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Internet of things usage models: A review and taxonomy

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ABSTRACT

Academicians are interested in researching the factors that influence users' acceptance or rejection of IoT technology due to they recognize that understanding the needs and acceptance of individuals is the first step in any collaborative activities from a central area. Many frameworks and models have been created to explain how users usage IoT technology, and these models include factors that may have an impact on user acceptability. An overview of ideas and concepts relating to user acceptability of IoT technology has been presented in this study. The literature that attempts to demonstrate how developers and academics foretell the level of usage IoT will achieve will be given special emphasis in the current review.This study analyzes technology adoption models pertinent to information systems and information technology studies on cutting-edge technologies like the Internet of Things. The study may be used to analyze the adoption and use of new technology. Additionally, it can be applied to enhance these theories and models when implementing new technology.

1. Introduction

Internet of things (IoT) is impacting all aspects of lives, educations, and business in private and public sectors [54][67]. IoT is being increasingly used by individuals, organizations, and governments. The application of IoT include almost everything. For this reason, the market size of IoT has reached $330.6 billion and expected to reach $875 billion in 2025 [55]. The successful implementation of the IoT in public domain is dependent on the public acceptance of this solution [56]. Previous studies indicated that there are several gaps in the literature pertaining to the usage of IoT technologies [57]. In general, usage of IoT is defined as "the degree to which users of IoT devices believe that they will use or continue using IoT services" [58]. To be able to consider them during the development process, decision-makers need to be aware of the factors that users consider when deciding whether or not to use a IoT technologies[2]. Why do people usage IoT technologies is a question that both practitioners and researchers frequently ask. By providing an answer, they might be able to develop better techniques for planning, assessing, and forecasting how user would react to IoT technology [66][3].

In a wide range of fields, including family planning, mode of transportation, education, consumer purchasing patterns, and computer usage, technology acceptance models, theories, and frameworks have been used to understand and predict users' behavior. These models also introduce

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variables that may have an impact on user acceptance, such as IoT. Many people have conducted research on the application of IoT technology, created frameworks to evaluate its application, and deployed the technology [66]. Many studies have used the TAM, TRA, motivational model (MM), TPB, combined TAM and TPB (C-TAM-TPB), model of PC utilization (MPCU), DOI, and SCT to carry out their research; the remainder have combined earlier models or added new constructs to developed models.

Against this background, existing theories and models of technology usage such as TAM or UTAUT ignore the significance of these technological characteristics and social related factors [25]. Other models, such as TOE, account for three perspectives, such as organizational, technological, and environmental. Further, IS success focuses on quality, which are essential for technology usage. To fully comprehend the issues at hand, more than one theoretical perspective is required, and methods are handled independently for clarity[66]. Nonetheless, approaches are required for diverse theoretically full understandings of the pertinent difficulties. As a result, a summary of the major usage models available in this area is required. Adoption models and ideas are presented in this essay to provide a summary and to improve comprehension. Combining models with the purpose of establishing a new model, according to this study, has become a distinct trend in information system studies, taking into consideration the flaws of various technology adoption models and theories. The review also concludes that existing frameworks and innovation hypotheses support the integrated model concept, despite being only moderately significant in illuminating technological acceptance for emerging technologies like IoT. As a result, the adoption and usage of IT systems and technologies must be investigated using new, changing models and theories.

2. Methodology

The_literature on IoT usage models, theories, and framworks were reviewed systematically. The objective of this study is to comprehensively review and taxonomy technology usage models, theories, and frameworks relevant to IS and IT studies published between 2012 and 2022. It concentrates on the most recent information technologies (ITs), like IoT, in any collaborative activities from a central location, to help the researcher better explain such models and to categorically select an ideal model for this study to evaluate a new technology prior to deployment to reduce IT project failures and IT-related wasteful expenditure. In order to prevent this publication from excluding important studies, Based on the goals of this investigation, a query was created. Using search parameters including the entire names of the models and their abbreviations as well as additional variations like "technology adoption, individual acceptance, and usage of_IoT," researchers further search the accessible sourcest.

The search was conducted in five databases, such as Scopus, Science Direct, ACM DL, IEEE Xplore, and Google Scholar. In total, 2314 articles were identified. However, filtering was conducted based on several inclusion criteria. First, the article must be behavioral, not technical. The behavior article uses theories, models, or frameworks or hypotheses testing design. In addition, the articles must be written in English and can be accessed in full text. This paper only focuses on IoT technology usage models, theories, and framework papers with an emphasis on technology usage in this field. In total, 1103 articles were identified related to the topic and fit the inclusion criteria. Duplicated articles were removed and this has resulted in removing 413 articles, resulting in 690 articles. The 690 articles were reviewed for titles and abstracts, and a total of 392 articles were removed based on their scope. Full reading was conducted on 392 articles. A total of 83 articles were removed because they were not examining hypotheses or related to IoT usage. A total of 309 articles were reviewed. Figure. 1 shows the process of selecting and filtering the articles.

