Journal of Information Technology Management
ISSN-OnLine: 2980-7972
University of Tehran

Intention to Adopt Next-Level Technology in Food and Beverage Manufacturing SMEs in Bangladesh: UTAUT Model and Business Continuity Theory

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Journal of Information Technology Management, 2025, Vol. 17, Issue 1, pp. 33-57
Published by the University of Tehran, College of Management
doi: https://doi.org/10.22059/jitm.2025.99922
Article Type: Research Paper

Received: June 06, 2024
Received in revised form: August 09, 2024
Accepted: December 23, 2024
Published online: January 01, 2025

Abstract

The performance of SMEs will keep the wheel of the country's economy turning. Upgrading the technologies currently used in SMEs will make the manufacturing process of food and beverage (F&B) industries more efficient. These firms are still using traditional equipment and machinery in their F&B manufacturing process; however, it is required to adopt the next level of technologies for maximum productivity, which they cannot afford. Thus, the study focuses on the intention to adopt upgraded technologies in F&B SMEs in developing countries. A total of 230 F&B SME owners and top management were surveyed in Bangladesh. The collected data were analyzed using PLS-SEM with SmartPLS software. The results showed that disaster preparedness and business continuity had significant effects on the intention to adopt; similarly, performance expectancy, effort expectancy, and social influence were also significant in the intention to adopt the next level of IR technologies. The moderating role of government support and policy had mixed effects on intention. The study

is significant because disaster preparedness and business continuity plans are utilized in technology adoption and intention scenarios. To investigate this intention, the study adopted two perspectives: the influence and role of disasters and hazards on SMEs through disaster preparedness and business continuity plans, and secondly, the Unified Theory of Acceptance and Use of Technology (UTAUT) for measuring the intention. The study contributed to these two theories in a new context with constructs. The study will also contribute to policymakers in developing constructive policies and providing effective financial and non-financial support for F&B manufacturing SMEs.

Keywords: Adoption Intention: Bangladesh, Business Continuity, Disaster Preparedness, F&B Manufacturing SMEs, Government Support and Policy, IT technology, UTAUT Model

Introduction

Small and Medium Enterprises (SMEs) are a vital part of the economy (Erdin & Ozkaya, 2020; Xin et al., 2023), and food and beverage manufacturing SMEs are overall the most vital within the SME sector (X. Chen & Voigt, 2020). World Bank (2023) reports revealed that formal SMEs contributed around 40% to emerging countries. The technological advancement in this industry has also had far-reaching success, namely the industrial revolution. The industrial revolution is a state-of-the-art business model (Butt et al., 2020; Wei & Pardo, 2022), which is expected to be an influential driver for SMEs, enabling them to flourish like large industries (Rakshit et al., 2022; Smith et al., 2022). However, not all SMEs can adopt the latest technology as larger enterprises do due to a shortage of capital, lack of skilled manpower, and inefficiencies (operational efficiencies, experience, etc.) (Bilan et al., 2020; Bruce et al., 2023; Indrawati, 2020). An enterprise adopts and uses state-of-the-art technology or modern equipment according to its capabilities and affordability (financial and non-financial capacities and affordability) (Zhang et al., 2022). Many small firms are still manufacturing with their indigenous technology or older versions of equipment and machinery. This scenario is mostly found in the least developed countries (LDCs) and developing countries (Sundaram & Zeid, 2023).

The Bangladesh government has taken the initiative to increase the production of food and beverages to be self-sufficient. As a significant number of SMEs are supporting the Bangladeshi economy to flourish, there is no alternative to developing the SME sector by producing more. In increased production, technological adoption has no substitute. On the other hand, many food and beverage SMEs may not adopt the latest technology. In this case, they might consider the gradual adoption of new technologies. This implies that food and beverage manufacturing SMEs can adopt the next level of technologies beyond what they are currently using in their production, packaging, and transportation.

Besides this difficulty in adopting the latest technologies, food and beverage manufacturing SMEs face various disasters and hazards. In these difficulties, many small firms need to wind up their business, many of them are about to close their business, and many firms survive in dire conditions. Thus, disaster preparedness and business plans and strategies become vital for F&B manufacturing small and medium firms. Disaster preparedness and business continuity plans are vital in the decision-making process of adopting new technologies (Rung et al., 2019). Thus, besides adopting the next level of technology, their disaster preparedness and business continuity plans are to be included in their business plans. As per the understanding of the researcher and a search for the literature, there is no research on disaster preparedness and business continuity plans in relation to the intention to adopt the next level of IR technologies (Oliver-Smith & Hoffman, 2019). Government support is another essential factor for small and medium business enterprises, especially when those firms suffer from a shortage of capital and cash (Wahab et al., 2018). These firms also need a facility for buying the technologies and machinery and require infrastructure and logistical support. Additionally, training for the use of these equipment and trained staff are prerequisites, where government effort and investment are mandatory. Importing those technologies from foreign countries, negotiating with them, and arranging installation and operational services are important issues that the government can facilitate; the small and disadvantaged firms cannot manage due to their capacity and strength (Akhter et al., 2023). Entrepreneurs' age and their business experience are also important factors that can influence an entrepreneur's perception and decision-making processes (M. Hossain et al., 2024).

The intention to adopt new technologies in food and beverage manufacturing SMEs might depend on many factors, including their perceived performance, usability, and consistency. Many theoretical grounds support various constructs. In light of the Unified Theory of Acceptance and Use of Technology (UTAUT), the influencing factors are performance expectancy, effort expectancy, and social influence. Previous research has highlighted the role of performance expectancy, effort expectancy, and social influence on the adoption of new or upgraded technologies (Alwadain et al., 2024; Ayaz & Yanartaş, 2020a; Wahab et al., 2022). The business continuity plan focuses on disaster preparedness and business continuity in this study.

