Mobile conversational commerce: messenger chatbots as the next interface between businesses and consumers

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ABSTRACT

Nowadays, businesses are slowly starting to deploy mobile messenger chatbots as a new method of communication with its customers. Due to the subject's infancy and lack of research on the subject, the purpose of this study is to explore the concept of mobile messenger chatbots and an attempt is made to determine the Dutch Millennials' intention to use messenger chatbots as the next interface for mobile commerce. A research model is proposed based on the Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT). Data is collected by means of an online survey among 195 participants. The proposed research model is tested by means of simple regression analysis and results are cross-validated using IBM Watson Analytics. All proposed hypotheses are supported. However, there is no unambiguous answer to whether Dutch Millennials have the intention to use mobile messenger chatbots as the next interface for commerce. Nonetheless, more than half of the respondents express a positive first impression towards mobile messenger chatbots. This study knows some limitations regarding external validity and the research model is limited to five independent constructs. Additional constructs or measurement tools could be used to obtain a deeper understanding regarding the subject. Moreover, using a real-life experiment may generate distinctive results. Organizations wanting to deploy messenger chatbots, marketers and chatbot developers should consider compatibility, the consumers' lifestyle and shopping preferences, for a successful implementation. Similarly, the consumers' privacy concerns and resistance to intrusive mobile advertisement are important topics to be considered.

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Keywords

Chatbot, Mobile Messenger Chatbot, Conversational Commerce, Technology Acceptance Model, IBM Watson Analytics

1. INTRODUCTION

Digitization, the rise of the internet and mobile devices have changed the way people interact with each other and with companies. The internet has boosted electronic commerce (e-commerce) and the growth of wireless networks and mobile devices has led to the development of mobile e-commerce (m-commerce) (Ngai & Gunasekaran, 2007; Wu & Wang, 2005). M-commerce lets users conduct e-commerce activities via a mobile device (Ngai & Gunasekaran, 2007). It provides multiple opportunities for companies as it can facilitate expansion of commerce activities and enables transactions that were not possible before (Pavlou, Lie & Dimoka, 2007). In addition, based on the research of Ganesan et al. (2009), van Bruggen, Antia, Jap, Reinartz, & Pallas (2010) state that "the rise of the internet and mobile smartphones has enabled firms to establish and maintain more direct relationships with their customers" **(**p.333).

Next to the growth in m-commerce, the number of monthly active users of mobile messenger apps is growing. The four biggest messenger apps even surpassed the four biggest social networks when looking at the amount of monthly active users (Statista, 2016). In response, several companies, airlines, fashion brands and insurance companies start providing services to their customers through messenger apps. Airlines now provide travelers the ability to check in, ask questions and provide information updates via Facebook messenger. Fashion brands offer styling advice for its customers based on previous purchases or personal preferences, and insurance companies handle claims via messenger apps. Communicating through a mobile messenger app allows customers and companies to interact via text messages, a universally understood method of communication and a familiar interface. Instead of calling, e-mailing or opening an app, customers can easily reach out to companies by texting, at a time suitable and comfortable for them.

Artificially intelligent chatbots or conversational agents can be used to automate the interaction between a company and customer. Chatbots are computer programs that communicate with its users by using natural language (Griol, Carbó, & Molina, 2013; Atwell & Shawar, 2007; Kerly, Hall, & Bull, 2007) and engages in a conversation with its user by generating natural language as output (Griol et al., 2013). The application of chatbots by businesses is no new development itself. Chatbots have been around in online web based environments for quite some time and are commonly used to facilitate customer service. However, chatbots are now shifting to the mobile messenger interface. The application of mobile messenger chatbots for commercial purposes is at the beginning of a development called 'conversational commerce'. Chatbots can respond with messages, recommendations, updates, links or call-to-action buttons and customers can shop for products by going through a product carousel, all in the messenger interface (Constine, 2016; Shopify, 2016). A chatbot can recognize the buyer's intent and refine offerings based on the buyer's choices and preferences. It can then facilitate the sale, order, and delivery process (van Manen, 2016).

The use of messenger based chatbots or conversational agents might be appealing to companies as it can combine and shorten the stages of the buying process (Shopify, 2016) to become a 'one stop shopping' channel. Chatbots are also platform independent as they use the messenger infrastructure and downloading (branded) apps is no longer required (van Manen, 2016; Amir, 2016). Furthermore, the use of conversational agents is more cost effective than human-assisted support (Mott, Lester and Branting, 2004). However, the current development of mobile messenger chatbots is still in its infancy and it is expected that messenger apps will be the next interface for mobile commerce. In Asia, WeChat is a widely-used app with integrated functionalities to e.g. transfer money, book a flight or order a taxi. Yet, messenger apps in the Netherlands are typically used to interact with friends, family and acquaintances. It is yet undetermined if people want to use this same platform for commercial purposes, such as online shopping. For new information systems and information technology to be adopted successfully, sufficient user acceptance is necessary (Wu and Wang, 2005).

Previous studies mainly focused on the application of chatbots in website environments. Due to its novelty, there is currently little to no research on the application or acceptance of chatbots in the mobile messenger interface. It is therefore valuable to know whether potential users have the intention to use messenger chatbots. Consequently, the aim of this research is multisided. First, this exploratory study examines the development of conversational commerce and messenger chatbots by means of desk research. Secondly, this study aims to identify whether Dutch Millennials intent to use mobile messenger chatbots as the next interface for commerce. The widely applied Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT) serve as a basis for this study. The original TAM variables perceived use (PU), perceived ease of use (PEOU), attitude towards using (A) and behavioral intent (BI) are kept and is extended with IDT's variable compatibility (C). By means of literature research the variables internet privacy concern (IPC) and attitude towards mobile advertisement (ATMA) are expected to influence the attitude towards using mobile messenger chatbots (A). In turn, A is expected to influences BI. The study focusses on Dutch Millennials as its target group as this generation grew up with mobile phones and the internet (Syrett & Lamminman, 2004).

