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# Intention to use mobile applications in competitive intelligence: An extended conceptual framework

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**ABSTRACT** This article aims at identifying the key antecedents to behavioral intention and use behavior of individuals regarding mobile applications that can support competitive intelligence of firms. Attention was given to perspective antecedents in behavioural intention and use behaviour of mobile applications in competitive intelligence. A qualitative research based on a literature review of 21 peer-reviewed journal articles covering a period of six years from 2014 was used. These articles were collected from separate databases using search engines. All UTAUT2 constructs had a direct and significant influence on mobile application use. Following significance factors were ease of use, perceived usefulness, perceived enjoyment, and trust. However, perceived risk, subjective norms, and self-efficacy were insignificant. An extended model was later developed with 15 constructs. This article highlights the key determinants of user behavior regarding mobile applications that firms should act on in order to foster the acceptance of these technologies despite the privacy risks that arise. Previous research has largely ignored the influence of perceptive antecedents in the behavioural intention and use behaviour of mobile applications in competitive intelligence. This article covers this gap by drawing attention to the cognitive psychological perspective of the phenomenon.

**KEYWORDS** Behavioural intention, competitive intelligence, mobile applications, mobile apps, unified theory of acceptance and use of technology, use behaviour, UTAUT, UTAUT2

## 1. INTRODUCTION

Competitive intelligence (CI) has become a global phenomenon in today's environment of intensifying global competition because of big data analytics. This includes AI, IoT, 5G/6G, cybersecurity, as well as the adoption and use of mobile applications such as WhatsApp, Facebook, Instagram, Twitter, and Telegram that have enabled high-speed availability and transfer of large amounts of data collected and accumulated by individuals and organisations over the years. Carlos and Herrera (2021) argue that the business environment of today is complex and dynamic due to increasing global competition. People in business need to master and know all the information that has strategic value, and CI is positioned as the most appropriate tool to achieve this goal (Carlos and Herrera, 2021). Organisations and individuals alike that can transform this data into information and knowledge faster remain at the top and thus achieve a competitive edge. The advent of mobile application technologies and the wider availability of internet connections have made it easier for individuals and organizations to access large amounts of data.

Singer and Friedman (2014) argue that what constitutes the internet itself is evolving before us in an even more fundamental way. It

is simultaneously becoming bigger and far more personalized (Singer and Friedman, 2014). According to Bulao (2021) and Vuleta (2021), on average, every human created at least 1.7 MB of data per second in 2020. They predict cloud data storage around the world will amount to 200+ Zettabytes by 2025. This will be up from 2019's 4.4 zettabytes and 2020's 44 zettabytes. The two further argue that by 2025, there will be 175 zettabytes of data in the global data sphere. They further argue that in 2020 2.5 quintillion data bytes daily were created and as of July 2020, the world had 4.8 billion internet users. That is a huge increase from the 2.6 billion internet users in 2013. Mobile phones were more popular than other devices, with 4.28 billion unique users. By 2025 people will generate 463 exabytes of data and by 2030, nine out of every ten people aged six and above would be digitally active (Vuleta, 2021 and Bulao, 2021). Rather than passively receiving this onslaught of online information, the individual users are creating and tailoring sites to their personal use, ultimately revealing more about themselves online. The amount of data is on the rise with the increase in smartphone subscriptions globally.

This amount of big data is critical to decision-makers and data analysts. The use of CI has, however, become relevant now more than before. Solberg (2019) argues that CI has developed and emerged with information technology (IT) solutions over the past ten years. Most advancements and developments are now about IT solutions and applications. This has again given rise to a whole new world of intelligence-related problems and opportunities, not only for engineers but for users of these technologies (Degerstedt, 2015 and Solberg, 2019). It is probably fair to say that the intelligence perspective has never been as important for businesses as it is today, thereby refuting the notion that CI is dead or there is nothing new in the field. The use of mobile applications such as WhatsApp, Facebook, Twitter, Instagram, and Telegram to mention just but a few have both increased and strengthened the role of CI globally. Mobile apps have become big data mines for gathering intelligent information in this competitive environment.

Thus far, CI research has focused primarily on the same phenomenon, how to gather information to make better decisions (Solberg, 2019). Some research has begun to address CI from a business intelligence perspective, big data analytics, AI this time around using algorithms as a predictive tool. Previously, CI research was more concerned with web and desktop applications but now there is a rapid shift towards mobile applications due to information available anytime, anywhere from everyone who has a phone. This sudden shift has also been influenced by an increase in the number of mobile apps and the number of active users per day. Mobile intelligence has now combined BI, transactions, and multimedia. To Singer and Friedman (2014), Facebook, Twitter, Google and all the rest are, in many ways the very definition of modern life though recently, issues around privacy, information security, mass surveillance, snooping, information theft through face recognition, cancel culture, and freedom of speech have been raised. A functioning internet with freedom of speech and a good connection to the social networks of one`s choice is a sign not just of modernity, but of civilization itself (Singer and Friedman, 2014). The two further argue that this is because the internet is where people live, do business, meet, and fall in love. It has become the central platform for business, culture, and personal relationships.

Other areas beginning to draw research attention are data mining, search engine optimization, social media marketing and digital marketing in general (Solberg, 2019). Accordingly, recent literature reviews have highlighted the need to further address mobile app users' perspectives and psychology. These reviews acknowledge that the nature of users' perspectives depends on the mobile app being examined, as motivations for use are driven by different antecedents. These notions are supported by the claims that understanding the users is fundamental to understanding CI, much like understanding the decision-makers' needs is fundamental to understanding CI gathering. To Singer and Friedman (2014), to misunderstand the centrality of these services today is to make a fundamental error. The internet is no longer the luxury it was, for most people, knowingly or not, it is life.

To address this gap, this article seeks to introduce a reasoning perspective into understanding CI through a literature review of the behavioural intention and use behaviour of mobile application users. This approach acknowledges that human behaviour is influenced by mental processes, and this is how people acquire, transform and use information (Shneor and Munimb, 2019). More importantly, the article seeks to examine and

understand the drivers, motivators, and influencers of acceptance and use of mobile applications in CI. Given the availability of mobile applications across the globe, it is critical to appreciate the reasons behind the behaviour of users of these platforms in the CI process.

This study uses the extended Unified Theory of Acceptance and Use of Technology (hereafter, UTAUT2) developed by Venkatesh, Thong, and Xu (2012). This theory can be used to capture the behavioural intention and use behaviour of users of mobile apps in CI and their antecedents. It also seeks to study mobile app acceptance and use in the CI process. Venkatesh, Thong, and Xu (2012) developed the UTAUT2 as a comprehensive integrated model for better-understanding consumer acceptance toward new technology or system. To this end, the assumption is that due to the novelty of digital manifestation, privacy, information security, risk of mass surveillance, data theft, hacking, and cyberbullying, individuals involved in gathering CI through mobile apps are unlikely to engage in this behaviour without prior and preliminary consideration. Previous research has largely ignored the influence of perspective antecedents in behavioural intention and use behaviour in mobile applications use in CI. This article gives attention to the cognitive psychological perspective of this phenomenon with the knowledge that personality affects behaviour. The underlying aim of this study is to identify the predictors of behavioural intention and use behaviour of CI professionals and experts in using mobile applications in intelligence gathering for decision-making. An extended framework, UTAUT2 is presented as the basis for identifying behaviour intention and use behaviour predictors in using mobile applications in intelligence gathering by CI professionals and experts. The starting point is appreciating these predictors of behaviour first since this behaviour has a strong bearing in the adoption and use of technology: in this case, mobile applications.

The article follows a systematic literature review on mobile application use for CI through the lens of UTAUT2. An exploratory design was followed to confront UTAUT2 with extant studies on mobile application use for CI. The study focused more on the perspective antecedents in behavioural intention and use behaviour of mobile application use in CI. The study highlights the key determinants of user behaviour regarding mobile applications. Identifying the determinants of user behaviour regarding mobile application use for CI enables firms to act appropriately in order to foster the acceptance and use of the mobile technologies despite the privacy risks associated with their use, thereby creating a virtuous cycle for the development of CI practices. The findings have both managerial and practical implications; their contribution is scientific, practical, societal, political, and educational.

The remainder of this article is as follows. First a review of the literature regarding the mobile application acceptance and use, and users' perspectives and psychological aspects in CI. A literature review is done to understand the reasons or influencers of mobile apps user behavioural intention and use in CI and how relevant the UTAUT2 framework is in this phenomenon. Subsequently, the findings and discussions in light of prior research are presented. Key contributions, limitations and implications for further future research are presented in the conclusion.

## 2. LITERATURE REVIEW

CI research has focused primarily on how to gather information to make better decisions (Solberg, 2019). Researchers have concentrated on the CI process with little or no attention given to the cognitive psychological perspective of users. In most cases, the behavioural intention and use behaviour of mobile app users have been ignored. Previous research on CI was more concerned with web and desktop applications but the focus has rapidly shifted towards mobile applications due to a surge in the use of mobile applications and digitalization of global economies. Of current concern to researchers are issues surrounding big data, AI, IoT, 5G, algorithms, and cybersecurity. With the rise in data censorship, risk of mass surveillance, data theft through face recognition, and victimization, users of mobile applications are unlikely to engage in CI gathering behaviour without prior and preliminary consideration. The acceptance and use of mobile applications in CI have become more of a planned behaviour.