This current research answers the research question: whether the disadvantaged, financially insolvent, capital-poor, and under-skilled F&B manufacturing SMEs intend to adopt their respective next level of technologies considering disaster preparedness and business continuity. To answer this question, the study is concerned with the willingness of these firms to adopt the upgraded technologies, which are not currently being used in their manufacturing operations. Specifically, if a firm has been using manual or traditional mechanisms in their production, whether it is willing to use upgraded mechanisms; if a firm has been using Industry Revolution technology 2.0, whether it is interested in adopting Industry Revolution 3.0 technologies; and for those firms using IR 3.0, whether they have the

intention to use IR 4.0 or the latest technologies of IR 5.0. From the literature, it is found that limited research has been conducted on this perspective, where a firm intends to adopt their next-level technologies (Meng et al., 2021). To the best of the researcher's knowledge, no research has been conducted on the intention of food and beverage SMEs to adopt their next-level technologies in manufacturing food and beverages in the Bangladesh context.

The current study follows the literature review, theoretical framework, hypothesis development, method and materials, data analysis and findings, and relevant discussion of the findings. The study concludes with recommendations, implications, and future directions.

Literature Review

Theoretical Ground

Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP)

Organizations are increasingly dealing with many forms of disruptions, which may happen one at a time or simultaneously, according to Kapatsila et al. (2023). Each interruption might impact organizational resources differently. Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP), the two primary contingency plans, are often implemented independently within enterprises across various time frames (Gori et al., 2022). BCP attempts to create suitable preparations before a catastrophe to restart essential company activities to a minimally acceptable predetermined level (i.e., Minimum Business Continuity Objective [MBCO]) within the so-called Maximum Tolerable Period of Disruption(s) (MTPD). DRP, on the other hand, works to achieve the complete recovery (restoration) of all hampered activities to their regular operational condition after a catastrophe (Gangwal et al., 2022).

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a very popular model for explaining technological adoption in organizations. Venkatesh et al. (2003) have suggested that UTAUT further improves technological acceptance models (Venkatesh et al., 2003). Performance expectancy, effort expectancy, social influence, and enabling circumstances are the four main constructs of UTAUT (Popova & Zagulova, 2022; Tewari et al., 2023). The UTAUT model helps examine skill and competency identification difficulties, as well as customized training to determine predictors of real technology use (Batucan et al., 2022). The Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), and Innovation Diffusion Theory were the eight models used to establish the UTAUT theory. There are three general types of extension or integration to examine UTAUT in new contexts, including new technologies such as collaborative technology and health information systems (Akinnuwesi et al., 2022), recent user populations such as healthcare professionals and consumers (Tamilmani et al., 2021), and new cultural contexts such as China, India, and the Middle East (Chen et al., 2021).

Hypothesis Development

This section discusses the empirical studies that show the relationship between variables following theoretical support for the research framework.

Disaster preparedness and intention to adopt next-level technologies

The interest in involving other stakeholders, including the private sector, has increased, although governments were previously thought to be the main actors in disaster risk reduction (M. S. Alam et al., 2024). This is due to the limited success in addressing underlying risks. The business sector, in particular SMEs, should be involved in disaster risk reduction and preparation for several reasons. Owing to their limited resources and ability to swiftly recover from catastrophes, SMEs are more vulnerable to them. They are constrained by a lack of resources, including money, people, and technology (Rezvani et al., 2023), and are more likely to experience direct and indirect effects of a disaster on supply networks. Recent global events remind all corporate organizations of the need to consider catastrophe risk preparation (Budiyanto et al., 2021; Hassel & Cedergren, 2021; Rolnick et al., 2022). This idea would motivate the owners of SMEs to use industry technology in their operations to lessen the loss brought on by uncertain risks. Therefore, the following hypothesis was formulated:

H1: Disaster preparedness has a significant effect on the intention to adopt the next level of technology.

Business continuity and intention to adopt next-level technologies

SMEs have the power to influence how catastrophe risk is managed in the future. Even though SMEs make up a significant number of all companies and are located locally, they interact with various individuals daily, including their customers, business partners, staff, and the neighborhood in which they operate (Marzi et al., 2023). Additionally, SMEs play a crucial part in supply chains by occupying lower-tier supplier positions with specialized technology and significant market shares (S. Hossain et al., 2023). Disaster Recovery Planning (DRP) will lower the vulnerability of people and economic assets to catastrophes and guarantee the resilience of supply networks, helping to build a more resilient society if SMEs can incorporate it into their companies (Upadhyay et al., 2022). While highlighting the crucial role played by the private sector the following hypothesis is formulated.

H2: Business continuity has a significant effect on the intention to adopt next-level technologies.

Performance expectancy and intention to adopt next-level technologies

Upadhyay et al. (2021) outlined how the respondents anticipated that new technology would enhance user performance in terms of time savings, which made it conceivable for this significant outcome or impact to occur (Chen et al., 2021). In their studies, M. Chen et al. (2021) and Jadil et al. (2021) found that performance is an active component that affects how people perceive and intend to utilize technology. Many researchers have looked into the

impact of performance expectancy on behavioral intention to adopt new technological arrangements, including Habib and Hamadneh (2021), Khan et al. (2021), Budi et al. (2021), Tewari et al. (2023), Tamilmani et al. (2021), and Jadil et al. (2021). Akinnuwesi et al. (2022) suggested behavior and the purpose of adopting new technologies.

H3: Performance expectancy has a significant effect on the intention to adopt next-level technologies.

Effort Expectancy and intention to adopt next-level technologies

According to Abushakra and Nikbin (2019), business owners will not use IoT technology until it helps their operations and procedures. Additionally, they did not support the association between effort expectation and behavioral intentions, which contradicts earlier research (Yein & Pal, 2021). This minor result was caused by the fact that the effect of effort expectations on behavioral intention lowers when users are already acquainted with and are comfortable using the tools (Bahri et al., 2021). Additionally, (Nikolopoulou et al., 2020) discovered a negligible correlation between effort expectations and intention to use mobile-assisted language learning.

H4: Effort expectancy has a significant effect on the intention to adopt next-level technologies.