1.1 Problem statement

Messenger chatbot, or better not? The main research question is stated as follows: 'to what extent will Dutch Millenials adopt mobile messenger chatbots as the next interface for mobile commerce?'

The rest of this paper is structured in five sections. The next section will clarify the theoretical background including several basic concepts considered helpful in understanding the full context of this paper. The third section of this study will elaborate on methodology. Data analysis and results will be discussed in the fourth section and this paper will end with a conclusion and recommendations.

2. LITERATURE REVIEW

In this section, several basic concepts will be explained to understand the context of mobile messenger chatbots. Moreover, this section elaborates on the constructs used in the research model, including the hypothesis development.

2.1 Mobile services

A mobile service is a broad term to define a variety of services that can be accessed via a mobile phone. Based on literature, Zarmpou, Saprikis, Markos, & Vlachopoulou (2012) define mobile services as: "mobile data services mainly refer to the communication services (e-mails, SMS, MMS, etc.), web information services (weather information, sports, banking information, news, etc.), database services (telephone directories, map guides, etc.), entertainment (ringtones, videos, games, etc.) and commercial transactions through the mobile devices (buying products, making reservations, banking, stock trading, etc.)" (p.226). A messenger chatbot is a combination of multiple services as it can combine communication services with information services, entertainment and commercial transactions.

2.2 Mobile commerce and marketing

The growth of mobile commerce (m-commerce) has led to the development of mobile marketing. M-commerce can be defined as "...any transaction with a monetary value - either direct or indirect - that is conducted over a wireless telecommunication network" (Barnes, 2002, p. 92). As there are no limitations regarding time, wires or space, m-commerce is characterized by its ubiquitous 'anywhere, anytime' nature (Balasubraman, Peterson, & Jarvenpaa, 2002; Pavlou et al., 2007; Barnes & Scornavacca, 2004). Mobile phones are typically owned by an individual which makes mobile devices an ideal platform for targeted and personalized marketing (Barnes & Scornavacca, 2004; Bauer, Barnes, Reichardt and Neumann, 2005). Mobile marketing can be defined as "using a wireless medium to provide consumers with time- and location-sensitive, personalized information that promotes goods, services and ideas, thereby benefiting all stakeholders" (Scharl, Dickinger and Murphy, 2005, p.165). Mobile marketing can be applied to enhance a consumers' relationship with a brand by text messaging, mobile advertisements, mobile (user-generated) content, m-commerce and permission based marketing (Watson, McCarthy & Rowley, 2013). Persaud and Azhar (2012) state that this type of marketing allows companies to easily reach consumers and is relatively easy and inexpensive. Nevertheless, this does not mean consumers want to receive marketing messages on their phones. Whether a new marketing instrument will be successful or not depends on the consumer acceptance (Bauer et al., 2005). Barnes and Scornavacca (2004) state the environment of a mobile phone is a much more personal one than an (e-)mail inbox. Due to the invasive nature of mobile marketing compared to other media, attention is required regarding user permission issues to make mobile marketing experience an enjoyable one (Barnes & Scornavacca, 2004). In addition, they state that in order to obtain the user's permission, the information pushed to the user must be of high value.

2.2.1 Push vs Pull marketing

According Barnes and Scornavacca (2004) mobile marketing can be divided into two main categories; push and pull marketing. In push marketing marketers approach customers by 'pushing' or sending them advertisement messages (e.g. e-mail, sms). In pull marketing, advertisements (e.g. banners, images) are placed on or in content that is accessed and browsed wirelessly (Barnes & Scornavacca, 2004).

2.3 Conversational commerce

The application of artificially intelligent messenger chatbots or conversational agents for commercial purposes is part of a development called conversational commerce. Conversational commerce is currently a trending topic in digital marketing and its definition appears ambiguous at first. Nonetheless, some communalities can be found in the various definitions. Conversational commerce "...is about offering convenience, personalization and assisting decision making processes" (van Manen, 2016). Messina (2016) defines conversational commerce as "...utilizing chat, messaging, or other natural language interfaces (i.e. voice) to interact with people, brands, or services and bots that heretofore have had no real place in the bidirectional, asynchronous messaging context". In line with Messina (2016), another extensive description of conversational commerce is given by Shopify (2016): "Consumers can chat with company representatives, get customer support, ask questions, get personalized recommendations, read reviews, and click to purchase all from within messaging apps. With conversational commerce, the consumer engages in this interaction with a human representative, chatbot, or a mix of both". In short, conversational commerce refers to the integration of messaging apps and e-commerce. This phenomenon is described by Kumar (2016) as: "chat as an interface for commerce". Although the mentioned definitions differ in extensiveness, there is one common factor, namely convenience. Conversational commerce is about offering convenience through a conversation in natural language. Nevertheless, the definitions differ regarding the natural language interface (e.g. voice vs. chat) and the extent a chatbot is artificially intelligent or a human representative. In the continuation of this study, chat is chosen as the natural language interface as chat is the interface in messaging apps.