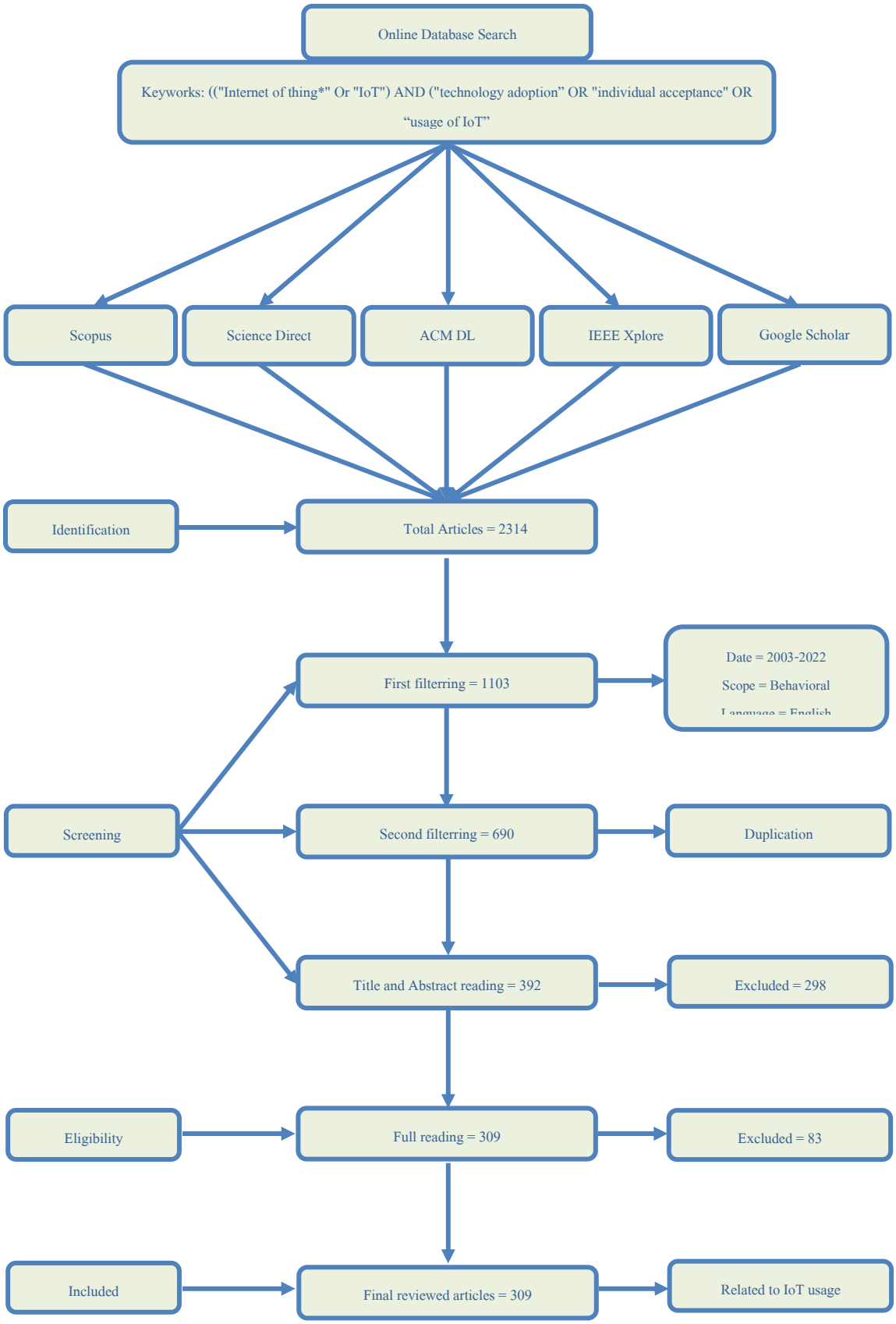

Fig. 1. Process of Filtering and Selection of Articles.

3. Literature review

There are eight well-known models, theories, and frameworks that are frequently utilized in literature on technology usage. The most recent of these models is UTAUT. TAM, however, is the most popular. Nevertheless, TAM was criticized for being generic and not focusing on the characteristic of technology [59]. In addition, TAM and UTAUT were criticized for being simple and focus only on one aspect of the technology usage, which is the individual aspect [25]. Since the variables of TAM are included in the UTAUT [60], the latter is used in this study. Rarely is the technological side included, which is more concerned with the capability and impression of the technology. The TOE is viewed as a multi-perspective framework that can bridge this gap. It consists of organizational, environmental, and technical elements. Once again, the TOE is insufficient for the specific applications of technology [60][66]. Furthermore, IS success is centered on quality, which is critical for technology usage. Figure 2 depicts a high-level summary of the most popular models and theories of IoT technology adoption in this study. Several hypotheses, as can be seen, build on previous theories and models.

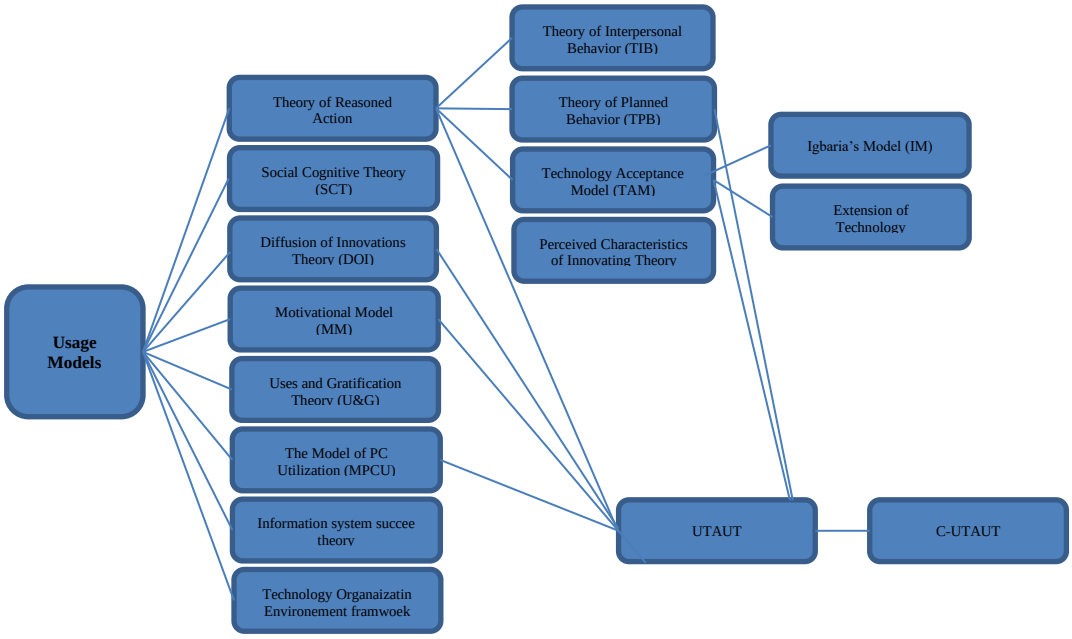

Fig. 2. A basic overview of the most well-liked theories and models of IoT technology usage

Various studies on IoT adoption have been done. These research incorporated new particular models, extended frameworks, and several models that had previously been employed in other studies, including TAM, UTAUT, and TOE. In Table 1, the core findings of this investigation are summarized.