According to Singer and Friedman (2014), mobile applications have in many ways influenced the very definition of modern life. The two further argue that a functioning internet with freedom of speech and a good connection to social networks is a sign not just of modernity, but of civilization itself. However, recent developments in mobile applications have caused huge debates around data privacy,

and freedom of speech. Data censorship, removal of accounts of users, and removal of platforms from networks has caused an outcry by users who feel that their rights are being infringed. Examples include the case of Donald J. Trump, Parler, and Telegram to mention just but a few. These developments now have a serious bearing on the acceptance and use of mobile applications. Motivators and drivers of user behavioural intention and use behaviour are now shifted towards risk, security, privacy, and freedom of speech. For example, Telegram, surpassed 500 million active users on the 18th of January 2020 with more than 25 million new users from around the world joining the platform as a result of freedom and security issues in other platforms (for example, https://t.me/TelegramTips/233). Telegram argues that it stands for freedom and privacy and has many easy to use features (ibid). Researchers have attempted to explain the acceptance and use of mobile applications with varied outcomes that range from social influence, utilitarian gratification, hedonic gratification of affection and leisure, website social presence, reasons linked to cost, sense of community, unlocking new opportunities for intimate communication, addictive behaviours as well as data gathering (Ellison, Steinfield and Lampe, 2007; Java et al., 2007; Schneider et al., 2009; Brandtzæg and Heim, 2009; Xu et al., 2012; Church and de Oliveira, 2013; Cheung, 2014; Sultan, 2014; Pielot et al., 2014; Bouhnik and Deshen, 2014; Narula and Jindal, 2015; Karapanos, Teixeira and Gouveia, 2016; and So, 2016).

CI has played an important role in economic development and its factors (Maune, 2017). The objective of CI has been to understand how the surrounding competitive environment impacts an organization – by monitoring events, actors, trends, research breakthroughs, and so forth – to be able to make relevant strategic decisions (Degerstedt, 2015). Degerstedt (2015) argues that a major trend in the world today is the increasing competition in global and digitalized markets where the speed of change and innovation is becoming faster than ever before. CI helps provide a better understanding of the global world. However, to Søilen (2017), developments in new technology are also posing a serious threat to companies as today every individual is a potential spy. Corporate espionage has also become a big problem with its consequences still underestimated. The current information/knowledge generation has placed CI at the centre stage of economic growth (Maune, 2017). Previously, factors such as capital, labour and natural resources were traditionally considered as the only factors which matter for economic growth. However, the technology explosion of the 1990s primarily stimulated the notion of CI as being something entirely new or even revolutionary (Maune, 2014a). Maune (2014b) argues that the emergence of the internet and online databases have offered an almost inexhaustible supply of information that has caused information overload in many instances. This has resulted in the development of social competitive intelligence by intelligence practitioners (Maune, 2017).

### 2.1 Unified theory of acceptance and use of technology

According to Benbasat and Barki (2007) and Venkatesh et al. (2007), understanding individual acceptance and use of information technology is one of the most mature streams of information systems research. Several theoretical models were developed from psychology and sociology to explain technology acceptance and use (Venkatesh et al., 2003). A review and synthesis of eight theories/models of technology use by Venkatesh et al. (2003) resulted in the unified theory of acceptance and use of technology (UTAUT). To Venkatesh et al. (2003), UTAUT has distilled the critical factors and contingencies related to the

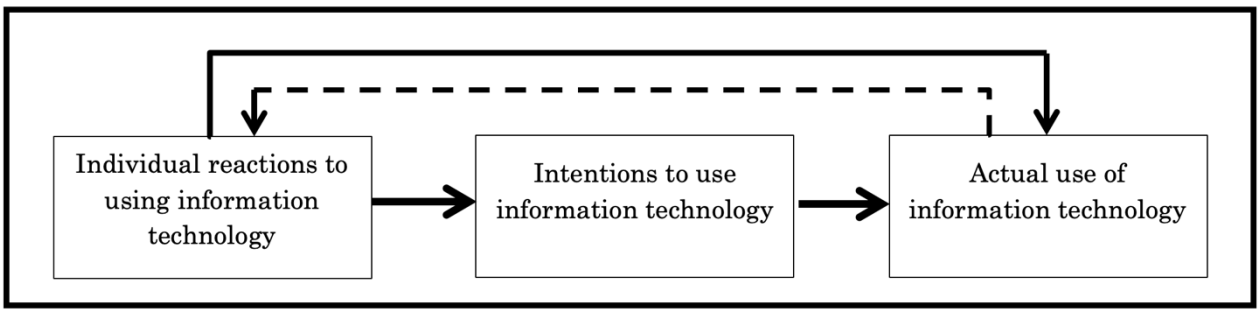


*Figure 1* The basic concept underlying the user acceptance model. Adapted from Venkatesh et al. (2003).

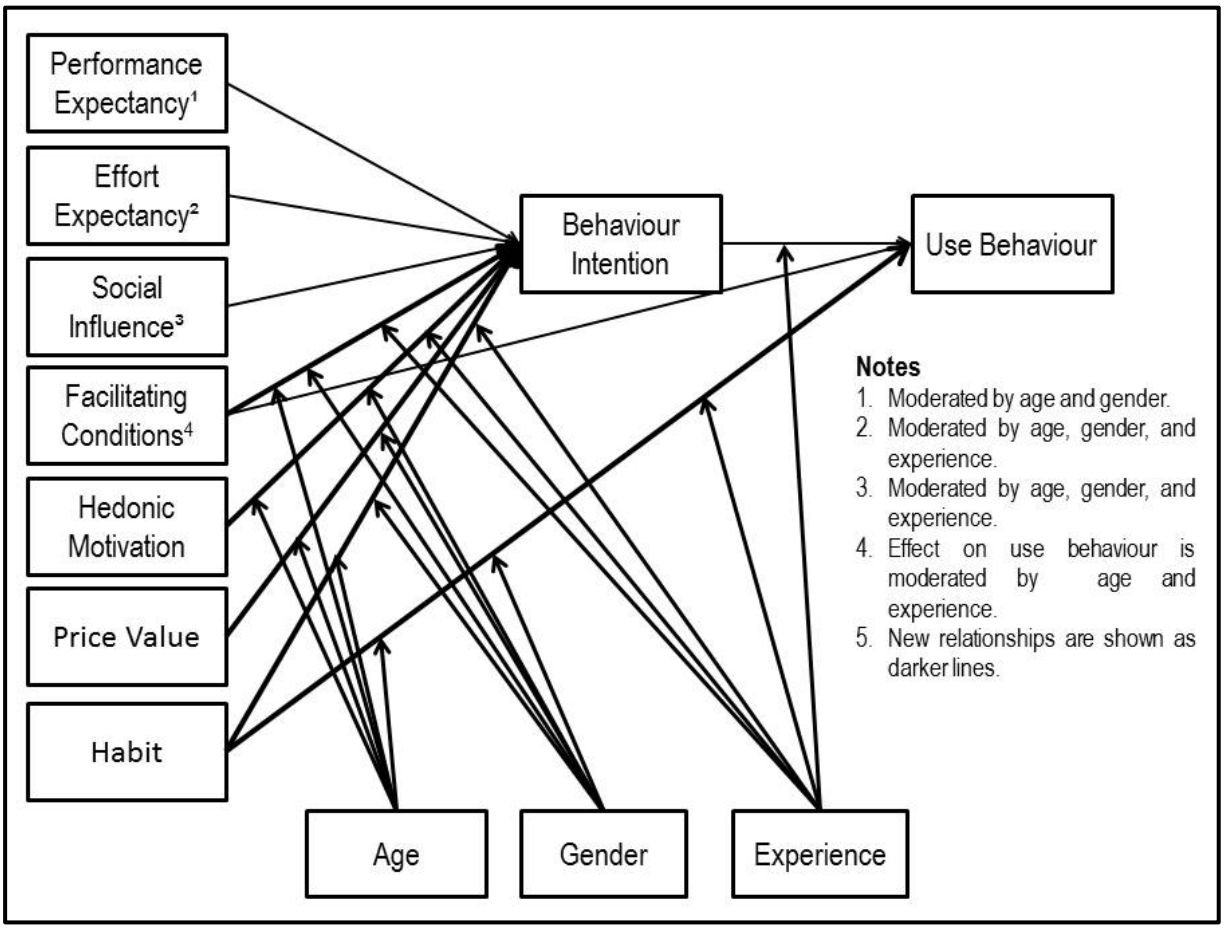


*Figure 2* UTAUT2 Model. Adapted from Venkatesh et al. (2012).

prediction of behavioural intention to use technology primarily in organizational contexts. Figure 1 presents the basic conceptual framework underlying the class of models explaining individual acceptance of information technology that forms the basis of this research.

According to Venkatesh et al. (2012), Venkatesh et al. (2003) developed UTAUT as a comprehensive synthesis of prior technology acceptance research based on a review of the extant literature. UTAUT has four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) that influence behavioural intention to use a technology and/or technology use. Venkatesh et al. (2012) adapt these constructs and definitions from UTAUT to the consumer technology acceptance and use context.