2.3.1 Potential

Chatbots have the potential to significantly transform the way we interact and communicate digitally, as described by Newman (2016) "the ultimate goal of chatbots is to replace the most common interfaces we use on computers and in connected devices". It provides the advantage of using natural language to communicate with companies and services through a familiar interface. As the method of communication is through conversation, the adoption of conversational commerce is expected faster than desktop apps (Messina, 2016). Future payments via chat apps will allow the chat to become a one-stop shopping channel that does not require to leave the interface to complete an order, allowing a smooth shopping experience (Shopify, 2016). The order, billing and delivery can all be handled in the messaging app (van Manen, 2016). A bot can eventually become a personal assistant capable of providing a range of services (Shebat, 2016). WeChat, a popular Asian messenger app already facilitates several services from within the app. Transferring money, ordering food, buying movie tickets and booking a flight are some of the integrated functionalities. Furthermore, search engines may become integrated in the chatbots to search, select and provide the user with the best options, based on previous choices, preferences and online reviews. For now, users choose the chatbot they want to interact with. It is not unthinkable that companies will start to use this platform for mobile (push) marketing as businesses want to be wherever their customers are. This is also described by Schlicht (2016): "logically, if you want to build a business online, you want to build where the people are. That place is now inside messenger apps".

2.3.2 Barriers

Despite the potential of chatbots, there are some barriers to be overcome as well. When dealing with innovation, consumer adoption is a barrier that must be overcome. A main reason for market failure of innovations is consumer resistance (Ram & Sheth, 1989). Furthermore, the interaction between computers and humans via natural language is a topic that is extensively researched for many years (e.g. Zadrozny, Budzikowska, Chai, Kambhatla, Levesque and Nicolov, 2000; Hill, Randolph Ford, & Farreras, 2015) and is a complex task. For now, it seems that chatbots can perform simple tasks and commands and they are much more of a tool than artificially intelligent (Hollister, 2016). Long conversations are hard to automate and if in an open domain, the conversation can go in any direction (Britz, 2016). For now, human intervention is still needed when things get complex (Gil as referred by Desaulniers, 2016).

2.3.3 Advantages

Messenger apps and chatbots are digital services and can be accessed anywhere, anytime on a mobile device. Chatbots will help customers sift through data and products on the internet and help make decisions (Moatti, 2016; van Manen, 2016). Chatbots 'live' in a familiar chat interface and builds upon existing infrastructure of mobile and social commerce (Kumar,

2016; Messina, 2016). Downloading and installing apps is no longer necessary (Messina, 2016; van Manen, 2016) and the use of chatbots allows for personalization possibilities (Messina, 2016). Furthermore, the use of chatbots can be more cost effective than human-assisted support (Mott et al., 2004).

2.3.4 Disadvantages

Besides the potential and advantages of communicating with a chatbot, there are also possible downsides to this technology development. First, there is the chance of misinterpretation when deviating from the pre-programmed script. This causes the chatbot to respond incorrectly, as experienced by users who tried the first chatbots (e.g. Perez, 2016). The latter might lead to frustration instead of appreciation regarding chatbots. Moreover, messaging apps are now mostly used for social communication purposes. Personal and commercial messaging may get intertwined and will have to exist side by side in the same interface. As companies will engage in mobile marketing through chatbots, the platform can become a threat to privacy and there is a possibility of receiving spam through the messaging app (Müller, 2016).

2.4 Chatbots

The development of chatbots enabled Human Computer Interaction (HCI) using natural language. When the use of personal machines grew, so did the desire to communicate with computers in the same way as with other people, by using natural language (Atwell and Shawar, 2007). According to Zadrozny et al. (2000), by letting users "..express their interest, wishes, or queries directly and naturally, by speaking, typing, and pointing" (p.117-118) a more sophisticated HCI can be achieved.

A chatbot is an umbrella term for similar concepts such as chatter bots, virtual agents, and conversational agents. However, the term chatbot and conversational agent are most typically used and in this research, these concepts are used indifferently in the continuation of this paper. Chatbots, or conversational agents "...exploit natural language technologies to engage users in text-based information-seeking and task-oriented dialogs for a broad range of applications" (Mott et al., 2004, p.2). Desaulniers (2016) defines chatbots as "interactive messaging powered by artificial intelligence (AI)". In addition to Desaulniers, Schlicht (2016) describes a chatbot as "a service, powered by rules and sometimes artificial intelligence, that you interact with via a chat interface". A chatbot is defined in various ways but they all describe the same phenomenon. The definitions mostly differ in mentioning to what extent a chatbot is driven by artificial intelligence. In the continuation of this research, the author or this paper defines a chatbot as: "an intelligent software program that communicates with its user in natural language via chat and can be utilized for commercial purposes".

2.4.1 Previous research on chatbots

As mentioned earlier, previous research mainly focused on website based chatbots that are accessed via a computer. From the 60's onwards, chatbots were initially used to entertain people by using simple keyword matching techniques to respond to input given by a user (Atwell and Shawar, 2007). From that time onwards, research on text and natural language interfaces has grown and a variety of architectures for chatbots were developed (Atwell and Shawar, 2007). Research by Mott et al. (2004) states chatbots can be applied in businesses to facilitate customer service, help desk, website navigation, guided selling and technical support. Their research focused on applications of web-based conversational agents and the technical challenges regarding design and deployment on a large scale. According to them, conversational agents require a strong language processing ability and in order to deploy them on a large scale, the agents need to be secure, reliable and interoperable with the existing IT infrastructure. In addition to Mott et al. (2004), Atwell and Shawar (2007) state that besides commerce, chatbots are also used for entertainment, language learning and as a tool in education, as also shown by Kerly et al. (2007) who studied how chatbots can be brought into education as a negotiation tool for students. Furthermore, conversational agents can also be used in healthcare as shown in research by Bickmore, Schulman and Sidner (2013) who presented a virtual health counselor. Several researchers (e.g. Häubl & Trifts, 2000; Xiao & Benbasat, 2007) explored recommendation agents; software to assist and recommend consumers while making their decisions in online shopping. Another well-researched topic is the shopping bot; a specific bot designed to help customers compare and shop products online (e.g. Rowley, 2000; Sadeddin, Serenko, & Hayes, 2007; Smith, 2002). Atwell and Shawar (2007) reviewed the usefulness of chatbots in multiple domains (e.g. education, e-commerce) and concluded chatbots are not supposed to replace humans completely, nor should they flawlessly imitate a conversation with a human. Instead, they believe chatbots should be designed as tools to help people and the use of natural language should ease the human-computer interaction. A recent study by Mhatre, Motani, Shah and Mali (2016) tried to describe an approach on how to implement a web-based artificially intelligent chatbot that could function as a personal assistant to schedule meetings. Nevertheless, the interaction still happened via e-mail messages. Besides the application of chatbots, there are several studies (e.g. Griol et al., 2013; Kuligowska, 2015) that propose techniques or measures to evaluate chatbots. Yet, as chatbots gradually start to expand to the messenger interface, a different research approach is required to measure the acceptance of mobile messenger chatbots.