Source	Object studied	Theory	Results
[68]	IoT (Smart connected devices)	• TAM • gratification theory • DOI • Privacy calculus theory	The TAM variables still hold true, utilitarian benefits are what drive technology adoption primarily, and in the long run, increased usage is influenced by well-being and social standing. However, privacy issues are what prevent most people from using SCOs.

[69]	Smart universities	• TAM • TPB	The use of four technologies—the Internet of Things, cloud computing, artificial intelligence, and big data—is examined in this article. The TPB, TAM, TRA, UTAUT, and UTAUT2 theories are the ones utilized with IoT the most frequently.
[70]	Libraries	• DOI • TAM	The perceived innovative benefits and perceived performance were influenced by relative "advantage, compatibility, and trialability. Perceived novelty had an impact on perceived performance, and both had an impact on IoT adoption willingness.
[71]	E-healthcare	• UTAUT	IoT use was impacted by PE and EE. IoT utilization is negatively impacted by financial costs. While gender is not a significant moderator, age is.
[72]	Public sector	• UTAUT • TAM • TPB	Public trust is impacted by information privacy, trust in government, and other factors. Affinity for the digital society was impacted by SI and FC. Affinity for the digital society has an impact on perceived value and use intention. The decision to use the IoT was influenced by perceived value. Public trust has an impact on perceived value and affinity for the digital society.
[73]	Consumers	• TAM • UTAUT	Innovation perception had an impact on PEOU, PU, and attitude. Usage intention was impacted by social influence, perceived risk, PEOU, and PU.
[74]	IoT Smart device	• TAM • TPB • TRA	The study put three models to the test: TPB, TRA, and TAM. The data revealed that the three models have medium to low explanatory power. The findings backed up the TAM.
[75]	Healthcare	• TAM • DOI • Protection motivation theory • Privacy calculus theory	The PA, image, and PEOU structures all have a substantial impact on the desire to use IoT healthcare technology solutions. Females' PEOU is influenced more by compatibility and trialability, whilst males' PEOU is influenced more by PA. Males are more affected by image, perceived privacy danger, and perceived vulnerability than females.

3.1. Theory of Reasoned Action (TRA)

Although Fishbein and Azjen created the TRA model in 1975 for sociological and psychological study, it has more recently been used as a base to look into people's IT usage patterns [17]. This model proposes that all human behavior may be predicted and explained by considering three major cognitive elements.: attitudes, social norms, and intentions. Human behavior in this area should be intentional, logical, and reasonable. Three boundary factors—volitional control, intention stability across time, and measurement of intention in terms of target, time, context, action, and specificity—are also defined in order to test and evaluate the TRA. Additional strategies like generality, target, action, context, and time horizon are built in order to reinforce the link between the related intention and attitude. The main flaws in TRA, on the other hand, are that it doesn't handle the significance of habit, reflective thought, misinterpretation revealed by a survey (attitudes, subjective nomrs, and respondents' intentions), and moral issues. The validity of "TRA" is also significantly influenced by the application of voluntariness. Figure 3 shows TRA model.

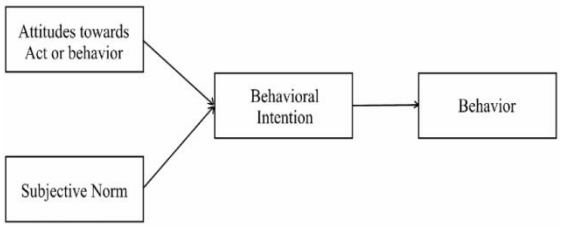

Fig. 3. Theory of Reasoned Action

3.2. Theory of Planned Behavior (TPB)

The TRA model is expanded by including a new variable called perceived behavioral control (PBC). PBC is primarily influenced by the availability of resources, opportunities, and skills as well as how important those resources, opportunities, and skills are seen to be in achieving goals [18]. While both TPB and TRA make the assumption that a person's behavioural intention (BI) influences their behavior, TPB uses the PBC for a person's non-volitional activities. By including PBC, it is possible to develop realistic limitations as well as a self-efficacy-type component [19, 20]. Furthermore, PBC affects real behavior directly as well as indirectly through behavioural intentions. As a result, according to the TPB model, perceived behavioral control, subjective norm, and behavioral attitude are the three key components that influence BI. The TPB model, however, has two fundamental issues [21,22]. First off, one's views on information technology won't matter much if a computer system is inaccessible. Second, the revised TPB might be considered the better suitable theoretical model for determining how freely a person decides to utilize or refrain from using information technology"at work[69,72]. Figure 4 presents the TPB model.