Here, performance expectancy is defined as the degree to which using technology will provide benefits to consumers in performing certain activities. Effort expectancy is the degree of ease associated with consumers' use of technology, social influence is the extent to which consumers perceive that important others (for example, family and friends) believe they should use a particular technology, and facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behaviour (Brown and Venkatesh, 2005; Venkatesh et al., 2003; and Venkatesh et al., 2012). According to UTAUT, performance expectancy, effort expectancy, and social influence are theorized to influence behavioural intention to use technology, while behavioural intention and facilitating conditions determine technology use. Also, individual difference variables, namely age, gender, and experience are theorized to moderate various UTAUT relationships (Figure 2).

Based on the gaps in UTAUT (Venkatesh et al., 2003) and the associated theoretical explanation provided, Venkatesh et al. (2012) integrate hedonic motivation, price value, and habit into UTAUT to tailor it to the consumer technology use context later known as UTAUT2 (Figure 2.). Brown and Venkatesh (2005) define hedonic motivation as the fun or pleasure derived from using technology, and it has been shown to play an important role in determining technology acceptance and use. Van der Heijden (2004) and Thong et al. (2006) find hedonic motivation (perceived enjoyment)

to influence technology acceptance and use directly. Brown and Venkatesh (2005) and Childers et al. (2001) also find hedonic motivation an important determinant of technology acceptance and use in the consumer context. Thus, Venkatesh et al. (2012) add hedonic motivation as a predictor of consumers' behavioural intention to use technology.

An important difference between a consumer use setting and the organizational use setting, where UTAUT was developed, is that consumers usually bear the monetary cost of such use whereas employees do not. The cost and pricing structure may have a significant impact on consumers' technology use. For instance, there is evidence that the popularity of short messaging services (SMS) in China is due to the low pricing of SMS relative to other types of mobile internet applications (Chan et al., 2008). Dodds et al. (1991), cited by Venkatesh et al. (2012), define price value as consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them. The price value is positive when the benefits of using technology are perceived to be greater than the monetary cost and such price value has a positive impact on intention (Venkatesh et al., 2012). Thus, Venkatesh et al. (2012) add price value as a predictor of behavioural intention to use technology.

Prior research on technology use has introduced two related yet distinct constructs, namely experience and habit. Experience, as conceptualized in prior research (Kim and Malhotra, 2005 and Venkatesh et al., 2003), reflects an opportunity to use a target technology and is typically operationalized as the passage of time from the initial use of technology by an individual. A habit has been defined as the extent to which people tend to perform behaviours automatically because of learning (Limayem et al., 2007), while Kim et al. (2005) equate habit with automaticity. Although conceptualized rather similarly, a habit has been operationalized in two distinct ways: first, habit is viewed as prior behaviour (Kim and Malhotra, 2005); and second, habit is measured as the extent to which an individual believes the behaviour to be automatic (Limayem et al., 2007). Consequently, there are at least two key distinctions between experience and habit. One distinction is that experience is a necessary but not sufficient condition for the formation of habit. A second distinction is that the passage of chronological time, that is, the experience can result in the formation of differing levels of habit depending on the extent of interaction and familiarity that is developed with a target technology.

## 2.2 Competitive intelligence

CI is variously presented as a process, a function, a product, or a mix of all three (Gilad and Gilad, 1985 cited by Bergeron and Hiller, 2002). Gračanin, Kalac, and Jovanović (2015) argue that there is no single and universal definition of CI and the most commonly used and cited definition was provided by the Society of Competitive Intelligence Professionals (SCIPs) where CI is defined as the process of monitoring the competitive environment. CI is defined as actionable recommendations arising from a systematic process involving planning, gathering, analysing and disseminating information on the external environment for opportunities, or developments that have the potential to affect a company's or country's competitive situation (Calof and Skinner, 1999). CI has become a strategic business tool that has long been proposed to increase companies' competitiveness (Montgomery and Urban, 1970; Pearce, 1976; Montgomery and Weinberg, 1979; Porter, 1980). CI enables managers in companies of all sizes to make decisions about everything, including marketing, research and development, investments and long-term business strategies. Following the arguments of many different authors cited by Pellissier and Nenzhelele (2013) in the 50 definitions of CI, one is forced to conclude that there is no universally agreed definition of CI although there are common characteristics in each, and there are also unique characteristics identified. CI should stimulate an organization's creativeness, innovativeness, and willingness to change (Bergeron and Hiller, 2002), in a continuing quest to create an evolving and intelligent organization. A more unified view of CI was recently provided by Madureira, Popovi˘c, and Castelli (2021) as "… the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance."

It is interesting to note how CI has developed over the years since the 1980s and 1990s when the founders Jan Herring, Leonard Fuld, and Ben Gilad built it. To Solberg (2019) CI now consists of an interesting body of literature, though it was not the first term to deal with questions of intelligence in private organizations, and it is not the last. Before CI

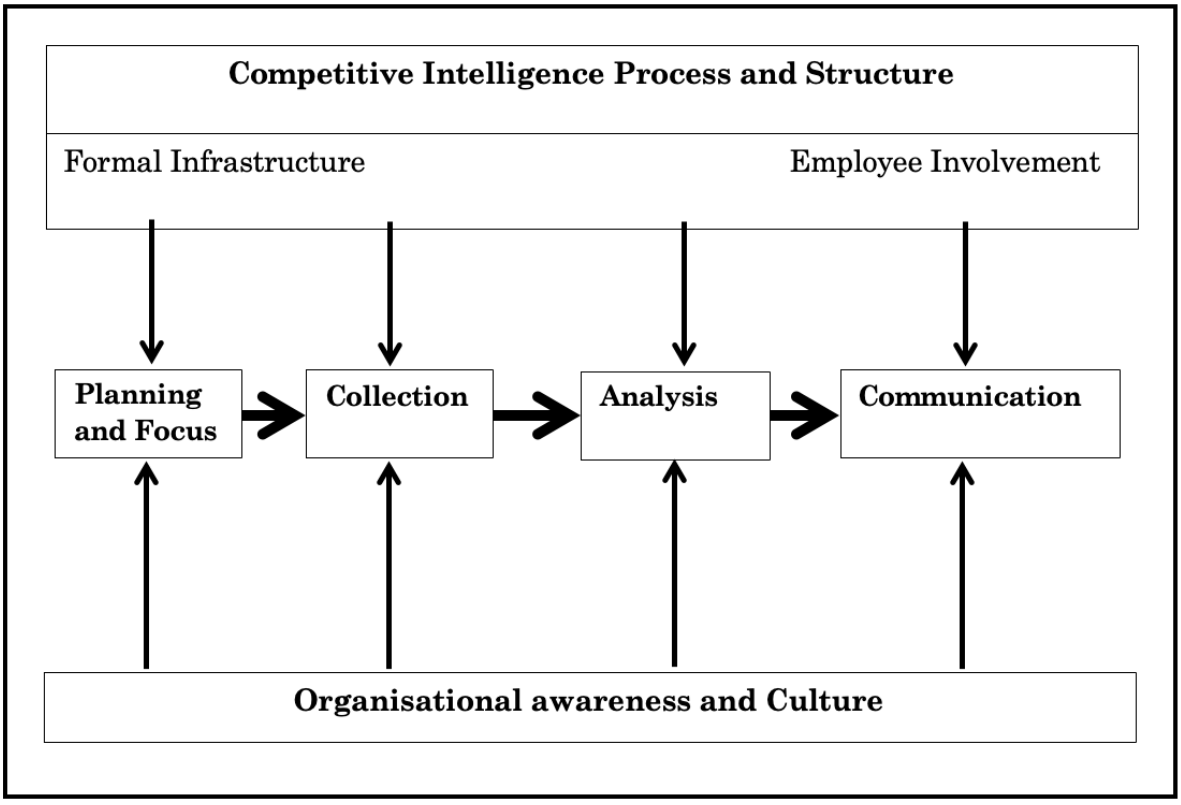


*Figure 3* Competitive intelligence process. Adapted from Dishman and Calof (2007, pp. 779).

there was social intelligence, strategic intelligence and corporate intelligence, and now it includes terms such as market intelligence, marketing intelligence, business intelligence, collective intelligence, financial intelligence, scientific and technical intelligence, foresight, insight, and equivalent terms in other languages as well. Maune (2019) argues that with the advent of globalisation, a term that was introduced in the 1980s, the role of CI becomes more visible and is strengthened by the increase in competition among nations and organisations.

Calof and Skinner (1999) state that countries such as the USA, France, Sweden, Japan and Canada have recognized the value of government and industry working jointly in the development of an intelligence culture. According to the Strategic and Competitive Intelligence Professionals website (SCIPs), CI has spread to six continents with 53 international chapters distributed as follows; North America (28), Australia (1), Europe (10), Asia (8), Africa (3), and South America (3). SCIP now has overs 300 ambassadors, 280 certified professionals, and 480 thought leaders.

CI is both a process and a product (intelligence) (Bose, 2008). The process of CI is the action of gathering, analyzing, and applying information about products, competitors, suppliers, regulators, partners, and customers for the short- and long-term planning needs of an organization (Kahaner, 1998). The CI process is a continuous cycle. Even though the phases are shown in sequence, are all conducted concurrently. While available information is processed, additional information is collected, and the intelligence staff is planning and directing the collection effort to meet new demands. Previously collected and processed information (intelligence) is disseminated as soon as it is available or needed. Five phases constitute the CI cycle (Kahaner, 1998, and McGonagle and Vella, 2012). The first phase, planning and direction, defines the company's requirements in terms of what information is needed? Why is it needed? When is it due? The collection activities include identification of all potential sources of information and then research and gather the right data legally and ethically from all available sources and put it in an ordered form. The analysis – a crucial step – activities involve analyzing collected data to identify patterns, relationships, or anomalies in it. Dissemination – report and inform – is the finished product or the CI communicated back to the decision-makers in a format that is easily understood. Feedback – evaluate – is the final phase in the cycle. It involves measuring the

impact of the intelligence that was provided to the decision-makers.