2.5 Technology Acceptance Model and Innovation Diffusion Theory

A widely applied model for user acceptance and usage in various domains is the Technology Adoption Model (TAM). The model was first proposed by Davis in 1986 and was designed to model user acceptance of information systems (Davis, Bagozzi and Warshaw, 1989). The original TAM model (see figure 1) can provide insights on "the impact of external variables on internal beliefs, attitudes, and intentions" (Davis et al., 1989, p. 985). The model is grounded on the theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975)

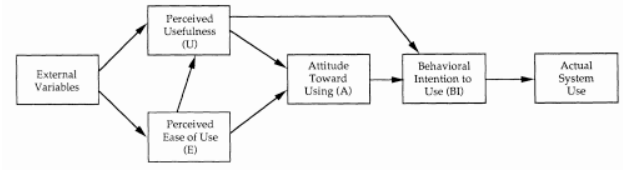


Fig. 1: Original Technology Acceptance Model (TAM) by Davis et al. (1989)

which states that a specific behavior is determined by behavioral intent (BI). BI is determined by a person's attitude (A) and Subjective Norms (SN) towards that specific behavior (Fishbein and Ajzen as reffered by Davis et al. 1989). TAM builds upon TRA to indicate whether causal relationships exist between perceived usefulness (PU), perceived ease of use (PEOU), the user's attitudes, intentions, and actual adoption behavior of computer usage (Davis et al., 1989). Davis et al. (1989) define PU as "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational

context" (p. 985) and PEOU is defined as "the degree to which the prospective user expects the target system to be free of effort" (p. 985). The model proposes that 'perceived usefulness' (PU) and 'perceived ease of use' (PEOU) are relevant determinants for acceptance behavior. The actual usage depends on the BI to perform a certain behavior. In turn, it is proposed that BI is dependent on PU and on the attitude towards using (A) of the user. The TAM model includes a direct effect of PEOU on PU and proposes PU has a direct effect on BI. The model has been verified in a longitudinal study and concludes that primarily PU and secondarily PEOU are good determinants for people's intentions to use computers. These intentions can predict the actual usage rather satisfactory (Davis et al., 1989). In addition, they state that any other factors influencing user behavior do so through BI indirectly. Furthermore, A only partially mediates between PU, PEOU and BI, less than hypothesized (Davis et al., 1989).

The TAM model has been tested, reviewed, criticized and extended extensively in literature. For example, Legris, Ingham and Collerette (2003) critically reviewed the TAM by analyzing 22 published articles in which the model was applied in the period between 1980 and 2001. Their meta-analysis concluded that overall the model was tested empirically and proved to be of quality while generating statistically reliable results. However, they criticized that the model should include additional components to explain more than 40% of system use. Legris et al. (2003) propose that the TAM model should be integrated into a broader model which also captures variables concerning human and social change processes, as well as variables related to the innovation adoption model. Moreover, their review shows mixed results for the relation between A and BI. Seven out of 22 studies found a significant and positive relation and four out of 22 found no relation (Legris et al., 2003). The remaining studies did not measure the relation.

The TAM model has been extended in numerous ways by various researchers. Davis and Venkatesh (2000) extended TAM by including social influence processes and cognitive instrumental processes and called it TAM2. Moreover, Venkatesh, Morris, Davis and Davis (2003) reviewed eight different user acceptance models including TAM and TRA and formulated a unified theory called the Unified Theory of Acceptance and Use of Technology (UTAUT).

Other researchers, Chen, Gillenson and Sherrell (2002) extended the TAM to assess consumer behavior in a virtual store setting by including the construct compatibility (C) of the Innovation Diffusion Theory (IDT). IDT is a well-established theory on the acceptance and adoption of innovations developed by Rogers (1983). He defined an innovation as: *"*...an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 11). The theory poses four elements that determine the spread of an innovation: the innovation as it is, the channel of communication, time and the social system. The rate at which an innovation is adopted depends on five characteristics of the innovation: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability (Rogers, 1983). However, research by Tornatzky and Klein (1982) suggests that only relative advantage, compatibility and complexity are related to innovation adoption. This suggestion is also adopted by Wu and Wang (2005). However, relative advantage is considered comparable to TAM's PU and complexity is comparable to TAM's PEOU.