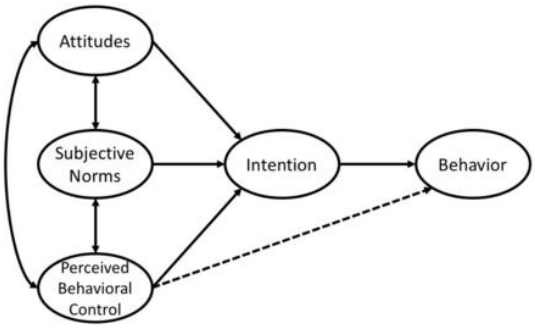

Fig. 4. Theory of Planned Behavior

3.3. Theory of Interpersonal Behavior (TIB)

The complexity of human behavior, which is influenced by social and emotional aspects, is mostly explained by this paradigm. In order to increase the predictive power, this model incorporates

habits, facilitating situations, and effects in addition to all of the features of TRA and TPB. The concept of social elements, which is comparable to the subjective norms developed in TRA [9, 23], includes roles, norms, and self-image. To put it briefly, TIB refers to a condition of being in which a person is neither fully automatic nor fully deliberate, nor is she or he fully autonomous nor fully social. TRA differs from TIB in that it aims to account for the maximum amount of variance with the fewest variables because even a tiny amount of variance may be socially relevant if the behavior in question is crucial. TIB, on the other hand, aims to capture the most total variance. According to this paradigm, emotions, social circumstances (such as subjective norms in TRA), and habits are the main influencers on how people create intentions. TIB challenges the behavior on three different levels. Personal characteristics and earlier experiences mold one's beliefs, attitudes, and social situations, which fundamentally define one's actions. The second level describes how affect, cognition, social factors, and individual normative beliefs shape intentions toward a certain activity. Behavioral intentions, environmental variables, and prior knowledge all contribute to the third level prediction of the likelihood of engaging in a specific behavior [24]. The main shortcomings of TIB in compared to TRA and TPB are complexity and lack of parsimony. The operational specification of the model's variables must also be defined by the researcher because TIB does not provide a simple method for doing so. Figure 5 presents the TIB model.

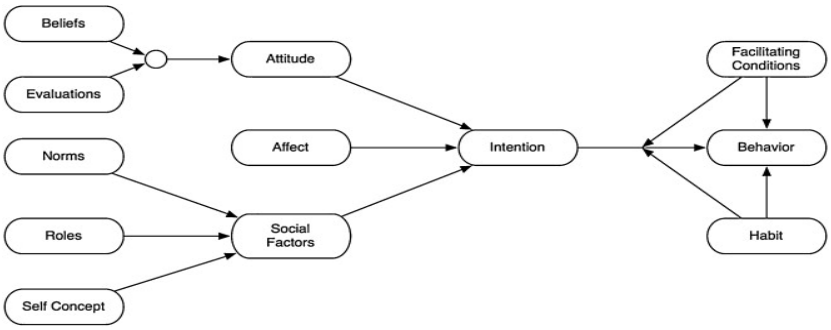

Fig. 5. Theory of Interpersonal Behavior

3.4. Technology Acceptance Model (TAM)

The TRA model forms the core of this idea. Fascinatingly, the TRA model's equivocal theoretical and psychometric status is addressed by the TAM model, which eliminates user subject norms [25]. The three factors that explain why users are motivated to utilize a product are perceived usefulness, perceived ease of use, and attitude toward usage. As a result, BI would be part of TAM in addition to having a significant influence on the user's attitude thanks to two key beliefs: perceived utility and ease of use. These could be categorized as harmful or advantageous to the system. The user training, system features, user involvement in design, and the structure of the implementation process are examples of other factors that the TAM model may occasionally consider [26]. TAM is probably one of the models that is most commonly discussed in the area of technological acceptance, such as IoT [27,68,69]. In recent years, it has received a lot of empirical support[70]. TAM has limitations in terms of extra-workplace applications because it ignored the social variables influencing technology adoption. Additional variables, such as external variables, must be included to TAM in order to provide a more accurate prediction of system utilization [19, 28]. Because the intrinsic incentives are not taken into account in TAM[72,73], its ability to be applied in a consumer environment where the adoption and utilization of information technology is not just to execute tasks but also to meet emotional needs may be limited. Figure 6 shows TAM model.

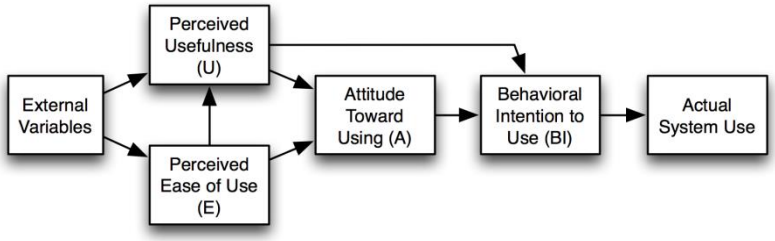

Fig. 6. Technology Acceptance Model

3.5. Extension of TAM (ETAM)

ETAM includes a few new criteria to improve TAM's "adaptability, explanatory power, and specificity" [29]. ETAM has been suggested in two separate studies. The TAM2 investigation's original focus was on variables affecting perceived utility and BI. By adding two new types of characteristics to TAM, social effect (image, subject norms, and voluntariness) and cognitive (outcome demonstrability, work relevance, and output quality), TAM2 was proposed to boost the predictive power of perceived usefulness. As a result, TAM2 functions better in both optional and necessary scenarios. The only exception is subjective norms, which have an impact in mandatory circumstances but not in voluntary ones. The second study discovered constructs that influence how something is thought to be used simply. The two basic categories of the antecedents of perceived usability are adjustments and anchoring. While general beliefs about using computers have been included in the anchor group (enjoyment and objective usability) (external control, computer self-efficacy, computer anxiety, and computer"playfulness), beliefs acquired based on first-hand experience with a specific system are included in the adjustments set. Figure 7 shows ETAM model.