Social influences and intention to adopt next-level technologies

Chang et al. (2019) explained how adopters' perceptions of their friends, family, co-workers, and other stakeholders affect whether they should utilize the new technology. Since the UTAUT model is well known, numerous researchers have looked into the impact of effort expectancy on behavioral intention to adopt new technological arrangements, including Budi et al. (2021), Cabrera-Sánchez et al. (2021), M. Chen et al. (2021), Habib and Hamadneh (2021), Jadil et al. (2021), Khan et al. (2021), and Tamilmani et al. (2021). According to Yein and Pal (2021), social impact is not significant; yet, it was included in UTAUT to be the successor to subjective norms for the organizational environment. This is why it lost its significance. A recent study by Alwadain et al. (2024) concludes that social influence does not change the desire to utilize new technology in diverse SME contexts.

H5: Social influence has a significant effect on the intention to adopt next-level technologies.

Moderating the role of government support and policy to adopt next-level technologies

Previous empirical research shows that government policies—specifically, government IT assistance and attitudes toward IT applications—significantly influence a firm's first choice to implement an IT system. The government's support includes rules and a commitment to promoting IT applications, tax incentives, information provision, the availability and caliber of public IT infrastructure, IT training and workshops, laws protecting personal information security and privacy, laws addressing cybercrime, and other initiatives (Khan et al., 2021; Tamilmani et al., 2021; Yein & Pal, 2021).

Government initiatives, directives, and practices may either encourage or obstruct a company's adoption of IT innovation (Jadil et al., 2021; Osei et al., 2022; Popova & Zagulova, 2022). The government may function as a promoter via its funding, dedication to IT innovation, and other initiatives, or as a barrier in cases where there is a lack of telecommunications infrastructure, insufficient tax breaks, little internet use, stringent national data protection laws, etc. Regarding the impact of government rules and support on the adoption of IT applications, it is reasonable to assume that the chance of non-adopter adoption will increase directly with the level of government commitment and support (Budi et al., 2021; Cabrera-Sánchez et al., 2021). It should be emphasized that earlier research provided no data on the impact of government funding and policies on the firm's use of innovative applications. Additionally, the government does disaster management as part of its regular duties. Every year, a nation has disasters or risks that disrupt business (Arfi et al., 2021; M. Chen et al., 2021). In this situation, business enterprises anticipate government support through various measures, such as tax breaks, exemptions, flexible business policies, funding and subsidies, low- or no-interest bank loans, the development of global markets, export, and import flexibility, etc. (Kapser & Abdelrahman, 2020). These benefits make it easier for SMEs to manage their company effectively. The ambition to embrace new technology is thus strengthened by this support and flexible policy, bearing in mind that government assistance is accessible. Considering this scenario, this study formulated the following mediating hypotheses:

H7a: Government support and policy mediate the relationship between disaster preparedness and intention to adopt next-level technologies.

H7b: Government support and policy mediate the relationship between business continuity and Intention to adopt next-level technologies.

Moderating role of entrepreneur's age and experience

Age influences the impact of performance expectancy on behavioral intention. This argument is supported by Ahamed et al. (2024) and Hu et al. (2024) in their research. According to earlier UTAUT investigations, age moderates the association between performance expectancy and adoption intention (Mariani et al., 2021). Men are more task-focused, productive, and effective than women, especially younger men (Lai & Stacchezzini, 2021). Therefore, younger men are more inclined to accept technology when they feel that next-level technologies will enhance their ability to accomplish their jobs.

H8a1-H8a2: Entrepreneurs' age and experience moderate the relationship between performance expectancy and intention to adopt next-level technologies.

Using new word processing software, Maritz et al. (2021) evaluated 107 MBA students and found that experience mitigated the impact of effort expectancy on behavioral intention. There is a claim that becoming older has a detrimental moderating impact on effort expectancy. It is more difficult for older individuals to comprehend complex inputs and

concentrate their attention while working, which makes it more difficult for them to master new technologies (Guerola-Navarro et al., 2022). Therefore, the following hypothesis was proposed:

H8b1-H8b2: Entrepreneurs' age and experience moderate the relationship between effort expectancy and intention to adopt next-level technologies.

Experience is predicted to attenuate the relationship between social influence and the inclination to embrace new technologies. According to Ho et al. (2022), a person's frame of reference may be shaped by their experience with technology. Individuals with minimal technological experience tend to conform more readily to social pressure, while users with high levels of expertise are less sensitive to other people's judgments. In a different study, Karadžić and Ristić (2022) examined people's experiences using personal computers and found that these experiences had a moderating impact on the association between social influence and behavioral intention. The moderating effects of experience on the relationship between social influence and behavioral intention were also significantly observed by Guerola-Navarro et al. (2022). Thus, the following hypothesis was created:

H8c1-H8c2: Entrepreneurs' age and experience moderate the relationship between social influence and intention to adopt next-level technologies.

UTAUT's significance was underlined by Akinnuwesi et al. (2022). It is simple to comprehend that customers have developed a consumption pattern before their actual consumption behavior. However, the design of a new technology that boosts consumer interest may now be what draws users to adopt and utilize it. Numerous studies have shown that a consumer's age and experience affect their hedonic motivation and behavioral intention, influencing their usage behavior (Arfi et al., 2021; Ayaz & Yanartaş, 2020b; Budi et al., 2021; Merhi et al., 2019). They predicted that experience and age would moderate the effects of UTAUT. Thus, the study formulated the following hypothesis:

H8d1-H8d2: Entrepreneurs' age and their experience moderate the relationship between facilitating conditions and intention to adopt next-level technologies.

Proposed Theoretical Model

The study proposed the following research model that explains the factors affecting the intention to adopt the industrial revolution for SMEs in Bangladesh for their next level compared to the current level of usage. This study’s framework is conceptualized based on three theories: a. Disaster Preparedness, Business Continuity, and UTUAT Model (Figure 1).