TAM and IDT complement one another (Wu and Wang, 2005; Chen et al., 2002), however, compatibility (C) is a construct that is not tested in the original TAM, while greater compatibility does lead to a faster rate of adoption (Chen et al., 2002). Other studies also extended TAM with constructs such as trust (e.g. Ha and Stoel, 2009) innovativeness (Zarmpou et al., 2012) and compatibility (e.g. Vijayasarathy, 2004). An extension of TAM has been deployed to study m-commerce service adoption (e.g. López-Nicolás, Molina-Castillo & Bouwman, 2008) or e-shopping acceptance (e.g. Vijayasarathy, 2004; Ha and Stoel, 2008). Kaasinen (2005) developed an acceptance model for mobiles services and extended the TAM by including two components to the model: trust and perceived use of adoption. Another enrichment of the TAM is developed by Zarmpou et al. (2012) to predict the behavioral intention of the consumer to use mobile services. Similarly, Wu and Wang (2005) adopted TAM to study the acceptance of mobile commerce. Among others, the aforementioned studies found support for the relationship between PU, PEOU and BI. Most studies have not included attitude in their research models. Instead, there is direct link between the constructs PU, PEOU and BI. Due to the subject's embryotic stage and the lack of fully functional mobile messenger chatbots, attitude is perceived a valuable variable and is implemented in the research model as similarly done by Vijayasarathy (2004) in a study on the acceptance of online shopping.

A mobile messenger chatbot is a type of mobile service and has close ties to m-commerce and e-shopping. Based on the reviewed literature and similar reasoning as Vijayasarathy (2004) PEOU, PU, C and BI are considered valuable and adequate variables for the prediction of mobile messenger chatbot acceptance. Consequently, the following hypotheses are defined:

H1. There is a positive relation between perceived usefulness and the consumers' attitude towards mobile messenger chatbots

H2. There is a positive relation between perceived ease of use and the consumers' attitude towards mobile messenger chatbots.

H3. There is a positive relation between compatibility and the consumers' attitude towards mobile messenger chatbots.

2.6 Internet Privacy Concern

Multiple technology acceptance studies on e.g. mobile services (Zarmpou et al., 2012), mobile commerce (Wu and Wang, 2005;) and mobile banking (e.g. Pikkarainen, Pikkarainen, Karjaluoto and Phanile, 2004; Lee, 2009) included an element of risk in their research model (e.g. perceived risk or privacy concerns). They found support for the relationship between the risk factor and BI. As mobile messenger chatbots are related to the aforementioned services, the inclusion of a risk factor in the research model is believed valuable to predict user acceptance.

Companies deploying mobile messenger chatbots might eventually engage in mobile marketing via this new communication channel. Due to its personal nature, parties engaging in mobile marketing (e.g. advertisers, policy makers) must deal with the consumer's perception of mobile marketing communications as being irritating, intrusive and a possible threat to personal privacy (Sultan, Rohm, & Gao, 2009). Furthermore, when consumers conduct purchasing activities in an online context, they might be exposed to several threats such as spam, privacy invasion, payment fraud or quality and service shortcomings (Hassanein & Head, 2007). More specifically, Dinev and Hart (2006) found evidence that a negative relationship exists between perceived internet privacy risk and the willingness to provide personal information for internet based transactions. As mobile messenger chatbots are likely to be used for (e-commerce) transactions, it is reasonable to assume that Internet Privacy Concern (IPC) is an influential factor on the acceptance of mobile messenger chatbots. Based on the latter, the hypothesis from Dinev and Hart (2006) is modified and defined as follows:

H4. There is a negative relation between internet privacy concern and attitude towards mobile messenger chatbots.

2.7 Attitude Towards Mobile Advertisement

As mentioned earlier, today's mobile marketing can be more personal and allows companies to reach customers in ways that can be perceived as intrusive. Multiple researchers have studied the acceptance of mobile marketing (e.g. Rohm, Gao, Sultan & Pagani, 2012), attitude towards mobile marketing (e.g. Karjaluoto & Alatalo, 2007; Watson et al., 2013) and attitude towards advertising (e.g. Ling, Piew & Chai, 2010). In these studies, marketers try to understand the factors influencing consumer acceptance and try to get insights how to increase their marketing efforts' effectiveness Studying the consumer's attitude towards mobile advertisement is perceived important, especially since consumers believe their mobile phone is to be used for personal communication and would rather like to control whether or not they interact with an organization (Watson et al., 2013). Moreover, the probability of companies engaging in mobile marketing activities through future mobile messenger chatbots is existent. Hence, it is reasonable to assume that attitude towards mobile advertising (ATMA) is an influential factor in the acceptance of mobile messenger chatbots. Therefore, the following hypothesis is formed:

H5. There is a positive relation between attitude towards mobile advertising and attitude towards mobile messenger chatbots.

As mentioned, previous TAM studies have included attitude as a mediator between beliefs and behavioral intention. All previous hypotheses include variables influencing the user's attitude. In turn, attitude is expected to have a positive relation to behavioral intent, leading up to the following hypothesis:

H6. There is a positive relation between Attitude towards using mobile messenger chatbots and behavioral intent.

2.8 Model, constructs and measures

Based on the reviewed literature and previous studies, three constructs (PU, PEOU and BI) as used in the Technology Acceptance Model are used and combined with one construct (C) belonging the Innovation Diffusion Theory. Two additional external variables, Internet Privacy Concern (IPC) and Attitude Towards Mobile Advertisement (ATMA) are integrated in the research model as illustrated in figure 2. The model consists of five factors who are assumed to influence the Attitude towards messenger chatbots which in turn influences BI. The five

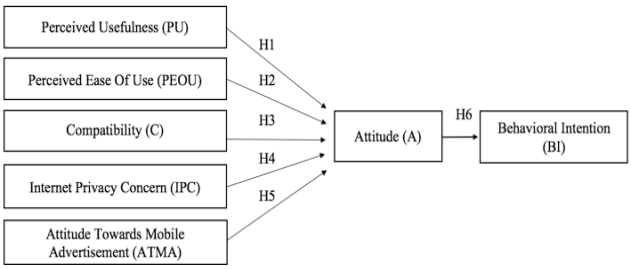


Fig. 2. Proposed research model

constructs are perceived usefulness (PU), perceived ease of use (PEOU), behavioral intent (BI), compatibility (C), Internet Privacy Concerns (IPC) and Attitude Towards Mobile Advertisement (ATMA). The original variable definitions are modified to fit the mobile context of this research (see table 1).