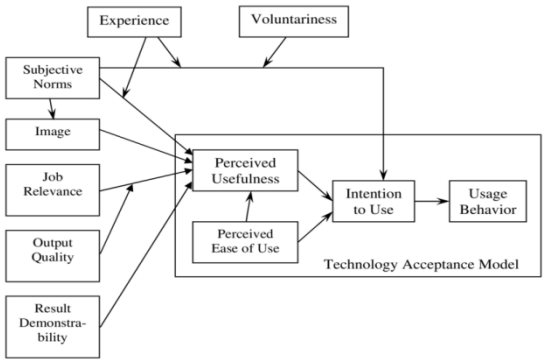

Fig. 7. Extension of Technology Acceptance Model

3.6. Igbaria's model (IM)

Extrinsic and intrinsic motivations can influence whether a new technology is adopted or rejected, claims IM [30]. This paradigm states that perceived utility, which influences behavior (such as computer use) and attitude (computer contentment), is an intrinsic motivator while perceived enjoyment, which influences behavior, is an extrinsic motivator. In addition to these, user acceptance (actual behavior) is also influenced by perceived utility, computer anxiety, computer contentment, and perceived pleasure. Adoption is also influenced by perceived pleasure and usefulness in both direct and indirect ways (through pleasure). Perceived utility also has an effect on perceived fun. Additionally, computer phobia has a major impact on both perceived fun and utility. Furthermore, it has been proven that a user's satisfaction with a computer directly impacts "utilization. Figure 8 shows IM model.

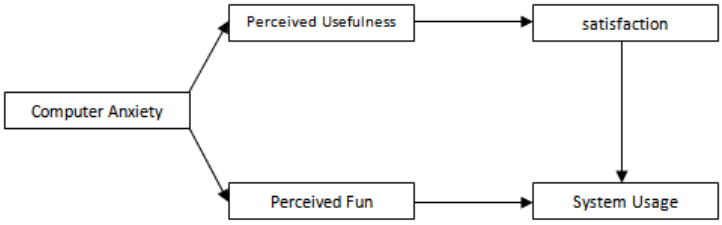

Fig. 8. Igbaria's model

3.7. Social Cognitive Theory (SCT)

The three fundamental elements of behavior, personal, and environment—which interact in both directions to predict both group and individual conduct—form the core of social cognitive theory (SCT). It can also identify methods for influencing and adjusting behavior [31]. The behavior elements of the SCT model are primarily focused on the usage, performance, and adoption challenges. A person's personality, cognitive abilities, or demography are all considered to be personal elements. On the other hand, environmental impacts include social and physical factors that are not physically a part of the person. The three variables in the SCT are a deterministic triadic structure that cannot be broken. The SCT model is incorporated to evaluate information technology use by using several constructs, including self-efficacy, performance, anxiety, affect, and result expectations. Figure 9 presents the SCT model.

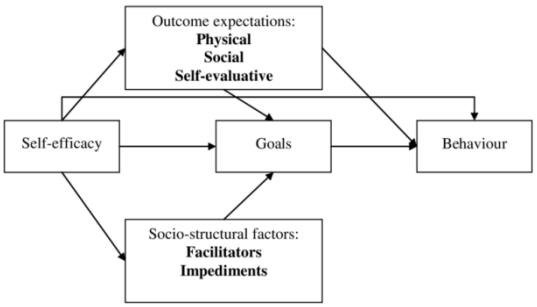

Fig. 9. Social Cognitive Theory

3.8. Diffusion of Innovations Theory (DOI)

The DOI model examines a range of innovations by taking into account the four actors—time, communication channels, innovation, and social system—that affect how a new idea spreads. DOI offers a theoretical framework for discussing adoption on a global scale in addition to being used at both the organizational and personal levels. Adopter characteristics, innovation characteristics, and the innovation decision process are the three main components of the DOI model. Over time, the players in a related social system communicated through a number of channels to carry out five processes in the innovation decision step: confirmation, knowledge, implementation, choice, and persuasion. The acceptability of any innovation, including IoT, has been shown to be significantly influenced by five key constructs: relative benefit, compatibility, complexity, trialability, and observability[68]. The adopter characteristics step defines five types: innovators, laggards, late majority, and early majority [32]. Conclusion: When compared to other adoption models, DOI has less explanatory power and is less useful for outcome prediction[70] since it lays more emphasis on system characteristics, organizational attributes, and "environmental factors. Figure 10 presents the DOI model.

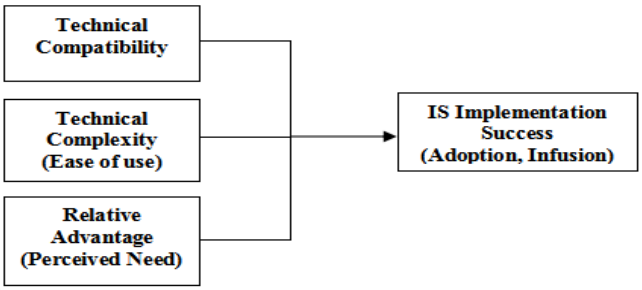

Fig. 10. Diffusion of Innovations Theory

3.9. Perceived Characteristics of Innovation Theory (PCIT)

By adding three more features—image, voluntariness, and behavior—this model broadens the scope of the DOI theory. When compared to voluntariness, the perception of voluntariness affects conduct, which has an impact on actual behavior. The findings indicate a strong relationship between adoption rate and demonstrability, with an inverse relationship between the two. Additionally, visibility and outcome demonstrability are the two sub-characteristics that make up observability. Voluntarism has an impact on users' decisions to accept or reject an innovation, according to the PCI model as well [33]. Figure 11 shows PCIT model.