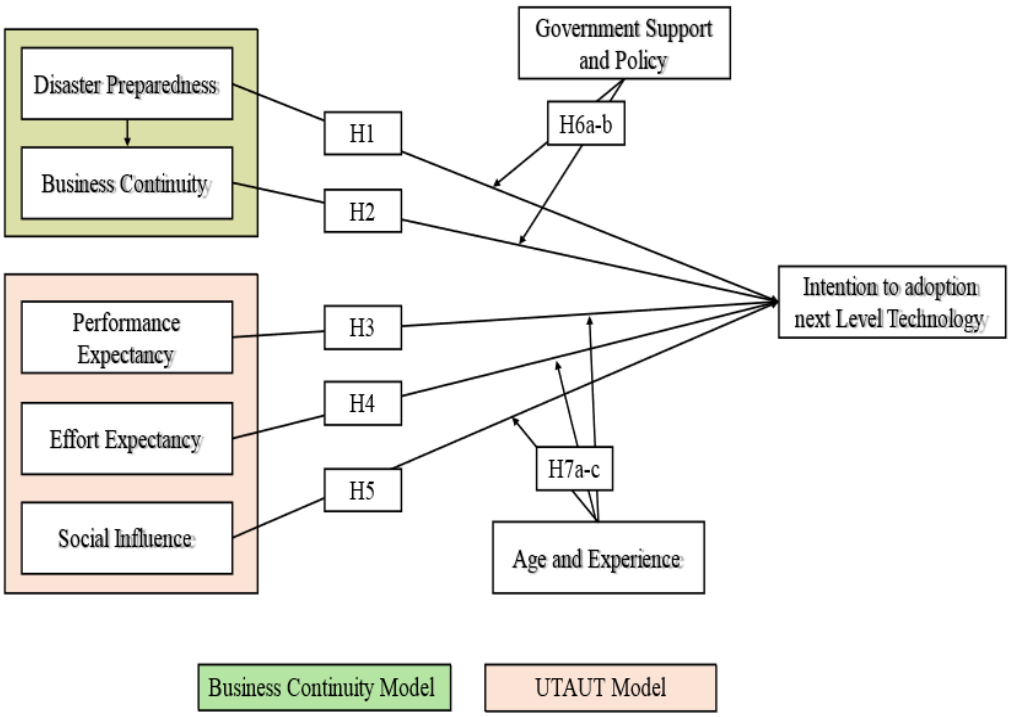

Figure 1. Research framework

Methodology

Population and Sample

The population for this cross-sectional research topic is small and medium-sized (SME) food and beverage manufacturing enterprises in Bangladesh. This current research selected Dhaka and its sub-urban areas where 32% of the country's SMEs are located. The researcher collected the list of F&B SMEs from several sources: SME Foundation (SMEF), Bangladesh Agro-Processing Association (BAPA), and Bangladesh Standard and Testing Institute (BSTI). These separate lists are mutually exclusive.

Sample Size and Its Determination Techniques

Many researchers adopt the simple approach of the "rule of 5" or "rule of 10" under the normal distribution theory to obtain appropriate significance tests (Hunziker & Blankenagel, 2021). Considering the above criteria of constructs and their items to a number of cases ratio (Bell et al., 2019; Rosenstein, 2019), the present study aims to examine 9 constructs including moderator and mediator, and 36 items within the model; therefore, the minimum required sample size needed is 180 (i.e., 36x5=180) to 360 (i.e., 36x10=360). Based on this criteria, 230 respondents are considered to be the representative samples.

Research Instrument

The five-point Likert scale was applied to the current study as it is the most widely used in many fields, although it originated in the field of psychology and social sciences (Martino et al., 2018). Five scores were given for 'strongly agree', four for 'agree', three for 'neutral', two for 'disagree', and one for 'strongly disagree' answers.

Data Collection and Field Work

The study utilized five data enumerators, each with expertise in data collection and surveys. These enumerators worked under the direct supervision of the researcher. In the list of respondents, contact was made via the formal business address or registered business address, along with contact numbers. After confirming appointments, the enumerators visited the respective managers, owners, or CEOs at scheduled times and dates. During the visit, they explained the purpose of the study, the process, and the intended use of the data. Upon receiving consent to participate in the survey, a hard copy of the questionnaire was provided to the participants for completion.

Results

Demographic Profile

As stated earlier, the data was collected with a structured questionnaire. In demographic information, the majority of the participants were male (96%; n=221) and only 3% of participants were female (3%; n=7). This finding implies that in Bangladesh males have the highest number in manufacturing industries. In the age spectrum, 43% were in the 31 to 40 category and 30% were from the 41 to 50 years category. There were also younger SME entrepreneurs (20%) being 21 to 30 years old. In terms of the highest education of the participants, a significant number of them were bachelor graduates (42%) and 30% were higher secondary school graduates. A maximum of 72% of participants were business owners or proprietors or directors. From a business perspective, 85% of enterprises were food manufacturing enterprises and 9% were beverage (soft drink and mineral water) enterprises in this study. The annual income or revenue information showed that a maximum of 38% of enterprises had an annual income of Bangladeshi Taka 10 lakh to 50 Lakh, followed by 25% who had between 50 Lakh to 1 crore, and 23% had between 5 Lakh to 10 Lakh.

In the event of permanent employees or workers, 82% of enterprises had between 5 and 74 employees or workers; on the other hand, 61% had 5 to 74 temporary employees or workers. Current operation duration information showed a wide spectrum – there were few new enterprises (less than 2 years); less than 5 years were around 19%; less than 10 years were 32% (maximum), and 20% had more than 25 years' operation duration. The individuals involved in those enterprises had a range of experience- 44% of participants had 6 to 10 years of experience, followed by 21% with 11 to 15 years of experience, and 20% of participants had less than 5 years of experience. This combination of business experience of the individuals is expected to produce a better understanding to adopt next-level technologies.

Inferential Statistics

Structural Equation Model and PLS-SEM Usage

Hair et al. (2021) mentioned that PLS-SEM can deal with two types of indicators- formative and reflective. Another reason is that to generalize the study's results, the result will use the SEM approach.