2.8.1 Measures

Multiple publications, frameworks and models were reviewed to determine the measures as displayed in appendix A. For PU and PEOU, measures are adapted from the previous studies using the Technology Acceptance Model (e.g. Chen, et al., 2002; Pikkarainen et al., 2004; Wu and Wang, 2005; Zarmpou et al. 2012). Four measures for behavioral intent (BI) are adopted from Zarmpou et al. (2012). The measures for compatibility are adapted from Chen et al. (2002) and for Internet Privacy Concern the measures are partially adapted from Dinev and Hart (2006). The measures for Attitude Towards Mobile Advertisement are adopted and modified from Ling et al. (2010). For attitude towards using mobile messenger chatbots the measures are adopted from Venkatesh et al. (2003) and modified to fit the mobile messenger context.

Some of the original measures for PU described to what extent an increase in productivity or efficiency is achieved. The inclusion of these two measures are believed to be less valuable in this study as they were originally specified to measure work-related performance. Therefore, the productivity and efficiency measures are replaced by one measure (PU3) as defined by Pikkarainen et al. (2004) and indicates whether using a technology gets the job done more quickly. Furthermore, an additional measure (PU5) for indicating usefulness as used by Chen et al. (2002) will be integrated to increase the number of measures for PU to a total of five.

Table 1 Variable definitions

Construct	Definition	Reference
Behavioral Intent (BI)	A person's subjective probability that he will use mobile messenger chatbots for commercial purposes (modified)	Ajzen & Fishbein (1975)
Attitude (A)	An individual's positive or negative feelings about using a messenger chatbot	Davis et al. (1989)
Perceived Usefulness (PU)	The degree to which a person believes that using a messenger chatbot would enhance his or her performance (modified)	Davis (1989)
Perceived Ease Of Use (PEOU)	The degree to which a person believes that using mobile messenger chatbots would be free of effort (modified)	Davis (1989)
Compatibility (C)	The degree to which a mobile messenger chatbot is perceived as consistent with existing values, past experiences, and needs of potential adopter (modified)	Rogers (1983)
Internet Privacy Concern (IPC)	Concerns opportunistic behavior related to the personal information submitted over mobile messenger chatbots by the respondent in particular (modified)	(Dinev & Hart, 2006)
Attitude Towards Mobile Advertisement (ATMA)	A consumer's positive or negative response towards mobile advertisement send through a messenger chatbot (modified)	Ling et al. (2010)

3. RESEARCH METHODOLOGY

A quantitative cross-sectional research approach is performed to answer the main research question. As the goal of this research is to discover the intention of using mobile messenger chatbots as the interface for commerce, an online survey will be used to gather empirical data. This section will elaborate on the procedure and research design, sample size and sample selection, measures, data collection and data analysis.

3.1 Procedure and design

An issue in researching user acceptance concerning new phenomena is the fact that participants are dealing with ignorance. The difficulty of evaluating user's needs and preparedness to use a service prior to its existence is a reason for the failure of mobile services as they are new and cannot be compared with existing ones (Martignoni, Stanoevska-Slabeva, Mueller & Hoegg, 2008). Furthermore, risks can be perceived by users when dealing with immature technology (Wu & Wang, 2005). To research the intention of using messenger chatbots, it is important the participants get acquainted with a chatbot before they can express their attitude and intention.

3.1.1 Getting to know messenger chatbots

To get acquainted with the concept of a messenger chatbot for commercial purposes, the participants are shown a demo video explaining the concept of a messenger chatbot. In the video, two existing messenger chatbots are used. One of the messenger chatbots is called 'Kayak'. Kayak is a meta-search engine and price comparison service for travel related bookings (flights, hotels etc.). Kayak is currently one of the few working shopbots on Facebook Messenger and uses Kayak's search results to look for hotels or flights. This chatbot is chosen as it includes some innovative chatbot features such as a product carousel and action buttons. The name 'Kayak' is cropped from the video to prevent bias. The second chatbot is called Shopbot and can be used to search for products based on the offerings of Amazon. To further clarify the possibilities of future chatbots, more examples of chatbot applications are briefly explained in the questionnaire (e.g. booking hotels, order a taxi/pizza, shopping for products/clothing, asking questions to companies).

3.1.2 Data collection

Data is collected by means of a self-administered online questionnaire designed with Qualtrics. The self-administered questionnaire consists of two parts. The first part is designed to acquire demographic information and gain insights on gender, age, level of education, mobile phone usage, use of messaging apps and mobile phone shopping experience. The demo video is shown afterwards. The second part of the questionnaire consists of statements regarding the constructs PU, PEOU, C, IPC, ATMA, A and finally BI. Although the messenger chatbots in the demo are English versions, the questions and statements in the questionnaire are translated and presented in Dutch, as it is the participants' native language. A five-point scale based on the Likert-scale is used to determine the extent to which a participant strongly disagrees (-2); disagrees to a certain extent (-1); nor agrees nor disagrees (neutral) (0); agrees to a certain extent (1) or strongly agrees (2) with a given statement. The quantitative data collected with the survey is analyzed with SPSS (v.22.0). The first part of the questionnaire is analyzed by means of descriptive statistics. The second part of the questionnaire is analyzed for reliability (Cronbach's alpha) and validity by means of a confirmatory factor analysis. Next, the research model is tested by means of simple regression to find the strength and direction of the relationship between the constructs. Furthermore, IBM's Watson Analytics is used to analyze and cross-validate the results acquired with SPSS. IBM Watson is a cognitive (cloud) computing technology designed for automated data analysis, visualization and predictive analytics (IBM, 2016).

