/variable) incurred when adopting a new technological innovation or evaluating the cost incurred for an existing technological innovation by measuring the PV dimension stemming from the UTAUT2. It should be noted that when looking at the construct of this dimension of the TAMC, external factors such as economic conditions of the developing nation in which the framework is being applied need to also be considered.

#### Price Value (PV)

'Price value' is the degree of benefit perceived by an individual or their cognitive trade-off between the perceived benefit and the monetary cost spent for a particular technology [29]. It is thus indicated by reasonable pricing, value for money, cost-effectiveness, affordability, economic viability, and good/bad investment [80,81]. For FS microbusinesses, this refers to costs involved in adopting smart technology (internet chargers, device costs, subscription charges, financial agreements, etc.), improvement in sales and revenue, the current financial capabilities of the business, and the overall monetary benefit gained from adopting smart technology. As a result, PV can also be closely associated with 'relative advantage' (RA) and 'facilitating conditions' (FC). Exploring the influence of PV on smart technology adoption within FS microbusinesses will help understand the businesses' current financial capacities, the operators' attitudes towards their savings, and their willingness to use those savings for technological investments.

#### 4.6. Comparing the TAMC with Other Technology Adoption Theories/Models

By incorporating the 16 technology adoption constructs into five key sections of the BMC as discussed in this section, the proposed TAMC framework overcomes a majority of the limitations of the other technology adoption theories and models. In contrast to other technology adoption theories/models such as the TRA, TPB, TAM, and TOE, the TAMC holds a distinct advantage by considering the organizational attributes, which is brought about by the incorporation of the DOI theory. The TAMC also acts as a more up-to-date framework in the realm of technology adoption by considering constructs that have grown in significance in relation to technology adoption. In addition, the TAMC also adds a new dimension to the UTAUT2 through the DOI theory, accounting for organizational attributes and likewise also adds a new dimension to the DOI theory through the UTAUT2 that accounts for the individual attributes of technology adoption.

The TAMC has a disadvantage compared to other theories and models such as the TOE, the CMC, and the TLBMC, especially as it falls short in considering the more external aspects that may influence technology adoption. However, the TAMC accounts for two

external factors, i.e., the social and political aspects, which have been deemed to have a greater influence on technology adoption compared to other external factors. This is further discussed in the subsequent section as a potential limitation of this study [36,49,50].

## 5. Conclusions

The pandemic has raised several concerns regarding the effectiveness of business models utilized by FS microbusinesses and a need for a technology-driven smart business framework to aid microbusinesses in their struggle to cope with the socioeconomic drawbacks of the pandemic and the dawning of Industry 4.0 [92]. This study proposes a new theoretical framework, the Technology Adoption Model Canvas (TAMC), to explore the readiness of microbusinesses towards smart technology adoption. In doing so, this study recognizes the most influential facilitating and inhibiting factors associated with technology adoption based on theories and models such as the UTAUT2, the DOI theory, and the BMC. This paper conceptualizes 16 constructs influencing smart technology adoption (Figure 2). The analytical descriptions and co-relationships between these constructs demonstrate the complex nature of technology adoption and the need for frequent explorations of various constructs as their influence on technology adoption can fluctuate across time and place.

### 5.1. Research Implications and Avenues for Future Practice

#### 5.1.1. Practical Implications

The proposed TAMC provides a foundation for FS microbusinesses aimed at evaluating and facilitating the adoption and incorporation of smart technological innovations into their daily business operations. It is aimed at FS microbusinesses since technology adoption within the FS sector needs to be further explored. The number of influencing factors can be plentiful due to the consumeristic nature of the industry, where the operators of FS businesses themselves exist as consumers of smart technology. Hence, the TAMC is one of the first frameworks explicitly developed for exploring smart technology adoption within the FS sector as there remains much to be discovered in this context. The TAMC can make this possible as it combines the constructs identified by previous studies by applying the underpinned models individually or in part (Table 2) within the FS sector. This model will provide the FS microbusiness operators the necessary knowledge/guidelines for determining if a smart technological innovation is suitable for their business and/or for measuring/evaluating the effectiveness of an adopted smart technological innovation in their business. The constructs proposed through the model will assist the operators in ensuring an overall fit of a smart technology with their business by considering multiple dimensions such as the individual, organizational, and external dimensions, all of which play a significant role in ensuring the effective and continued application of smart technological innovations within FS microbusinesses.

#### 5.1.2. Theoretical Implications

By theoretically underpinning the model with the UTAUT2 and the DOI theory, the TAMC makes it possible to measure the suitability of technological innovations from both the business's physical attribute perspective and the operator's cognitive perspective. Furthermore, the model also incorporates new/emerging variables such as 'perceived security', 'perceived risk', 'trust', and 'government support', as identified in the recent research on technology adoption [29,32,50,88]. Thus, the TAMC will provide FS microbusinesses with a foundation for a much smoother transition from their traditional business models to a more sustainable technology-oriented smart business model.