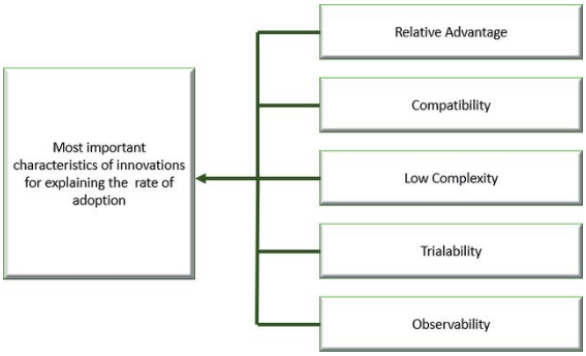

Fig. 11. Perceived Characteristics of Innovation Theory

3.10. Motivational Model (MM)

In general, both intrinsic and extrinsic incentive have an impact on system utilization. Extrinsic motivation refers to the notion that people will engage in a behavior because they think doing so will enable them to obtain desired outcomes that are apart from the activity itself, such as improved job performance. Intrinsic motivation is the notion that people will want to engage in an activity for no apparent reason other than the act of engaging in the activity itself. Davis and Bagozzi [11] proposed that felt utility was an external reason and that enjoyment was an intrinsic motivation. The output quality and perceived ease of use have a general impact on perceived satisfaction and utility. They also included task relevance as a mediator of the relationship between output quality and usability and user-friendliness. As a result, perceived output quality, perceived ease of use, perceived utility, and reported "enjoyment all have an indirect impact on BI. Figure 12 shows MM model.

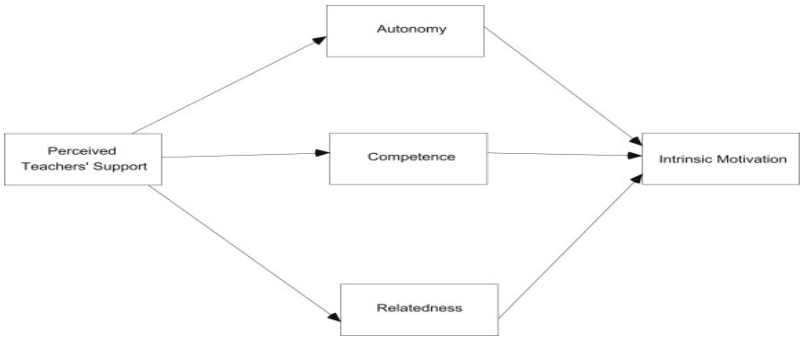

Fig. 12. Motivational Model

3.11. Uses and Gratification Theory (UGT)

This approach aims to examine why people choose to use particular communication mediums over others. Utilizing media has brought about specific satisfaction. The social and psychological components of consumers' use in their search for motivation and fulfillment are the primary focus of UGT [34]. Motivations, behavioral usage, and gratifications/satisfaction are the three basic constructs in U&G. The general attitudes that shape how people behave in response to their requirements are referred to as motivation [35]. "Patterns of exposure of use (such as amount of use, duration of use, and type of use)" are referred to as behavioral usage. Unlike other models like TPB and DOI, UGT is a special framework that can be used in all types of media. The U & G paradigm can be applied not only in settings where media is utilized for communication, but also for play and work processes. Figure 13 shows UGT model.

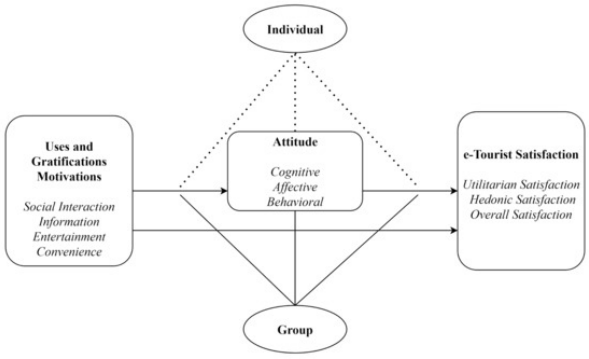

Fig. 13. Uses and Gratification Theory

3.12. The Model of PC Utilization (MPCU)

In terms of information systems, the Model of PC"Utilization is suitable for predicting personal acceptance and PC use. Because the MPCU model only assessed actual behavior (personal computer use), behavior intention was excluded from the suggested model. Additionally, habits are not included in the model because, in the context of PC usage, they are tautologically tied to present use. MPCU evaluates how factors such as affect, enabling conditions, long-term use effects, perceived penalties, social influences, complexity, and job fit have a direct impact on behavior. The results provide credence to the idea that characteristics like complexity, long-term consequences, social factors, and work appropriateness significantly influence PC use. The use of PCs is not much impacted by facilitating circumstances or consequences, nevertheless. Despite being a powerful predictor of behavior, habits have been left out of the MPCU[36]. Figure 14 presents the MPCU model.

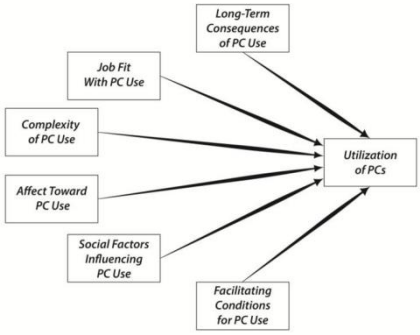

Fig. 14. Model of PC Utilization

3.13. Unified Theory of Acceptance and Use of Technology (UTAUT)

Eight models that were previously applied in the setting of information systems, all of which had their roots in sociology, psychology, and communications, were compared by Venkatesh and Morris [12] to see how they were similar and dissimilar. The Technology Acceptance Model, Theory of Reasoned Action, Theory of Planned Behavior, integrated TAM and TPB, Model of PC Utilization, Diffusion of Innovation, Motivational Model, and Social Cognitive Theory are some examples of these models. Four preconditions for the acceptability of IS were identified by UTAUT. The fourteen basic constructs from the eight acceptance theories were modified to create them [12,71,72,73]. The important constructs are social influence, enabling conditions, effort expectancy, and performance expectancy. In addition, four important moderating factors—gender, experience, age, and voluntariness of use—were found. Figure 15 presents the UTAUT model.