3.1.3 Sampling

This study focusses on Millennial respondents aged between 18 and 36, also known as generation Y which includes people born between starting from the early 80's till the mid 90's (Dwyer and Azevedo, 2016). Snowball sampling is used to contact participants to partake in the online questionnaire. The current author tapped into its own network and used social media to reach potential participants. To stimulate participants in partaking in the online survey, a gift card of one of the biggest Dutch online web shops is awarded to one of the participants.

4. DATA ANALYSIS AND RESULTS

4.1 Descriptive statistics

In total, 239 respondents started the online survey of which 44 responses are excluded due to incomplete information or age exceedance. Respondents older than 36 are filtered out to prevent age disturbance. Among the 195 remaining respondents, 93 respondents were male (47.7%) and 102 were female respondents (52.3%). The average age of the respondent is 26 years (SD = 3.3 years), the youngest participants was 19 and the oldest participants was 36 years old. Around four out of ten respondents are aged between 25 and 27 years old (41%) and most respondents (84.6%) were higher educated and studied higher vocational education (HBO) or above. More detailed information on the respondents can be found in table 2. Out of all respondents, over one-third (37.9%) stated to spend between 2-3 hours on average per day using their mobile phone while 32.8% indicated to use their phone even more than 2-3 hours per day. Most respondents use their messaging apps between 20 to 30 times a day (29.7%) whilst one quarter of the respondents uses a messaging app more than 40 times a day (25.1%). Detailed information on mobile phone usage can be found in table 3. In addition, all subjects were asked to rank six mobile phone activities from most to least used. The six activities and their rankings are displayed in table 4.

Table 2 Demographic characteristics of the respondents

	Frequency	Percent (%)	Cumulative
Gender			
Male	93	47.7	47.7
Female	102	52.3	100
Age			
24 or below	61	31.3	31.3
25 - 27	80	41.0	72.3
28 - 36	54	27.7	100.0
Level of Education*			
MAVO	1	.5	0.5
HAVO	3	1.5	2.1
VWO	8	4.1	6.2
MBO	18	9.2	15.4
HBO	81	41.5	56.9
WO Bachelor	24	12.3	69.2
WO Master	60	30.8	100.0
PhD	0.0	0.0	100.0

* English translations can be found in appendix B

Table 3 Mobile phone usage

	Frequency	Percent (%)	Cumulative
Time spend per day on mobile phone on average			
0 – 1 hour	6	3.1	3.1
1 – 2 hours	51	26.2	29.2
2 – 3 hours	74	37.9	67.2
3 – 4 hours	31	15.9	83.1
> 4 hours	33	16.9	100.0
Use of messaging app per day			
0 - 10	9	4.6	4.6
10 - 20	44	22.6	27.2
20 - 30	58	29.7	56.9
30 – 40	35	17.9	74.9
> 40	49	25.1	100.0

A score close to 1.00 means the participants placed that activity on the highest position most often. Consequently, the activity with the lowest mean score is ranked on first position while the activity with the highest mean score is ranked on the lowest position. The most popular activity performed on a mobile phone is sending chat messages via a messenger app and is ranked on position 1 by almost two-third of the respondents (62,56%). The second most popular activity is checking social media. Browsing the internet is ranked on third position and the least popular activity on a mobile phone is online shopping and is ranked on position 6 by 61% of the respondents.

Table 4 Mobile phone activities ranked by popularity

Activity	Mean score	SD	Rank
Messaging via app	1.50	0.78	1
Social media	2.36	1.27	2
Browsing the web	3.56	1.26	3
Calling	3.81	1.46	4
Making photos	4.36	1.00	5
Online shopping	5.41	0.88	6

The survey also recorded online shopping behavior of the respondents (see table 5). Slightly more than two-third (69.2%) of the respondents indicated that, on average, they buy 1-2 items online on a monthly basis. The majority (80.5%) indicated to have experience in online shopping using their mobile phone. A quarter of the respondents (25.1%) stated to have bought one or two items using their mobile phone in the last 12 months, whilst more than half (55.4%) bought two or more items in the last 12 months. About one-tenth (10.8%) of the respondents declared to have bought even more than 10 items on their mobile phones in the last 12 months.

The most popular device for online shopping is a computer or laptop as indicated by more than two third of the respondents (72.8%). Online shopping on a mobile phone is done by roughly one fifth on the respondents (19.0%) and a tablet is used the least (8.2%). Although messenger apps are widely used by the respondents, over two third (69.7%) of the respondents has never contacted a company using a messenger app.

After watching the demo video of the messenger chatbot, the respondents were asked if they were familiar with a messenger chatbot and were requested to give their first impression. Findings regarding these questions are displayed in table 6. About half of the respondents has heard of a messenger chatbot before (46.7%), whilst the other half did not (53.3%). Overall, over half of the respondents (57.5%) stated to have a positive first impression of messenger chatbot. About one-third (33.8%) was neutral and only 8.7% was negative about a messenger chatbot.