These basic phases are linked to each other by a feedback loop (Kahaner, 1998, and McGonagle and Vella, 2012). Dishman and Calof (2007) argue that the CI process identified in the literature includes the constructs of planning and focus, collection, analysis, communication, process and structure, and organisational awareness and culture as given shown in Figure 3. Barnea (2013) traces the CI roots to national intelligence. Barnea (2013) argues that governmental decision-makers are aware that intelligence is an important and often critical tool to the national decision-making process. To him, CI is based on the "intelligence cycle". CI adopted the discipline of national intelligence and applies it to its needs, with necessary modifications.

According to Field Manual [FM] 34-3 (1990), CI operations follow a four-phase process known as the intelligence cycle. The intelligence cycle is oriented to the mission (FM 34-3, 1990); this can be for the country or organisation. The FM 34-3 (1990) reports that "supervising and planning are inherent in all phases of the cycle. The intelligence cycle is continuous. Even though the four phases are conducted in sequence, all are conducted concurrently. While available information is processed, additional information is collected, and the intelligence staff is planning and directing the collection effort to meet new demands. Previously collected and processed information (intelligence) is disseminated as soon as it is available or needed." Mobile apps are becoming critical in the CI process given their perceived mobility and the limited functionality of websites (Murphy, 2011). Table 1 shows some of the CI resources from social media platforms.

*Table 1* Competitive intelligence type and resources.

| **Competitive intelligence type** | **Competitive intelligence resources** |
|---|---|
| People events | News, company websites, social media platforms such as Facebook, Twitter, Whatsapp etc. |
| Competitor strategies – technology investments etc. | News, discussion forums, blogs, patent search sites, social media platforms. |
| Consumer sentiments | Review sites, social networking sites, social media platforms such as Facebook, Twitter, Whatsapp etc. |
| Promotional events and pricing | Social media platforms such as Facebook, Twitter, Whatsapp etc. |
| Related real-world events | News, Social media platforms such as Facebook, Twitter, Whatsapp etc. |

## 2.3 Determinants of mobile application use for competitive intelligence

Mobile applications are defined as software that can perform certain tasks for the users operating their mobile devices (Islam and Mazumder, 2011). Mobile applications differ from websites, as the user downloads them from the mobile application store, which is a database that allows the mobile user to discover and install available mobile applications (Wong, 2012).

The surge in the uptake and use of mobile apps has helped many organisations and individuals in making decisions. Mobile applications have also played a very critical role in the CI process. Why mobile applications? Bulao (2021) and Vuleta (2021) state that Google, Facebook, Microsoft, and Amazon store at least 1,200 petabytes of information. Google handles a staggering 1.2 trillion searches every year. The two state that there were 71.5 billion apps downloaded worldwide in the first half of 2020. Google Play Store had 52.3 billion total downloaded apps during that period while the App Store had 18.3 billion. In 2020, roughly 306.4 billion emails were sent and received each day and in 2024, the number of emails will be about 361 billion every day (http://www.statista.com). Bulao (2021) states that experts predict that Google searches will amount to about 2 trillion in the whole of 2021. That equates to 6 billion searches a day.

In terms of connection, for example, over 2 billion minutes of voice and video calls are made on WhatsApp daily, and one billion people use this platform every day with more than two billion WhatsApp users in 180 countries as of 2020. Facebook had 1.82 billion daily active users and 2.7 billion monthly active users as of the 3rd quarter of 2020. Facebook generated four petabytes of data every day in 2020. The total number of Twitter users was 340 million as of October 2020 with 500 million tweets sent per day. These figures show how large these mobile applications are in terms of data repository. These numbers are

more likely to increase with the adoption of 5G technology. 5G has the ability to increase data transmission speed by up to 100 times and decrease latency from about 20 milliseconds to one millisecond (http://www.statista.com).

The UTAUT2 has been widely used to examine the acceptance and use of IT. For example through instant messengers, Web-based learning, cellphone application adoption, acceptance of network by urban people, use of electronic public service innovations, electronic booking solutions, academic settings, mobile banking adoption, mobile commerce, and mobile shopping (Lin and Anol, 2008; Chiu and Wang, 2008; Tan et al., 2010; and Yuen et al., 2010).

Kang (2014) argues that researchers such as Gefen and Straub (1997), King and He (2006), Schepers and Wetzels (2007), and Huang (2008) suggest that theoretical models of technology adoption and use encompass other important theoretical constructs such as motivations and functional aspects. In 2012 Venkatesh et al. developed the UTAUT2 that combines diffusion of innovation theory (DIT) (Rogers, 1962, 1995), theory of planned behaviour (TPB) (Ajzen, 1985; Fishbein and Ajzen, 1975), the technology acceptance model (TAM) (Davis, 1989), social cognitive theory (SCT) (Bandura, 1997), and unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) to encompasses functional and contextual factors to increase the explanatory power in the adoption and use of information technology. The UTAUT2 specifically uses several key variables that lead to the intention of use and actual use. Venkatesh et al. (2012) explain that performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit are factors influencing behavioural intention or use behaviour of IT.

*Table 2* Behaviour intention measurement items and sources.

| **Latent Variable** | **Measurement items** | **Source** |
|---|---|---|
| PE (***performance expectancy)*** | PE1. I find mobile Apps useful in my daily life.<br>PE2. Using mobile Apps increases my chances of achieving things that are important to me.<br>PE3. Using mobile Apps helps me accomplish things more quickly.<br>PE4. Using mobile Apps increases my productivity. | PE1-4 adapted and modified from "performance expectancy" in and Venkatesh et al. (2003) and Venkatesh et al. (2012). |
| EE (***effort expectancy)*** | EE1. Learning how to use mobile Apps is easy for me.<br>EE2. My interaction with mobile Apps is clear and understandable.<br>EE3. I find mobile Apps easy to use.<br>EE4. It is easy for me to become skillful at using mobile Apps. | EE1-4 adapted and modified from "effort expectancy" in and Venkatesh et al. (2003) and Venkatesh et al. (2012). |
| SI (***social influence)*** | SI1. People who are important to me think that I should use mobile Apps.<br>SI2. People who influence my behaviour think that I should use mobile Apps.<br>SI3. People whose opinions that I value prefer that I use mobile Apps. | SI1-3 adapted and modified from "social influence" in Venkatesh et al. (2012) and Venkatesh et al. (2003) for SI1-2. |
| FC (***facilitating conditions)*** | FC1. I have the resources necessary to use mobile Apps.<br>FC2. I have the knowledge necessary to use mobile Apps.<br>FC3. Mobile Apps are compatible with other technologies I use.<br>FC4. I can get help from others when I have difficulties using mobile Apps. | FC1-4 adapted and modified from "facilitating conditions" in Venkatesh et al. (2003) and Venkatesh et al. (2012). |
| HM (***hedonic motivation)*** | HM1. Using mobile Apps is fun.<br>HM2. Using mobile Apps is enjoyable.<br>HM3. Using mobile Apps is very entertaining. | HM1-3 adapted and modified from "hedonic motivation" in Venkatesh et al. (2012). |
| PV (***price value)*** | PV1. Mobile Apps is reasonably priced.<br>PV2. Mobile Apps is a good value for the money.<br>PV3. At the current price, mobile Apps provide good value. | PV1-3 adapted and modified from "price value" in Venkatesh et al. (2012). |
| HT (***habit)*** | HT1. The use of mobile apps has become a habit for me.<br>HT2. I am addicted to using mobile Apps.<br>HT3. I must use mobile Apps.<br>HT4. Using mobile Apps has become natural to me. | HT1-4 adapted and modified from "habit" in Venkatesh et al. (2012). |
| **BI (*behavioural intention)*** | BI1. I intend to continue using mobile apps in the future.<br>BI2. I will always try to use mobile apps in my daily life.<br>BI3. I plan to continue to use mobile Apps frequently. | BI1-3 adapted and modified from "behavioural intention" in Venkatesh et al. (2003) and Venkatesh et al. (2012). |
| **TT *(trust)*** | Based on my previous experience in using mobile apps…<br>**TT1.** I think they are honest.<br>**TT2.** I think they are trustworthy.<br>**TT3.** I think they provide good services to users.<br>**TT4**. I think they care about their users and take their concerns seriously.<br>**TT5.** I think they keep users' security and privacy in mind. | TT1-5 adapted and modified from "trust" in Groß (2015). |

Research has shown that performance expectancy (Rogers, 1995; Venkatesh et al., 2003; Arya, 2011; Pynoo et al., 2011; and Venkatesh et al., 2012), effort expectancy (Davis et al., 1989; Bandura, 1997; Agarwal and Prasad, 1999; Venkatesh et al., 2003; Han et al., 2006; Gupta et al., 2008; Wang and Wang, 2010; Curtis et al., 2010; and Venkatesh et al., 2012), social influence (Ajzen, 1985; Moore and Benbasat, 1991; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Yang, 2007; Kijsanayotin et al., 2009; Homburg et al., 2010; Chong et al., 2010; and Venkatesh et al., 2012), facilitating conditions (Venkatesh et al., 2003; Brown and Venkatesh, 2005; and Venkatesh et al. 2012, hedonic motivation (Childers et al., 2001; van der Heijden, 2004; Brown and Venkatesh, 2005; Thong et al., 2006; and Venkatesh et al., 2012), price value (Zeithaml 1988; Dodds et al., 1991; Chan et al., 2008; and Venkatesh et al. 2012), habit (Ouellette and Wood, 1998; Ajzen, 2002; Kim et al., 2005; Kim and Malhotra 2005; Limayem et al., 2007; Ajzen and Fishbein, 2005; and Venkatesh et al. 2012), and trust (Gefen, Karahanna and Straub, 2003; Luarn and Lin, 2005; Lin and Wang, 2005; Wei et al., 2009; Joubert and Van, 2013; Vasileiadis, 2014; and Groß, 2015) toward IT predicts behavioural intention and use behaviour (Figure 2 and Table 2). In other words, the individual intention to use the technology depends on whether the technology is perceived as useful, easy to use, suggested by important others, the needed resources to use the technology are present, the technology is fun to use, the price value of the technology, and if the users have a habit of using the technology.