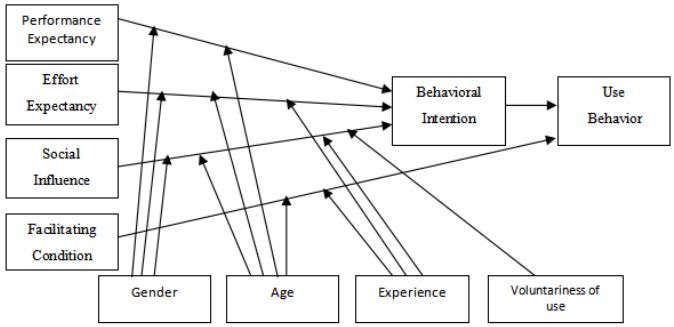

Fig. 15. Unified Theory of Acceptance and Use of Technology

3.14. Compatibility UTAUT (C-UTAUT)

To enhance the explanatory power of Venkatesh and Morris' UTAUT model [12], Bouten [37] incorporated compatibility beliefs created by Karahanna and Agarwal [38]. By discovering and putting to the test additional boundary conditions, it also seeks to provide a more full explanation of how the cognitive phenomena of the UTAUT model are created [37]. Measuring actual usage behavior was not important because the study's goal was to examine the connection between behavioral perceptions and compatibility views. It was cross-sectional, as well. Retrospective analysis could pose issues, however measuring behavioral intention rather than usage behavior gets around this. Figure 16 presents the C-UTAUT model.

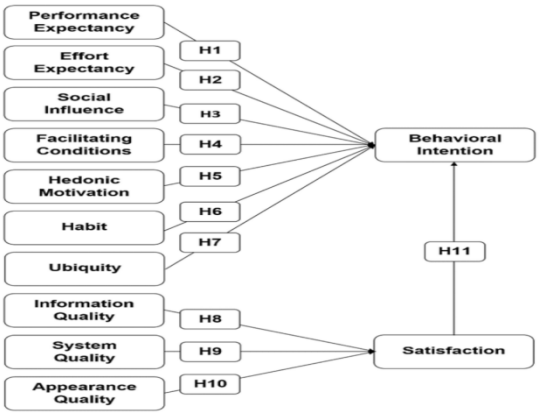

Fig. 16. Compatibility UTAUT

3.15. Information system success model (ISS)

[61] , who conducted a taxonomy encompassing 180 research that investigate the use of technology, produced the IS success model. The model suggested that information quality, system quality, and service quality all have an impact on user happiness and intention to use, which in turn affects the information system's overall benefits [61]. [62] investigated the model's validity and dependability in describing the variation in adoption of new technology after ten years of development. The authors examined more than 100 papers that used the IS success model to describe diverse technological applications, including e-commerce, e-learning, and other applications. [61] discovered that the model is reliable and effectively explains how people use technology. [61] noted that while low service quality will have a negative effect on satisfaction and net benefits, excellent service quality will result in high satisfaction, which will improve the net benefits. [62] once more examined studies that had applied the IS model and noted that the model was gaining attention from academics and was being applied in an increasing number of articles in refereed journals. Researchers have put the De Lone and McLean model into practice and proved its value in illuminating IoT usage. Figure 17 presents the ISS model.

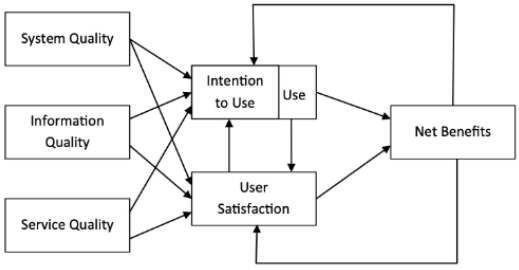

Fig. 17. Information system success model

3.16. Technology Organization Environment framwork (TOE)

The TOE is used to take into account many viewpoints on how technology is employed, such as the technological aspect, organizational aspect, and environmental aspect. Three groups of variables—technological, organizational, and environmental—make up the TOE framework (TOE). The framework was created by [63]. The availability and the features of the technology are included in the original framework, as the name of the framework suggests, and [63] demonstrated that the technological aspects are related to the characteristics of the technology. The organizational component is made up of the organization's structure, as well as its size, slack, and communication. The environment in which the organization operates is relevant to the environmental elements. Among the originally listed features of the environment are the industry and market structure, as well as the technical support infrastructure and governmental regulation. However, the TOE was altered by the researchers who used it to incorporate other characteristics in the same categories. Figure 18 presents the TOE model.

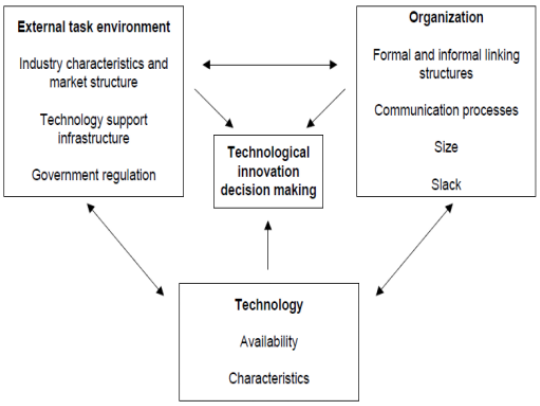

Fig. 18. Technology Organization Environment framwork

4. Discusion

Usage models have a variety of theoretical foundations, such as the Innovation Diffusion Theory (IDT). is a sociological theory, while TIB, TPB, and SCT are psychosocial theories [39] and Theory of Reasoned Action (TRA) is a social psychology theory. Each of the three theories has demonstrated success in foretelling and illuminating a range of human behaviors in various settings. However, TRA and TPB differ from DOI in that they put more of an emphasis on describing individual behavior. The latter focuses on adoption choices in which organizational traits, rather than individual factors, are crucial. SCT and TPB incorporate the idea of perceived results when predicting behavior, whereas DOI and TAM only take technology beliefs into account. While SCT relies on the reciprocal causality of behavior, emotional and cognitive processes, and the environment, which are all continuously and reciprocally influencing each other [40], DOI, TAM, and TPB adopt a unidirectional perspective on causal relationships, in which environmental constructs affect cognitive beliefs, which affect attitudes and behaviors.