Hypothesis testing with Structural Equation Modeling (SEM)

SEM engages with two core models: the Measurement Model and the Structural Model.

Measurement Model Assessment

Reliability in research measurement can be dissected into two primary facets: stability and internal consistency. Assessment of reliability through Factor Loadings, Cronbach's Alpha values, Composite Reliability, and Average Variance Extracted (AVE). Such meticulous attention to reliability ensures that the study's findings are both robust and grounded in a solid empirical foundation, enhancing its credibility and generalizability (Kieser, 2020). Factor Loadings, Cronbach's Alpha values, and Composite Reliability are achieved once their values are more than 0.708.

Table 1.Summary Measurement Model Analysis

Variable	Items	Loading	CA	rho_A	CR	AVE
Intention to adopt	IA1	0.763	0.820	0.821	0.881	0.650
next level technologies	IA2	0.815				
	IA3	0.821				
	IA4	0.824				
Government Support	GS1	0.897	0.882	0.885	0.920	0.742
and Policy	GS2	0.748				
	GS3	0.877				
	GS4	0.915				
Performance Expectancy	PE1	0.749	0.808	0.814	0.874	0.635
	PE2	0.858				
	PE3	0.778				
	PE4	0.797				
Effort Expectancy	EE1	0.756	0.820	0.824	0.881	0.650
	EE2	0.835				
	EE3	0.820				
	EE4	0.811				
Social Influence	SI1	0.831	0.833	0.857	0.888	0.666
	SI3	0.869				
	SI4	0.836				
	SI5	0.721				
Business Continuity	BC1	0.790	0.928	0.933	0.941	0.665
	BC2	0.796				
	BC3	0.838				
	BC4	0.883				
	BC5	0.784				
	BC6	0.817				
	BC7	0.754				
	BC8	0.856				
Disaster Preparedness	DP1	0.855	0.900	0.902	0.926	0.715
	DP2	0.833				
	DP3	0.874				
	DP4	0.868				
	DP5	0.794				

Table 1 and

Figure 1 offer an in-depth evaluation of the measurement model, spotlighting the intricate relationships between observed variables and their corresponding latent constructs. Factor Loadings, Cronbach's Alpha values, and Composite Reliability are more than 0.708. And, the Average Variance Extracted (AVE) indicates another layer of validation having above the 0.5 (threshold). Besides, the reliability and stability of a measurement model, construct validity is very important because it strengthens the fact that data collected from samples can truly capture population characteristics (Hair et al., 2021). Construct validity can be examined by establishing convergent validity through AVE and discriminant validity through the Fornnel and Larcker criterion.

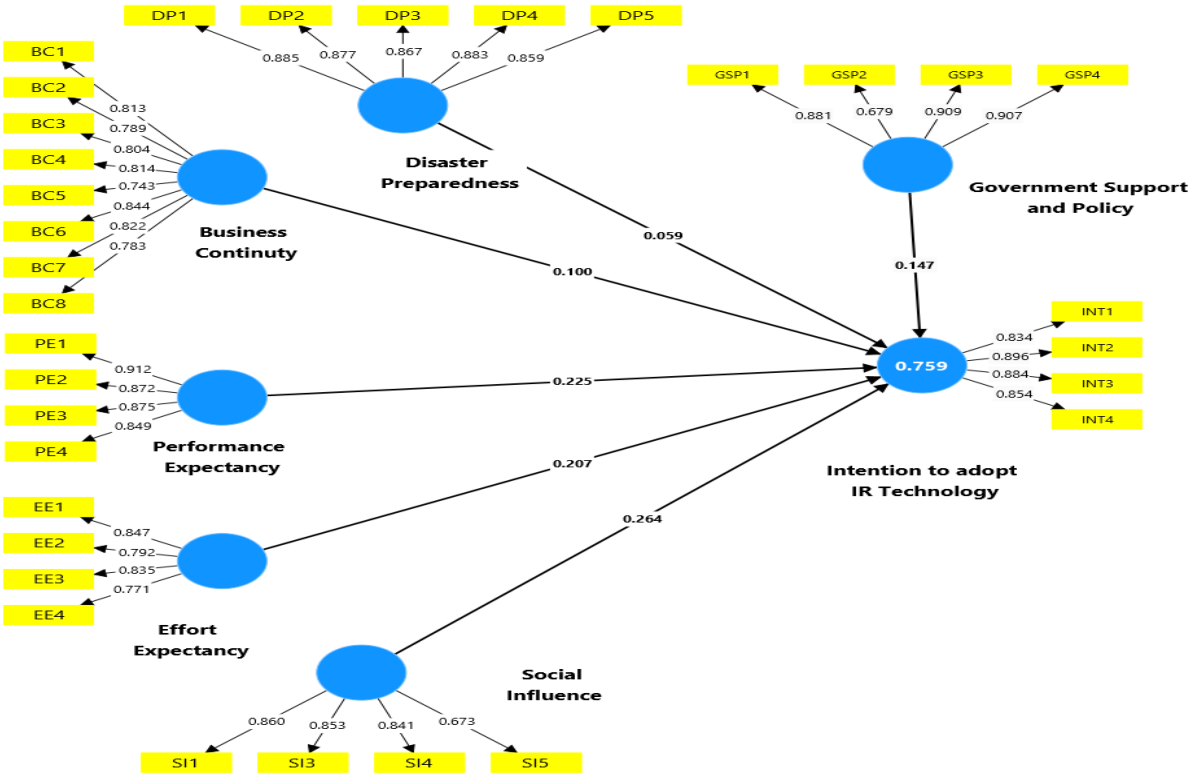

Figure 1. Measurement model

One of the widely accepted methods to assess discriminant validity is by examining the square root of the Average Variance Extracted (AVE) of the constructs (Hair et al., 2021), referring to the Fornell and Larcker criterion. Table 2 showed that the analysis adhered to this

criterion. For each construct, the square root of its AVE consistently surpassed its correlation coefficients with other constructs.