From a theoretical perspective, the TAMC can be the starting point for scholars to identify additional aspects of technology adoption within FS microbusinesses and offer practitioners more robust results. This paper categorizes the key factors influencing technology adoption from an individual and an organizational perspective. It contributes to recent conceptualizations of technology adoption, especially in the context of FS microbusinesses. The TAMC framework improves the existing technology adoption models

by combining their constructs and incorporating new/emerging ones absent from those models. The TAMC advances those models by identifying co-relationships between previously identified constructs and new/emerging constructs and, in doing so, creates new avenues for technology adoption research. All constructs of the TAMC have, through previous studies, been proven to be suitable for exploring technology adoption within the FS context, making it possible to utilize the TAMC as an appropriate framework to guide technology adoption research in the context of FS microbusinesses. Furthermore, scholars can obtain guidance from the current study and delve further into comparative investigations of the implementation of the TAMC by various organizations to enhance the generalizability of the framework. In addition, the TAMC will help promote further investigations into the facilitating and inhibiting factors of technology adoption within the FS sector in developing nations. However, these factors will likely differ across economies due to varying employment levels, resource availability, profitability potential, incentive plans, and subsidies. Hence, once the canvas has been established conceptually, researchers can apply it to different types of service industry microbusiness. In this way, the TAMC can be applied to other forms of service industry microbusinesses, and when certain constructs of the TAMC are deemed to be inapplicable/unsuitable, they need to be omitted or modified. For example, when applying the TAMC to a travel agency certain constructs such as 'habit' and 'societal support' may not be all that relevant. Such efforts will thus improve the current understanding and facilitate policymakers' efforts to devise strategies and policies for improving the rate of smart technology adoption particularly within service industry microbusinesses.

#### 5.1.3. Methodological Implications

From a methodological perspective, the TAMC can be utilized as a framework to evaluate the readiness to adopt smart technology and/or evaluate the effectiveness of an adopted smart technology from both a qualitative and a quantitative approach. Qualitative studies can utilize the five broader sections of the TAMC, 'value proposition', 'key activities', 'key resources', 'key partners', and 'budget cost' to explore further the attitudes and perceptions of business operators towards smart technology adoption and implementation. Meanwhile, quantitative studies can utilize each of the 16 components (Figure 2) belonging to the five broader thematic sections of the TAMC to measure the readiness to adopt and/or the effectiveness of an adopted smart technological innovation. Furthermore, quantitative approaches can also be utilized to assess (co-)relationships between constructs across each of the five main sections and investigate if, for example, 'trialability' (TR) influences 'trust' (T) or if 'complexity' (CX) influences 'hedonic motivation' (HM). Thus, the TAMC provides the foundation for numerous qualitative and quantitative or even mixed approaches that scholars can utilize to understand further the narrowly explored area of FS microbusinesses and smart technology adoption.

Finally, the field of technology adoption research has surged rapidly in recent years, leaving significant areas to be covered, especially within the FS sector. Future scholars can further expand the framework by incorporating different dimensions of business models and technology acceptance theories such as the TOE and TAM. Lastly, the current TAMC needs more empirical evidence, which future research can also provide.

#### 5.2. Limitations

The framework is developed in the context of FS microbusinesses within a developing economy as each of the constructs discussed within the TAMC has been closely linked to smaller businesses. As a result, some of the variables incorporated within the model may be irrelevant when applied within the context of larger businesses in developing economies. Additional variables may be required to strengthen the framework's effectiveness when applying it to businesses of different scales within different economic stages.

This study solely focuses on the development of the TAMC and thus does not focus on its application. Therefore, research focusing on applying the TAMC should assess and

evaluate its strength and effectiveness in the current industry context. Hence, future studies can thus apply the framework to small, medium, and microenterprises in developing economies under different market conditions to further enhance the frameworks' generalizability. Moreover, both qualitative and quantitative studies are required to complement and further establish each of the constructs proposed in the TAMC, whereby qualitative studies will help explore each of the constructs in greater depth and quantitative studies can help further enhance their validity and reliability.

The TAMC focuses on internal aspects of microbusinesses in the form of individual and business attributes with very limited attention being paid to external attributes. Thus, future research could extend the model by incorporating additional social, cultural, political, and environmental attributes to broaden the scope of the proposed framework. Furthermore, the model has been developed within the context of a developing country where the authors have extensively explored service industry microbusinesses, and hence, the proposed constructs have been identified to be of significant importance to FS microbusinesses in developing economies. Nonetheless, further research is needed to effectively draw comparisons between developed countries and developing countries when applying the TAMC in terms of economic development, technological awareness, consumer attitudes and behaviour, and legal and institutional regulations, a gap which future studies can help address.

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