MPCU model, presented by [10], is a different model that is grounded in the theory of human behavior. On the other hand, TIB, TPB, and SCT models are theoretically comparable and overlap; nevertheless, SCT and TPB have been used to the study of behavior more frequently than Triandis TIB. All characteristics of the TPB model are included in the TIB, but it also incorporates extra elements that boost its predictive value, particularly habits and FC [41, 42]. Similar to this, there are various criteria between DOI and TAM that overlap, including complexity, perceived usability, relative advantage, and usefulness [43]. Similar to Thompson and Higgins' facilitating conditions, Moore and Benbasat's compatibility construct, and Ajzen's [44] perceived behavioural control, Venkatesh and Morris' [12] facilitating conditions also capture these concepts.

5. Conclusion

This study was a literature review of existing studies conducted over a ten-year period. The research is restricted to the search parameters, timeframe, and keywords. To expand on the findings, future researchers are encouraged to undertake additional literature reviews using alternative terms, such as focusing on one area, such as higher education, medical care, or the public sector. Between 2012 and 2022, the number of studies decreased; more research is needed to investigate IoT adoption. Industries like as oil and gas and agriculture received less attention, and further research into the predictors of IoT adoption in these industries is advised. TAM is still the most generally utilized theory, and the number of research that merged many theories is low. Future research should focus on deploying additional adoption theories and combining TAM with TOE or TAM with ISS. This may assist to explain the disparities in IoT adoption. To incorporate earlier related models ((TAM, TRA, motivational model (MM), TPB, combined TAM and TPB (C-TAM-TPB), model of PC usage

(MPCU), DOI, and SCT), [28] developed the UTAUT model. Performance expectancy, effort expectancy, social influence, facilitating factors, behavioral intention, and use behavior are the six basic variables that make up UTAUT. In addition, four moderators were chosen based on their volunteerism, experience, age, and gender. Since UTAUT is a more recent theoretical model than other models, it can accentuate their shortcomings [64] [65]. The goal of UTAUT was to identify the elements that specifically influence consumers' perceptions of adopting new technologies, such as IoT [28]. [61], who conducted a taxonomy encompassing 180 research that investigate the use of technology, produced the IS success model. The model suggested that information quality, system quality, and service quality all have an impact on user happiness and intention to use, which in turn affects the information system's overall benefits [61]. Researchers have put the DeLone and McLean model into practice and proved its value in illuminating IoT usage.

The TOE is used to take into account many viewpoints on how technology is employed, such as the technological aspect, organizational aspect, and environmental aspect. Three groups of variables—technological, organizational, and environmental—make up the TOE framework (TOE). The framework was created by [63]. Researchers who have used the concept to explain how IoT is used in many sectors have affirmed its significance. The majority of information systems researchers do not distinguish between the cognitive component of beliefs and the emotive component of attitudes, which have a like/dislike connotation. Perlusz [46] claimed that behavioral influences come from both emotional and affective components as well as cognitive processes.

In light of this, he claimed that theories and models of technology use have generally been indifferent to sentiments and emotions. With a few notable exceptions, like Venkatesh [47], technological acceptance models only use cognitive predictors to link attitudes, beliefs, and perceptions to how people actually use and behave with new technologies like IoT [5, 11, 44, 48]. In studies on technology use, emotions are usually seen as having detrimental effects, such as computer anxiety [46, 47, 49], anxieties [50], and worries [51, 52]. On the other hand, "positive"emotions have mostly been disregarded [46]. Examples include happiness, curiosity, joy, contentment, and enthusiasm. Some of the earlier models place greater emphasis on external factors like norms, incentives, and institutional restraints while others place more emphasis on internal factors like attitudes, values, and intentions. In addition, many models, like TIB [53], do not include precise instructions for the operational description of the model's variables. In this paper, the most well-known and often used theories and models of user technology adoption were covered. The UTAUT, TAM, ISS, TOE, and DOI techniques appear to be the most widely used ones in the field of information systems, which includes IoT technology.

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نماذج استخدام إنترنت الأشياء: مراجعة وتصنيف

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الملخص

يهتم الأكاديميون بالبحث عن العوامل التي تؤثر على قبول المستخدمين أو رفضهم لتكنولوجيا إنترنت الأشياء نظرًا لإدراكهم أن فهم احتياجات الأفراد وقبولهم هو الخطوة الأولى في أي أنشطة تعاونية من منطقة مركزية. تم إنشاء العديد من الأطر والنماذج لشرح كيفية استخدام المستخدمين لتقنية إنترنت الأشياء، وتشمل هذه النماذج عوامل قد يكون لها تأثير على قبول المستخدم. تم تقديم لمحة عامة عن الأفكار والمفاهيم المتعلقة بقبول المستخدم لتكنولوجيا إنترنت الأشياء في هذه الدراسة. سيتم التركيز بشكل خاص على الأدبيات التي تحاول إظهار كيف يتنبأ المطورون والأكاديميون بمستوى استخدام إنترنت الأشياء الذي سيحققه في المراجعة الحالية، وتحلل هذه الدراسة نماذج اعتماد التكنولوجيا ذات الصلة بأنظمة المعلومات ودراسات تكنولوجيا المعلومات حول التقنيات المتطورة مثل الإنترنت من الأشياء. يمكن استخدام الدراسة لتحليل اعتماد واستخدام التكنولوجيا الجديدة. بالإضافة إلى ذلك، يمكن تطبيقه لتحسين هذه النظريات والنماذج عند تطبيق التكنولوجيا الجديدة.

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