## 3. METHODS

Data were collected from published peer-reviewed journal articles collected from electronic databases. A broad search strategy was used covering separate databases such as EBSCO, Emeralds, ProQuest, Sage, Sabinet, Taylor & Francis, and Google scholar. Articles on acceptance and use of IT, specifically those that focused on mobile applications, were selected. Also, articles that were based on the UTAUT and UTAUT2 by Venkatesh et al. (2003) and Venkatesh et al. (2012) respectively were targeted. The intention of reviewing these articles was to identify constructs that predict behavioural intention and behavioural use of mobile applications in CI.

Keywords such as, 'competitive intelligence,' 'business intelligence,' 'tactical intelligence,' 'market intelligence,' 'corporate intelligence,' 'competitor intelligence,' 'social competitive intelligence,' 'technological intelligence,' 'product intelligence,' 'mobile apps,' 'mobile applications,' 'UTAUT,' 'UTAUT2,' 'unified theory of acceptance and use of technology,' 'behavioural intention,' 'behavioural use,' and 'strategic intelligence' were used in search engines to find relevant articles. To ensure reliability, peer-reviewed journal articles were highly considered. The researcher skimmed through the text of the journal articles first, checking whether it was relevant for this research article. Reviewing data from existing journal articles was necessary to enhance the generalisability of the findings. The purpose of this review was to identify the motivation for acceptance and use of mobile apps in CI as a way of enhancing the understanding and appreciation of human behaviour in the use of mobile apps in CI. Criteria for inclusion of articles in the review also included that the articles must be written in English. For effectiveness, the author reviewed 21 articles (Appendix 1). Articles were strictly selected to achieve the desired objective. Appendix 1 presents the distribution and articles that were used for this study.

The researcher also brought in ideas from outside the traditionally defined field of CI and IT and integrated different approaches, lines of investigation, or theories that had no previous connections. The researcher`s purpose was not only descriptive but also critical. The researcher used literature not as an authority to be referred to, but as a useful but fallible source of ideas about developments in the acceptance and use of mobile apps in CI. The review was done to serve as the basis for understanding the causal or correlational patterns of interconnections across events, ideas, observations, concepts, constructs, knowledge, interpretations and other components of mobile app acceptance and use in CI.

### 3.1 Analysis

First, the survey items were checked for measurement properties and sources (Table 2) as given by Venkatesh et al. (2003), Venkatesh et al. (2012), and Groß (2015). The estimation or proposed model was informed by studies by Venkatesh et al. (2003), Venkatesh et al. (2012), and Groß (2015). This was followed by

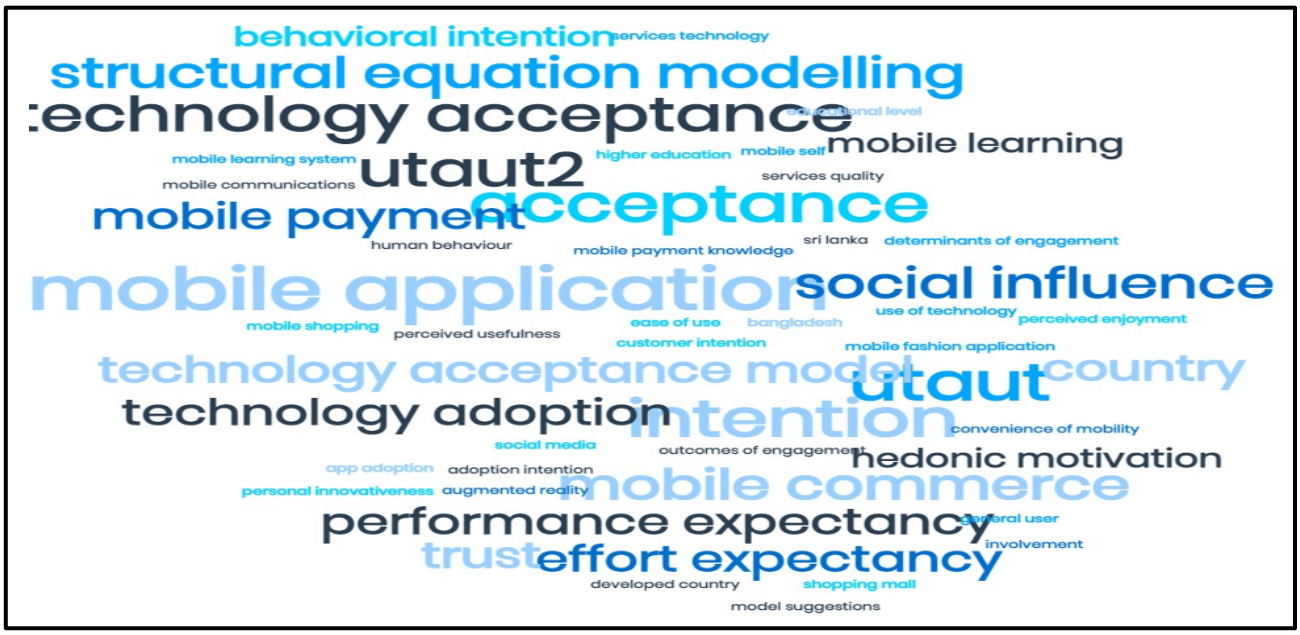


*Figure 4* A visual representation of keywords.

a gathering of keywords and constructs used in the 21 reviewed journal articles. These words were analysed using the MonkeyLearn word cloud generator, a powerful AI visualization tool (Figures 4 and 5). This tool scores words for relevance as shown in Table 3 and Table 4. The researcher had to use his discretion to determine the cutoff of the ranking. The keywords and constructs generated from the word cloud and survey items, measurement properties and sources in Table 2 were used as a basis to formulate the proposed model of mobile applications intention of use and actual use in CI (Figure 6). The constructs used in the model were supported by the studies reviewed (Appendix 1). The researcher also found support from the following theories: TPB, TAM, UTAUT, and UTAUT2. The only missing construct or variable from all the reviewed articles was CI. No articles that integrated CI with mobile application acceptance and use from a cognitive psychological perspective were found. This promoted the development of an integrated model to cater to the cognitive perspective (Figure 6).

The CI construct is very important given the nature of the business environment that has become very dynamic and competitive, driven by developments in IT, AI, big data, algorithms, 5G, and cybersecurity. Decision making has become a challenge due to huge amounts of data availability. CI has become a relevant strategic business tool. As a result, CI has developed and emerged with IT to provide decision-making solutions over the years. Perceived usefulness, perceived ease of use and perceived enjoyment were omitted as these were perceived to be the same as performance expectancy, effort expectancy, and hedonic motivation, respectively (van Heijden, 2004 and Thong et al., 2006). To avoid confusion and duplication, these constructs were omitted even though they were presented as separate constructs in some of the reviewed journal articles. See Table 2 for specific details. In the end, the model in Figure 6 was proposed as the final model with 11 predictors of behavioural intention and use behaviour of mobile applications for CI.

*Table 3* Rank, keywords and their relevance.

| Rank | Keywords | Relevance |
|---|---|---|
| 1 | Mobile application | 0.994 |
| 2 | Structural equation modelling | 0.745 |
| 3 | Technology acceptance model | 0.559 |
| 4 | Mobile commerce | 0.497 |
| 5 | Social influence | 0.497 |
| 6 | Performance expectancy | 0.373 |
| 7 | Effort expectancy | 0.373 |
| 8 | Technology adoption | 0.373 |
| 9 | UTAUT | 0.373 |
| 10 | UTAUT2 | 0.311 |
| 11 | Hedonic motivation | 0.248 |
| 12 | Mobile payment | 0.248 |
| 13 | Behavioural intention | 0.248 |
| 14 | Trust | 0.186 |
| 15 | Use of technology | 0.186 |
| 16 | Ease of use | 0.186 |
| 17 | Perceived usefulness | 0.124 |


*Figure 5* A visual representation of latent variables.