Table 2. Fornell and Larcker Criteria

Constructs	01	02	03	04	05	06	07
01. Business Continuity	0.802						
02. Disaster Preparedness	0.860	0.874					
03. Effort Expectancy	0.581	0.627	0.812				
04. Government Support and Policy	0.679	0.690	0.615	0.849			
05. Intention to Adopt next level technologies	0.718	0.716	0.734	0.731	0.867		
06. Performance Expectancy	0.733	0.745	0.742	0.746	0.802	0.877	
07. Social Influence	0.690	0.652	0.659	0.683	0.776	0.745	0.810

Structural Model For Testing Hypothesis

The structural model's primary objective is to test the hypothesized relationships posited in the theoretical framework once the measurement model meets its criteria.

Multicollinearity Analysis

Multicollinearity arises when two or more exogenous (independent) constructs in a model are highly correlated, suggesting potential redundancy among them. A VIF value greater than 10 is conventionally considered as an indicator of high multicollinearity (Radomir et al., 2023). However, more conservative scholars suggest a threshold of 5 as a potential cause for concern (Chattamvelli & Shanmugam, 2023). In this context, all VIF values are well below these conventional thresholds (maximum 3.410), indicating that multicollinearity is not a significant issue for the relationships under examination.

Determinants Coefficient (R2)

The squared multiple correlation often denoted as R2, represents the proportion of variance in the dependent variable that can be attributed to the independent or predictor variables in a regression model (Atkinson et al., 2021). For "Government Support and Policy", the R2 value is 0.273, suggesting that approximately 27.3% of the variance in this construct can be explained by its predictors. When interpreting the strength of this R2 value, it aligns with the benchmarks set by (Cohen, 2013) and Hair et al. (2021) as "Fair", while (Chin, 1998) considers it "Substantial". For the variable "Intention to adopt next-level technologies", the R2 value is notably higher at 0.760, indicating that 76% of the variance in the intention to adopt can be explained by its predictors. The substantial R2 value for "Adoption intention suggests that the predictors in the model capture a significant portion of the variability in this construct (Avkiran & Ringle, 2018; Chin, 1998; Cohen, 2013).

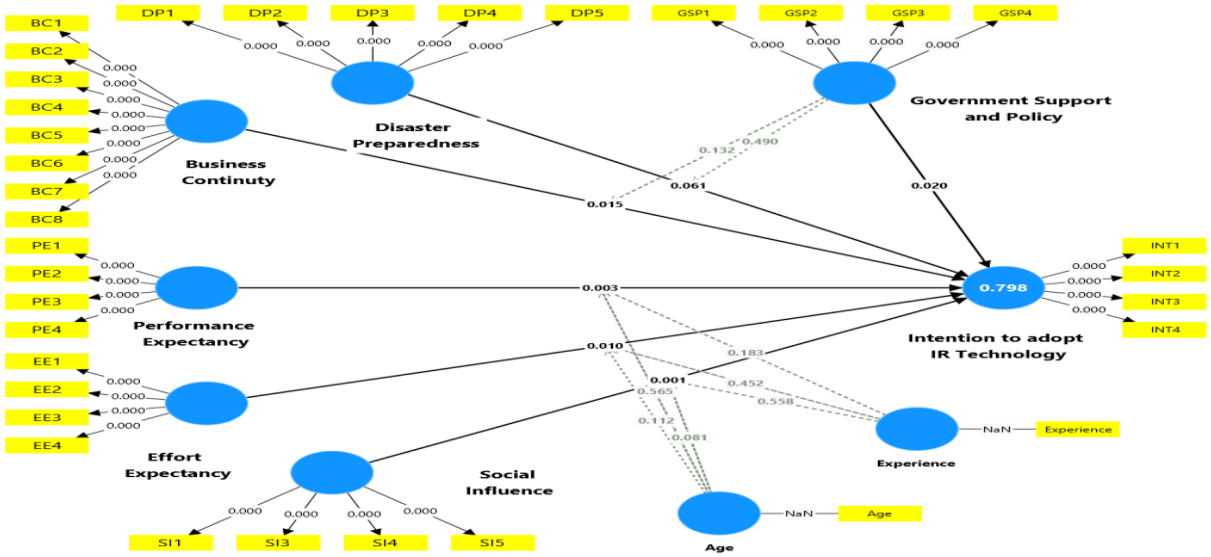

Figure 2. Structural model

Table 3. Hypothesis Testing Based on Regression Coefficient

Hypo	Relation	Std. Beta	Std. Error	t-value	P Values	Decision
H1	Disaster _Preparedness -> Intention to adoption	0.128	0.068	1.886	0.061	Not Supported
H2	Business _Continuity -> Intention to adoption	0.159	0.064	2.461	0.015	Supported
H3	Performance _Expectancy -> Intention to adoption	0.274	0.091	3.000	0.003	Supported
H4	Effort _Expectancy -> Intention to adoption	0.265	0.102	2.589	0.010	Supported
H5	Social _Influence -> Intention to adoption	0.263	0.076	3.456	0.001	Supported
H6	Government Supp-Policy -> Intention to adoption	0.153	0.065	2.352	0.020	Supported
H6A	Govt Supp-Policy x Disaster _Preparedness -> Intention to adoption	-0.067	0.097	0.692	0.490	Not Supported
H6B	Govt Supp-Policy x Business _Continuity -> Intention to adoption	0.164	0.108	1.512	0.132	Not Supported
H7a1	Age x Performance _Expectancy -> Intention to adoption	0.054	0.094	0.577	0.565	Not Supported
H7a2	Age x Effort _Expectancy -> Intention to adoption	-0.181	0.114	1.596	0.112	Not Supported
H7a3	Age x Social _Influence -> Intention to adoption	0.152	0.087	1.752	0.081	Not Supported
H7B1	Experience x Performance _Expectancy -> Intention to adoption	-0.118	0.088	1.336	0.183	Not Supported
H7B2	Experience x Effort _Expectancy -> Intention to adoption	0.077	0.102	0.754	0.452	Not Supported
H7B3	Experience x Social _Influence -> Intention to adoption	-0.063	0.107	0.586	0.558	Not Supported

Hypothesis Testing

In empirical research, hypothesis testing serves as a pivotal phase where the proposed relationships between variables are scrutinized against collected data to ascertain their validity (Hair et al., 2021). This process involves comparing the observed data with the predictions posited by the hypotheses. Utilizing robust statistical techniques, researchers can determine whether any observed effects in the data are statistically significant or if they might have occurred by random chance (Field, 2026). The results, including the acceptance or rejection of each hypothesis, will be systematically presented, offering a comprehensive understanding of the study's findings. The findings of the analysis are presented in **Error! Reference source not found.** and Figure 2.