*Table 4* Rank, latent variables and their relevance.

| Rank | Latent variables | Relevance |
|---|---|---|
| 1 | Performance expectancy | 0.997 |
| 2 | Effort expectancy | 0.935 |
| 3 | Social influence | 0.935 |
| 4 | Behavioural intention | 0.623 |
| 5 | Hedonic motivation | 0.498 |
| 6 | Ease of use | 0.467 |
| 7 | Price value | 0.436 |
| 8 | Perceived usefulness | 0.374 |
| 9 | Perceived risk | 0.249 |
| 10 | Perceived enjoyment | 0.187 |
| 11 | Facilitating conditions | 0.155 |
| 12 | Habits | 0.129 |
| 13 | Subjective norm | 0.125 |
| 14 | Social efficacy | 0.063 |
| 15 | Trust | 0.051 |

## 4. DISCUSSION

Appendix 2 presents the effects of selected predictors of behavioural intention and use in mobile applications. From the table, as developed from the 21 peer-reviewed journal articles, UTAUT2 predictors had a direct and significant influence on mobile application use with hedonic motivation, ease of use, and habits having 100% direct influence. Latent variables including hedonic motivation, effort expectancy, price value, habits, performance expectancy, social influence, and facilitating conditions have proved to be significant in influencing mobile application use and acceptance (Appendix 2). These are followed by ease of use, perceived usefulness, perceived enjoyment, and trust, though ease of use, perceived usefulness, and perceived enjoyment were omitted from the final proposed research model. As for perceived risk, Abrahão et al. (2016) and Khurana and Jain (2019) find it to have a direct and significant influence on mobile application behavioural intention and use while Liu and Tai (2016) and Chao (2019) find it insignificant, but due to recent developments in social media networks, perceived risk remains significant and having a direct influence on mobile applications user behavioural intentions. Subjective norms and self-efficacy have been found to exert significant influence on behavioural intention (Roy, 2017), but still Uğur and Turan (2019), Chao, (2019), and Tarhini et al. (2019) found them to have indirect insignificant influence. These two variables are borrowed from the Theory of Planned Behaviour developed by Ajzen (1991). These will be a good addition to the UTAUT2 model. Three moderating variables were identified with varying effects: gender, age, and experience (Kang, 2014, Palau-Saumell et al., 2019, and Nawaz and Mohamed, 2020). However, the role of moderators (gender, experience, and age) needs to be explored further in future research (Barua et al., 2018).

### 4.1 Implications for research

The conceptual framework of mobile applications behavioural intention and use in CI found in this study has serious future

research implications. To validate the proposed research model (Figure 6), a deductive research approach with a huge sample is required. This will help in the generalizability of findings with the potential of replication in different cultures, nations, age groups, and sectors. Such a model and its replication are critical for CI analysts and practitioners given the current mobile technology penetration as measured by its acceptance and use. Also, further studies catering for developed and developing countries as well as those looking at people with different income levels and age groups within the same society would be welcomed to understand the patterns and predictors of mobile application adoption and use in CI. These studies can then help with the replication of the model in different countries, cultures and sectors as well as shed further light on the generalizability of the findings. These findings will be critical for mobile application developers as well as users.

More so, such studies will help validate the explanations given regarding the insignificant influence of perceived risk, subjective norms, and self-efficacy on user behavioural intention and use of mobile applications. This presents an interesting opportunity for empirically validating these suggestions. Thus, researchers can evaluate different variable combinations to explore their relationships with behavioural intention. For example, research can combine TPB and UTAUT2 variables to predict their influence on behavioural intention and actual use. Research may also focus on mobile application security and privacy and their impact on behavioural intention and actual use of mobile applications in CI. Research needs to look at the best mobile application for CI practitioners and analysts.

Longitudinal and mixed methods research provides another important research paradigm in the area of mobile application user behavioural intention and actual use in CI given the dynamism in mobile technology and mobile platform user censorship, alienation and cancel culture.

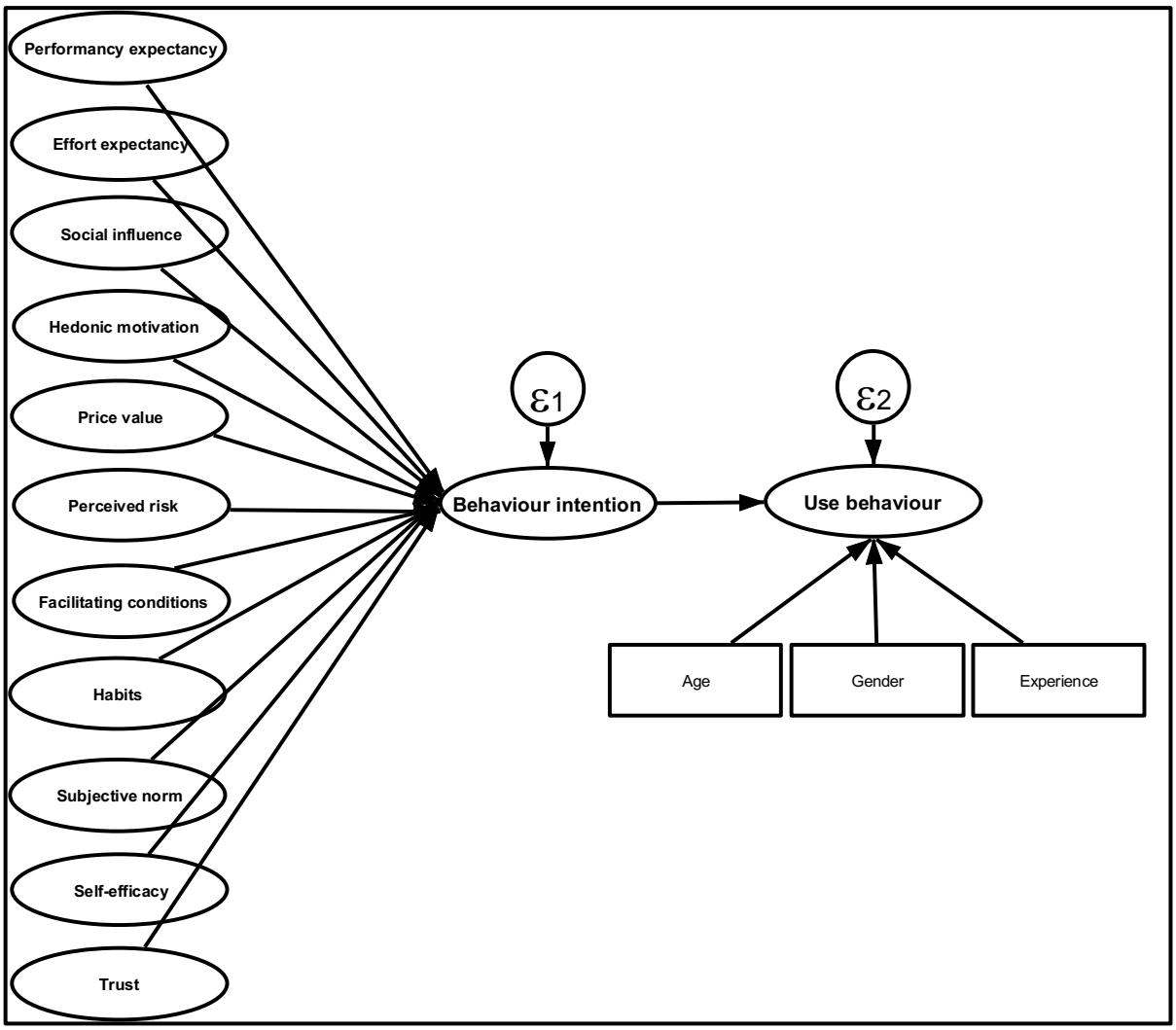


*Figure 6* Proposed research model.

### 4.2 Implications for practice

The study developed a conceptual framework that is useful to mobile application developers and users alike. On one hand, developers will have a better understanding of users' needs and intentions in using their applications and on the other hand users (CI analysts, decision-makers, professionals) will make their needs and intentions fully known to developers. Given the issues surrounding privacy and cybersecurity risks associated with mobile applications, the study will be critical to policy formulation and implementation as well as regulation of mobile applications or technology companies. This study will go a long way in helping businesses develop competitive strategies through CI. The combination of different predictors of behavioural intention and the use of mobile applications in CI from different theories provides an in-depth understanding of this phenomenon. Particularly, UTAUT constructs turned out to have a well-established influence on acceptance and use of mobile applications. The current study therefore theoretically attempts to combine UTAUT2 constructs with other concepts or variables of cognitive behaviour to develop a robust conceptual framework that enhances the understanding of mobile application use in CI. This study contributes theoretically to the UTAUT2 model with particular emphasis on the role of cognitive behaviour in the use of mobile applications in CI.

Practically, there is no literature that has attempted to examine the relationship between UTAUT, mobile applications, and CI. This is still a grey area that requires more research, hence a follow-up is needed that will address this issue from an empirical point of view to establish the relationships that exists between constructs of UTAUT, mobile applications and CI. There is need to address the CI professionals as to the best mobile application to use. This entails ranking these mobile applications in terms of significance as a source of intelligence for decision making. An empirical survey will address this through involving experts and professionals both in mobile applications and CI. All these issues will be addressed in an empirical way as there is no current study that has addressed the issue. This has become more critical and urgent given the amount of big data created and stored by mobile applications on a daily basis as shown above. For CI professionals and analysts, mobile applications have become the biggest mines for intelligent data for decision-making. CI cannot avoid mobile applications and remain relevant given the amount of data that is created and stored by mobile applications. The predictions by Vuleta (2021) and Bulao (2021) that by 2030 nine out of every ten people aged six and above would be digitally active is just an example of how rapidly data production is growing each day. Predictors of behaviour are very critical for CI professionals and experts in this competitive environment as a result of technological developments. Understanding of behavioural intentions of users of technology has become more important than ever before. In this case research has shown that predictors such as performance expectancy, effort expectancy, social influence, ease of use, price value, perceived risk, and trust (see Tables 4 and 5) are important in determining one's behaviour in using mobile applications. This information is critical for players in CI and developers of mobile applications. What users need is more important than just imposing things on them.

### 4.3 Limitations

Several factors limited this study. A qualitative research approach was used based on a literature review of 21 published peer-reviewed articles which to some might be viewed as a small sample but to develop a conceptual framework the sample was adequate given the nature and timeframe of the study. According to Neuman (2014), doing an extensive professional summary review that covers all of the research literature on a broad question could take years for a skilled researcher. On the other hand, the same person could finish a narrowly focused review in a specialized area in a week. Nevertheless, as noted by Shneor and Munimb (2019), a bigger sample may strengthen the generalizability of the findings and illuminate the potential roles of contextual factors in shaping the phenomena under investigation. This study builds on Neuman's (2014) arguments that, "as in other areas of life, it is wise to find out what others have already learned about an issue before you address it on your own. Doing a literature review builds on the idea that knowledge accumulates, and that one can learn from and build on what others have done. The review rests on the principle that scientific research is a collective effort, one in which many researchers contribute and share results."

This approach, though subjective in nature, was critical in giving an in-depth

understanding and meaning of concepts under consideration. The articles used, however, were deemed trustworthy, authentic, and credible. This article forms an important base in analyzing the behavioural intention and use of the mobile application in CI. As stated by Creswell (2009), the intent of this study is not to generalize findings to individuals, sites, or places outside of those under study: the value of this study lies in the particular description and themes developed in the context of a specific site. Particularity, rather than generalizability (Creswell, 2009), is the hallmark of this study. The dynamics in mobile application technology also constrain the generalizability of the present findings. This study, however, forms a strong base for more robust quantitative studies based on surveys and structural equation models using advanced analytical software, such as SPSS, STATA, R, and Python. Prior limited research regarding behavioural intention and use of mobile applications in CI had a negative bearing on the review.

This study followed a mono-method approach which results in a certain level of method bias. Nonetheless, this was addressed by considering peer-reviewed published articles and reviewing different journal articles taken from different databases, countries, years and authors (Appendix 1).

The study could not, however, identify the CI construct in any of the analyzed articles. The final framework, therefore, presents a representation of the determinants of mobile application use. Literature has failed to show the link between these determinants for mobile application use for CI. This gap in the literature needs to be filled with an empirical study that connects the identified determinants in the model above to CI. A literature review was useful to unpack this phenomenon and identify the gaps in the literature.

## 5. CONCLUSION

Mobile applications are an important channel through which analysts, professionals, and businesses, as well as individuals, can gather CI for decision-making purposes. CI has become a global phenomenon in today's environment of intensifying global competition as a result of big data analytics, AI, IoT, 5G/6G, cybersecurity, as well as the adoption of mobile applications such as WhatsApp, Facebook, Instagram, and Telegram that have enabled high-speed availability and transfer of large amounts of data collected and accumulated by various individuals and organisations over the years. CI must not be confused with economic espionage which is unlawful and unethical: it is legal and is associated with a detailed code of ethics. The study has budded literature on CI and mobile application behavioural intention and use behaviour.

The study focused on developing a conceptual framework based on the understudied role played by cognitive antecedents in influencing behavioural intention and use of mobile applications in CI. The study showed the usability of the UTAUT2 model in the acceptance and use of mobile applications in CI. This culminated with the development of a conceptual framework with 11 predictors of behavioural intention and use of mobile applications in CI. The framework was developed from UTAUT, UTAUT2, TPB, and TAM. The articles that were reviewed made use of these theories in examining the predictors of behavioural intention and use of mobile applications. The missing element in all these studies was CI, which this study seeks to incorporate given its role in decision-making. The integration of UTAUT, UTAUT2, TPB and TAM with CI is critical considering the role of technology in the current business environment. To ensure reliability and credibility of the study, articles covering several countries such as Sri-Lanka, Jordan, Greece, Spain, India, Turkey, Taiwan, Korea, Oman, Bangladesh, Pakistan, Egypt, Malaysia, Germany, Vietnam, and Brazil from 2014 to 2020 were considered for this review.

A qualitative literature review of peer-reviewed journal articles was used to explore mobile application user behavioural intention and use to develop a conceptual framework that forms a base for a more robust deductive research approach. The study reviewed 21 journal articles to understand the role played by cognitive antecedents in behavioural intention. The results of this study will have a bearing on the use of mobile applications in CI. Articles were drawn from reputable academic databases such as EBSCO, Emeralds, ProQuest, Sage, Sabinet, Taylor & Francis, and Google Scholar.

The findings of this study support the generally accepted views regarding the factors influencing the acceptance and use of technology with minor variations and considerations. All UTAUT2 predictors of behavioural intention and use had a direct and significant influence on mobile application use

with hedonic motivation, ease of use, and habits having 100% direct influence (Appendix 2). Following in significance were ease of use, perceived usefulness, perceived enjoyment, and trust which were later dropped from the final proposed model, except for trust. However, perceived risk, subjective norms, and self-efficacy were insignificant in influencing behavioural intention and use of mobile applications (Roy, 2017; Uğur and Turan, 2019; Chao, 2019; Tarhini et al., 2019; Abrahão et al., 2016; Khurana and Jain, 2019; and Liu and Tai, 2016).

To summarize, this study presents several contributions. The study fills a gap in mobile application behavioural intention and use in CI though this needs to be validated using SEM, EFA and CFA. The proposed conceptual framework provides a theoretical base for the proposed model. This framework can be applied and tested in various contexts such as m-commerce, m-marketing, m-shopping, and m-banking. This model will go a long way in helping developers, analysts, policy-makers, regulators, and users of mobile applications understand the needs of each other.

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## APPENDICES

**Appendix 1.** Articles reviewed by authors, title, purpose, methods, and keywords.

| Author(s) | Title | Purpose | Context & nature | Method | Keywords |
|---|---|---|---|---|---|
| Nawaz and Mohamed (2020) | Acceptance of mobile learning by higher educational institutions in Sri Lanka: An UTAUT2 approach | The purpose of this study was to investigate the factors that might influence the intention and use behaviour of M-learning systems by students in higher education in Sri Lanka. | 453 undergraduate and postgraduate students from Sri Lankan state universities. | Self-administering and Web-form questionnaire. The model was evaluated using CFA, EFA & SEM. Data were analysed using Microsoft excel 16, IBM's SPSS 22 and AMOS 22. | Structural Equation Modelling, UTAUT2, M-Learning Systems, Higher Education, Sri Lanka |
| Gharaibeh et al. (2020) | Exploring the intention to adopt mobile commerce: Integrating UTAUT2 with social media | To predict the determinants that influence consumer expectation and intention to adopt mobile | Jordan, Cross-sectional | Data was collected from 400 Jordanian consumers. Linear regression analysis. | Mobile commerce, UTAUT2, Social Media, customer intention, social influence, effort expectancy, hedonic |

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|---|---|---|---|---|---|
| | | commerce in Jordan. | | | motivation, performance expectancy, habit, facilitating conditions |
| Saprikis, Avlogiaris, and Katarachia (2020) | Determinants of the Intention to Adopt Mobile Augmented Reality Apps in Shopping Malls among University Students | The study aimed at making substantial suggestions and investigating an integrative theoretical paradigm that attempts to establish the significance of specific factors which allow using mobile augmented reality apps in shopping malls. | Greece – University students. Cross-sectional | 2300 e-questionnaire sent, 405 responded & 381 retained. SEM, CFA & Maximum likelihood estimation. | augmented reality; adoption; UTAUT; mobile commerce; shopping mall |
| Palau-Saumell, Forgas-Coll, Sánchez-García, and Robres (2019) | User Acceptance of Mobile Apps for Restaurants: An Expanded and Extended UTAUT-2 | The paper examines the adoption of mobile applications for restaurant searches and/or reservations (MARSR) by users, as part of their experiential quality. | Spanish who owned a smartphone and use MARSR applications. Cross-sectional. | An Online (netquest.com) questionnaire survey was sent to 1200 individuals. Data that was analyzed using structural equation modelling (SEM) – Maximum likelihood estimation procedure (EQS6.1) statistical software. | Mobile applications; technology adoption; UTAUT; perceived credibility; social influence. |
| Khurana and Jain (2019) | Applying and Extending UTAUT2 Model of Adoption of New Technology in the Context of M-Shopping Fashion Apps | To recognize the factors that affect the adoption of m-shopping fashion apps from the consumer perspective in Delhi NCR | Delhi-NCR, India. Cross-sectional | Structured online survey on the sample of 557 mobile app users aged 18-25. SPSS Amos – SEM & CFA used to analyse data. | Mobile Fashion Applications, Mobile Shopping, Utaut2, Technology Adoption, India |
| Uğur and Turan (2019) | Mobile Applications Acceptance: A Theoretical Model Proposal and Empirical Test | Investigating the factors influencing the behavioural intentions to use mobile apps and find out what makes some apps popular. | Turkey, State University. Cross-sectional. | Structured questionnaire to collect data from 1852 college students. SEM, PLS - SmartPLS Software. | Mobile Apps, Model Suggestion, Structural Equation Modeling (SEM), Technology Acceptance Model (TAM), Uses and Gratifications |
| Chao (2019) | Factors Determining the Behavioral Intention to Use Mobile Learning: An Application and Extension of the UTAUT Model | This study explored the behavioural intention to use m-learning from the perspective of consumers | Taiwan, Cross-sectional | A questionnaire sent to 2000 University students. Partial least squares (PLS) regression. | mobile learning, mobile self-efficacy, unified theory of acceptance and use of technology model, trust, perceived enjoyment, perceived risk |
| Jeon, Ali, and Lee (2019) | Determinants of consumers' intentions to | This study examines customers' | Korean, Cross-sectional | An invitation survey link to 4000 potential | Technology acceptance; UTAUT; innovativeness; |