The association between disaster preparedness and the intention to adopt next-level technologies was analyzed. The data revealed a standardized beta coefficient of 0.168 and a standard error of 0.061. With a t-value of 2.833 and a p-value of 0.005, the hypothesis was validated. This indicates that organizations with better disaster preparedness are more inclined to adopt next-level technologies. The linkage between business continuity and the intention to adopt next-level technologies was explored. The data revealed a standardized beta coefficient of 0.152 and a standard error of 0.055. With a t-value of 2.906 and a p-value of 0.004, this hypothesis was substantiated. This implies that business continuity has a positive influence on the intention to adopt next-level technologies. The relationship between performance expectancy and the intention to adopt next-level technologies was analyzed. The results showed a negative standardized beta coefficient of -0.157 with a standard error of 0.056. With a t-value of 3.094 and a p-value of 0.002, this hypothesis was confirmed. This indicates that while users expect the next-level technologies to enhance their performance, other factors might be influencing their intention to adopt, leading to the negative coefficient.

The correlation between effort expectancy and the intention to adopt next-level technologies was investigated. The results displayed a standardized beta coefficient of 0.402 and a standard error of 0.082. With a t-value of 5.011 and a p-value less than 0.001, this hypothesis was confirmed. This suggests that as the perceived ease of use (Effort Expectancy) of the next-level technologies increases, there is a corresponding rise in the intention to adopt it. The association between social influence and the intention to adopt next-level technologies was explored. The data revealed a standardized beta coefficient of 0.069 and a standard error of 0.035. With a t-value of 2.150 and a p-value of 0.032, this hypothesis was supported. This suggests that social pressures or perceived norms play a role, albeit a smaller one, in influencing the intention to adopt next-level technologies.

Moderating effect of government support and policy and age and experience.

The study investigated the moderating role of government support and policy in the relationships between disaster preparedness, business continuity, and the intention to adopt the next level of technology. The product indicator method was used to determine the role of

government support and policy. The findings indicated that these factors were insignificant. Similarly, the entrepreneur's business age and experience were also found to be insignificant.

The Moderating Effect of Age and Experience

Moderation describes a situation in which the relationship between two constructs is not constant but depends on the values of a third variable, referred to as a moderator variable. The moderator variable (or construct) changes the strength or even the direction of a relationship between two constructs in the model (Hair et al., 2019). When estimating moderating effects in partial least squares structural equation modeling (PLS-SEM), researchers can choose from a variety of approaches to model the influence of a moderator on a relationship between two constructs by generating different interaction terms. In this study, age and experience are two moderating variables.

Discussion

The study found the impact of disaster preparedness on the intention to adopt next-level technology (H1) and the impact of business continuity on the intention to adopt next-level technology (H2). The H1 hypothesis was not significant due to the belief that Bangladesh is always alert and prepared to face disasters. With the help of the Ministry of Disaster Management, the World Bank, and other international agencies, Bangladesh has developed and successfully implemented disaster preparedness and risk reduction programs. Therefore, SME entrepreneurs did not focus on disaster preparedness. Instead, they focused on business continuity planning—how to face calamities before, during, and after a disaster. Thus, the H2 hypothesis is accepted. Since this hypothesis is significant, past literature supports this finding. SMEs are locally located and interact with various individuals daily (Adekola & Clelland, 2020), including customers, business partners, staff, and the local community (Suriyankietkaew et al., 2022). SMEs play a crucial role in supply chains by occupying lower-tier supplier positions with specialized technology and significant market shares (Melnyk et al., 2022). This resilience in supply networks contributes to building a more resilient society if SMEs can integrate it into their businesses. In Bangladesh, many SMEs face critical challenges during disasters, and some fail to recover due to a lack of funds, manpower, and infrastructure. Therefore, having a business continuity plan is very helpful for smaller and less-capable firms. For this reason, adopting new technology is part of ensuring the continuity of their business operations.

This research examined the influence of performance expectancy, effort expectancy, and social influences on the intention to adopt Industry Revolution technology in Bangladeshi food and beverage manufacturing SMEs (H3, H4, and H5). The adoption of new technology is expected to enhance performance by saving time, making this outcome possible (Upadhyay et al., 2021). Similar results are available from earlier studies (Merhi et al., 2019; M. Chen et al., 2021), which found that the desire to adopt cutting-edge technology is highly influenced by performance anticipation. In their view, individuals are more inclined to accept these

technologies if they believe that employing new industrial practices will boost productivity. In Bangladesh, SME owners aim to secure their investment, capital, and resources, in addition to increasing production with limited resources. SME owners or their management believe that adopting state-of-the-art technologies in production would be very useful. Although not all of these firms will be able to afford the latest technology, they aim to upgrade their manufacturing technology according to their capability and experience (Menon & Shah, 2020; Shao et al., 2020; Yao et al., 2020). Business owners will only use technology when it helps their operations and procedures. The study found that the association between effort expectancy and behavioral intentions is not supportive, contradicting earlier research (Menon & Shah, 2020).

In Bangladesh and other developing countries, the use of next-level technologies helps reduce physical effort and labor. However, intensive training is required before using these technologies or machinery. The owners and managers believe they can learn and use this technology in their business operations. One significant feature of next-level technologies is their ease of use, which is a consideration for SME owners. Thus, H3 and H4 were significant in the Bangladeshi context.