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| | use smartphones apps for flight ticket bookings | adoption and acceptance of smartphone apps to book their flight tickets. | | respondents, 440 followed the invitation link, 381 respondents were retained, the final sample of 369 respondents. PLS-SEM-SmartPLS 3.0 | involvement; trust |
| Tarhini et al. (2019) | An analysis of the factors affecting mobile commerce adoption in developing countries Towards an integrated model | This study aims to investigate the factors that may hinder or facilitate consumers' adoption of mobile-commerce in developing countries | Oman, Cross-sectional | 530 questionnaires were distributed of which 432 were returned, of which 430 were retained. SEM & CFA -AMOS 21.0. | SERVQUAL, Developing countries, Structural equation modelling, Technology adoption, UTAUT, Mobile-commerce, Developed countries |
| Alam, Hu, and Barua (2018) | Using the UTAUT Model to Determine Factors Affecting Acceptance and Use of Mobile Health (mHealth) Services in Bangladesh | To identify the critical factors affecting the adoption of mHealth in the healthcare system by extending the UTAUT model to include perceived reliability and price value. | Dhaka city of Bangladesh, Cross-sectional. | Survey questionnaire to 323 participants from public and private hospitals. Smart PLS 2.0 was used to analyse data. | mHealth, UTAUT, general users, Developing Countries, Bangladesh |
| McLean (2018) | Examining the determents and outcomes of mobile app engagement- a longitudinal Perspective. | This research provides insight into the determinants and outcomes of consumer engagement with a retailer's m-commerce application. | longitudinal study | An online questionnaire to 689 consumers over 12 months and SEM - AMOS Graphics 24 (EFA, CFA). | Mobile applications, M-Commerce, Human behaviour, Determinants of engagement, Outcomes of engagement. |
| Sair & Danish (2018) | Effect of Performance Expectancy and Effort Expectancy on the Mobile Commerce Adoption Intention through Personal Innovativeness among Pakistani Consumers | To understand the relationships among performance expectancy, effort expectancy, personal innovativeness and behavioural intentions…. | Pakistan, Cross-sectional | A questionnaire-based survey of 320. SEM-AMOS version 23. | M-commerce, performance expectancy, effort expectancy, personal innovativeness, behavioural intentions |
| Bendary & Al-Sahouly (2018) | Exploring the extension of the unified theory of acceptance and use of technology, UTAUT2, factors effect on perceived usefulness and ease of use on mobile commerce in Egypt | To examine the most relevant factors for mobile commerce adoption | Egypt, Cross-sectional | Questionnaire survey to 200 participants. SEM - AMOS Version 20 | Convenience, Social influence, Hedonic motivations, perceived usefulness, ease of use. |

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| Fadzil (2017) | A Study on Factors Affecting the Behavioral Intention to use Mobile Apps in Malaysia | To investigate the determinants of consumer behavioural intention (BI) to use mobile apps. | Undergraduate students at a Malaysian local university. Cross-sectional. | Survey questionnaire sent to 200 respondents. Regression analysis and equation modelling by using SPSS software | Consumer behavioural intention, Gender, Educational level, Malaysia, Mobile applications, UTAUT2 |
| Ibrahim et al. (2017) | Descriptive Findings Regarding Factors Influencing Mobile Application Acceptance among Millennial in Malaysia | Factors influencing mobile application intention behaviour among millennial. | University students in Malaysia. Cross-sectional. | Survey questionnaire to 200 respondents. Descriptive analysis using frequency and scoring techniques. | Technology Acceptance, Mobile Application Use, UTAUT2 |
| Kiat, Samadi, and Hakimian (2017) | Consumer Behaviour towards Acceptance of Mobile Marketing | To investigate the enabling factors that influence consumers' behaviour to accept mobile marketing | Malaysia, Cross-sectional | 140 questionnaires designed in Google Forms sent to online respondents. SPSS – Pearson & multiple regressions. | - |
| Roy (2017) | App adoption and switching behaviour: Applying the extended TAM in smartphone app usage | The study examines (a) the adoption behaviour of mobile apps using the extended TAM framework and (b) whether adoption leads to subsequent use behaviour and switching intentions. | India – University. Cross-sectional | Target survey 600 and usable respondents 549. SEM, EFA, CFA, CV (maximum likelihood estimation – AMOS 20). | Mobile Applications (APPS); App Adoption; Switching Behavior; Extended TAM; Structural Equation Modeling |
| Schmitz, Bartsch, and Meyer (2016) | Mobile App Usage and Its Implications for Service Management – Empirical Findings from German Public Transport | To explain consumers' intentions to use mobile apps of service companies | Germany, Cross-sectional | An online survey using QuestBack's EFS to collect data from 197 app users of public transportation. focus groups of 18 people | mobile apps; self-service technologies; technology acceptance model; service quality |
| Liu and Tai (2016) | A Study of Factors Affecting the Intention to Use Mobile Payment Services in Vietnam | To spot out factors affecting the intention to use a mobile payment service plan | Vietnam, Cross-sectional | 604 quantitative questionnaire, SPSS & AMOS software (SEM, EFA, CFA, & ANOVA). | The convenience of mobility, compatibility, M-payment knowledge, ease to use, usefulness, trust of safe to use, intention to use mobile payment, Vietnam |
| Abrahão, Moriguchi, and Andrade (2016) | Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT). | To evaluate the intention of adopting a future mobile payment service from the perspective of current Brazilian consumers of mobile phones. | Brazil, Cross-sectional | 30,000 emails were generated randomly and sent to Brazilian Telecom operator mobile phone users. 750 responses were collected, of which 605 were | Mobile payment; Innovation; Adoption intention; Acceptance and use of technology. |

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| | | | | validated. SEM - partial least squares (PLS), Smart PLS 3.0 software. | |
| Kang (2014) | Factors influencing the intention of mobile application use | The study examined factors that predict the use of intention of mobile applications. | Social networking sites | In an online survey, a total of 1513, 755 responses were used. SEM, MLP, AMOS 18.0 | mobile communication; mobile applications; performance expectancy; effort expectancy; social influence; motivations; use intention. |

**Appendix 2.** Effect of latent variables on behaviour.

| **Latent variable** | **Influence on behaviour** | |
|---|---|---|
| | **Direct/significant** | **Indirect/No significant** |
| Performance expectancy | Nawaz and Mohamed (2020), Barua et al. (2018), Saprikis et al. (2020), Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Hakimian et al. (2017), Chao (2019), Sair & Danish (2018), Jeon et al. (2019), Abrahão et al. (2016), Tarhini et al. (2019). | Uğur and Turan (2019), Kang (2014). |
| Effort expectancy | Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Hakimian et al. (2017), Chao (2019), Sair & Danish (2018), Abrahão et al. (2016), Kang (2014). | Tarhini et al. (2019), Khurana and Jain (2019). |
| Social influence | Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Abrahão et al. (2016), Bendary & Al-Sahouly (2018). | Tarhini et al. (2019), Khurana and Jain (2019), Saprikis et al. (2020), Kang (2014), Hakimian et al. (2017). |
| Hedonic motivation | Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Tarhini et al. (2019), Bendary & Al-Sahouly (2018). | - |
| Ease of use | McLean (2018), Roy (2017), Schmitz et al. (2016), Liu and Tai (2016). | - |
| Price value | Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Tarhini et al. (2019). | Gharaibeh et al. (2020), Barua et al. (2018). |
| Perceived usefulness | McLean (2018), Roy (2017), Schmitz et al. (2016), Liu and Tai (2016). | Uğur and Turan (2019). |
| Perceived risk | Abrahão et al. (2016), Khurana and Jain (2019). | Liu and Tai (2016), Chao (2019). |
| Perceived enjoyment | Roy (2017), Chao (2019), Saprikis et al. (2020). | McLean (2018). |
| Facilitating conditions | Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Khurana and Jain (2019), Jeon et al. (2019), Tarhini et al. (2019). | Saprikis et al. (2020), Hakimian et al. (2017). |
| Habits | Nawaz and Mohamed (2020), Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Tarhini et al. (2019). | - |
| Subjective norm | Roy (2017). | Uğur and Turan (2019). |
| Self-efficacy | Roy (2017). | Chao (2019), Tarhini et al. (2019). |
| Trust | Liu and Tai (2016), Chao (2019), Tarhini et al. (2019), Jeon et al. (2019). | Saprikis et al. (2020). |