The findings support existing literature that social influence is significant in adopting next-level technology. Studies by Al-Nuaimi and Uzun (2023) and Zhou et al. (2021) revealed that businesses are more likely to adopt technology if they find that their competitors are using it. Social influence (SI) refers to how adopters' perceptions of their friends, family, co-workers, and other stakeholders impact their adoption of new technology, as suggested by Rajendran and Wahab (2022) and Upadhyay et al. (2022). In this context, owners and managers are motivated to adopt these technologies to meet the expectations of these stakeholders.

Past literature has shown that government support and policy enhance the relationship between disaster preparedness and IR adoption (Han et al., 2021; Liao et al., 2020; Wahab et al., 2018). Thus, H6 was significant. Since Bangladesh is a deltaic and disaster-prone country, it faces various natural and man-made calamities every year, prompting the government to take many steps to address these issues.

Previous empirical research indicates that government policies, specifically government IT assistance and attitudes toward IT applications, significantly influence a firm's decision to implement IT systems (Akinnuwesi et al., 2022; Budi et al., 2021; Popova & Zagulova, 2022). The moderating role of government support and policy was found to be significant. This finding suggests that government support and business policies are essential at every level. Government support includes regulations, commitments to promoting IT applications, tax incentives, provision of information, the quality and availability of public IT infrastructure, IT training and workshops, laws protecting personal information security and privacy, and laws addressing cybercrime, among other initiatives.

In Bangladesh, business-friendly policies and government support are vital for the continuation of businesses in critical situations. Many small and medium firms require financial support due to capital shortages, and they may also need bank loans with lower interest rates and grace periods. The government offers bank loans for adopting new technology at lower or zero interest rates, often with an exemption period. This support ensures the continuity of businesses. In addition to financial support, firms may require orientation, guidelines, suggestions, and valuable information. Business continuity encourages firms to adopt new technology with non-financial support from the government. In this study, the business age and experience of entrepreneurs had no significant moderating role. This finding indicates that entrepreneurs from all age groups and experience levels intend to adopt next-level technologies.

Conclusion

The current study details the theoretical, practical, policy implications, and policymaking implications in this section. Theoretical implications

Theoretical Implications

The findings showed that business continuity and disaster preparedness were significant factors in the intention to adopt industrial revolution technology. In the second theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), the study examined four relationships: performance expectancy and the intention to adopt next-level technologies; effort expectancy and the intention to adopt next-level technologies; social influence and the intention to adopt next-level technologies; and facilitating conditions. The results indicated that these four relationships were significant. Specifically, performance expectancy, effort expectancy, social influences, and facilitating conditions were found to be significant factors influencing the intention to adopt next-level technologies in food and beverage manufacturing SMEs.

In contrast, the moderating effect of the owners' age and experience was found to be insignificant in this theoretical model regarding the intention to adopt next-level technologies, except in the relationship between performance expectancy and intention. This unique finding may be attributed to the understanding of owners or top management, based on their age and experience, that effort expectancy, social pressure, business setting, and the external environment are no longer critical factors in determining whether or not to adopt next-level technologies in their business. Performance expectancy was significant because owners and top management recognized that new technology offers ease of use and improved performance in terms of productivity, competitive advantage, and core competency. This requirement was established in this study.

Practical Implication

F&B manufacturing SMEs often cannot afford to use advanced technologies due to a shortage of capital, manpower, and capabilities. The research findings, which highlight the significance of business continuity and disaster preparedness in fostering the intention to adopt industrial revolution technologies, present a pivotal implication for SMEs operating in the food and beverage manufacturing industry. SMEs should prioritize developing comprehensive plans that integrate technological innovations with strong business continuity and disaster preparedness strategies. Rather than being viewed as separate tactics, these elements should be understood as interconnected components that work together to strengthen the enterprise's operational capabilities.

Decision-makers, managers, and other stakeholders in these businesses can benefit from the following implications: (a) Acknowledging the importance of presenting the tangible benefits and enhanced performance that next-level technologies bring to the discussion table, with an emphasis on how these technologies can enhance productivity, accuracy, and efficiency in food and beverage production processes; (b) Reducing the perceived complexity and effort required to implement next-level technologies to expedite the adoption process. SMEs should offer thorough training courses and may utilize social media and influential figures within the company to foster a culture that is receptive to technology adoption.

These implications provide decision-makers and stakeholders with a comprehensive set of guidelines to successfully integrate next-level technologies into their business processes, promoting efficiency, innovation, and long-term industry growth.

Policy-Making Implications

The association and foundation should work together to ensure financial and non-financial support from the Bangladeshi government, and the Bangladesh Ministry of Disaster Management and Relief. The association and foundation could arrange bank loans without collateral and interest, arrange training programs to associate with state-of-the-art technology, support both service and online assistance, and assist in importing these technologies.

Limitation and Recommendation for Future Study

This study has several limitations related to the sample, sample size, and methodological or theoretical choices. It is suggested that future research select a representative sample from unregistered SMEs. Future studies could use a systematic random sampling technique to collect data from unregistered F&B SMEs with a more diversified demographic profile, including male and female entrepreneurs, as well as SMEs from both urban and rural areas. Additionally, other technology acceptance models and theories, such as the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Technology, Organization, and Environment (TOE) framework, could be explored. Future research might also include additional constructs and variables.

Acknowledgments

This study is a part of PhD thesis. Acknowledgment is bestowed on honorable supervisors and examiners.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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Bibliographic information of this paper for citing:

Jerin, Ishraq; Jantan, Amer Hamzah & Abdul Hamid, Abu Bakar (2025). Intention to Adopt Next-Level Technology in Food and Beverage Manufacturing SMEs in Bangladesh: UTAUT Model and Business Continuity Theory. *Journal of Information Technology Management,* 17 (1), 33-57. https://doi.org/10.22059/jitm.2025.99922