Table 5 Online shopping behavior

	Frequency	Percent (%)	Cumulative
Products bought online on average per month			
1 - 2	135	69.2	69.2
3 - 4	34	17.4	86.7
5 – 6	10	5.1	91.8
7 – 8	2	1.0	92.8
None	14	7.2	100.0
Experience in online shopping using mobile phone			
Yes	157	80.5	80.5
No	38	19.5	100.0
Online shopping using mobile phone in last 12 months			
None	38	19.5	19.5
1 - 2	49	25.1	44.6
3 - 4	40	20.5	65.1
5 – 6	24	12.3	77.4
7 – 8	18	9.2	86.7
9 – 10	5	2.6	89.2
> 10	21	10.8	100.0
Device used for online shopping			
Computer or Laptop	142	72.8	72.8
Mobile Phone	37	19.0	91.8
Tablet	16	8.2	100.0
Ever contacted company via messenger app			
Yes	59	30.3	30.3
No	136	69.7	100.0

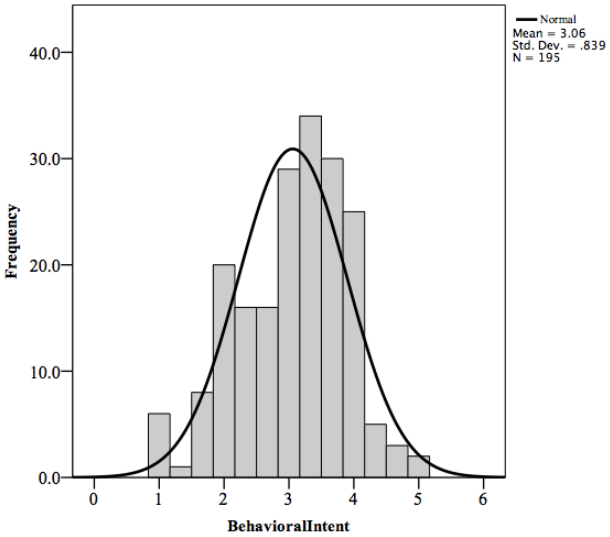
Table 6 Chatbot experience

	Frequency	Percent (%)	Cumulative
Ever heard of messenger chatbot			
Yes	91	46.7	46.7
No	104	53.3	100.0
First impression of messenger chatbot			
Very negative	2	1.0	1.0
Negative	15	7.7	8.7
Neutral	66	33.8	42.6
Positive	98	50.3	92.8
Very Positive	14	7.2	100.0

4.2 Behavioral Intent

The dependent variable in the research model is BI. Graph 1 shows the results of the BI score. The mean score is 3.06 (N=195, M=3.06, SD=.839) and the data is normally distributed whilst slightly left skewed. The spread and distribution in the scores shows that there is no clear single-mindedness in the respondent's intention of using messenger chatbots. ANOVA

Graph 1: Distribution of Behavioral Intent score

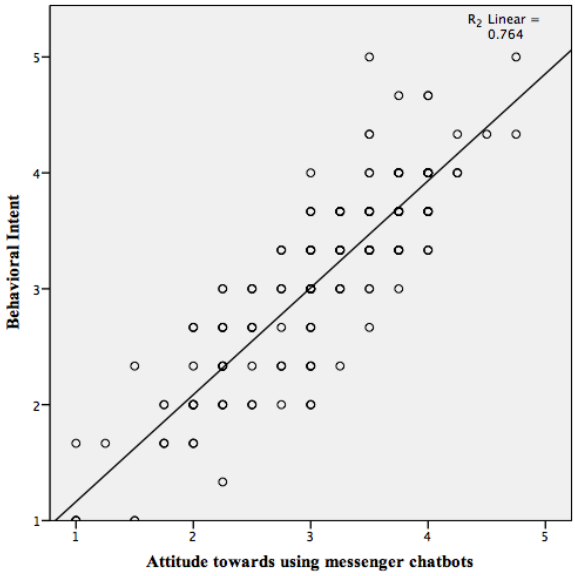


analysis and independent T-tests are performed to test whether there is a difference in BI based on gender, level of education and age. Initially, there is no difference between males and females in BI (t=0.74, df=193, p=.94) and neither between lower and higher education (t=1.445, df=193, p=.15) in which lower education is considered all education up to and including higher vocational education (HBO) and higher education is considered university education bachelor and above. When looking at the three age categories '24 and below', '25-27' and '28-36', the age group of 25-27 years has a slightly higher mean than the other two age groups. However, there is no significant difference in BI between the groups (F=1.133, df=2, p=.324). This is expected as the groups all belong to the same Millennial generation. Furthermore, an additional test was performed to determine whether prior knowledge about the existence of a messenger chatbot causes differences in BI. The mean score for BI is slightly higher for respondents who already knew about a messenger chatbot but this difference is not significant (t=.722, df=193, p=.471). Mobile shopping behavior is neither of influence on BI. Respondents who were small shoppers and bought 1-2 items or less on their mobile phones in the last 12 did not have a lower mean score than respondents who bought 3-4 items or more in the last 12 months (t=-.378, df=193, p=0.706).

4.3 Attitude

There is a strong correlation between A and BI as presented in graph 2, and the mean score for A is equal to that of BI (N=195, M=3.06, SD=0.794). The latter indicates A and BI practically measure the same phenomenon. The scores for A show a normal distribution meaning that most participants have a neutral attitude towards messenger chatbots. To make the results more meaningful, the mean scores are categorized (see table 7). Scores lower than 1.5 are considered as a strongly negative attitude and scores between 1.5 and 2.5 as a negative attitude. Scores between 2.5 and 3.5 are considered neutral and scores between 3.5 and 4.5 as a positive attitude. Lastly, scores higher 4.5 is considered as strongly positive. Of all respondents,

Graph 2: Correlation between A and BI



a little less than half of the respondents has a neutral score (44.1%). The group of people with a negative attitude (28.2%) is close to equal to the people with a positive attitude towards messenger chatbots (27.7%). Moreover, the same statistical tests were performed for A as for BI. Correspondingly, no significant differences were detected in A's score based on age, gender, level of education, prior knowledge on chatbots and online shopping behavior.

Table 7 Attitude towards using messenger chatbots

	Frequency	Percent (%)	Cumulative
Strongly negative	9	4.6	4.6
Negative	46	23.6	28.2
Neutral	86	44.1	72.3
Positive	52	26.7	99.0
Strongly positive	2	1.0	100.0

4.4 Measurement model

In this section, the measurement model is analyzed and results will be discussed. First, all items were analyzed using confirmatory factor analysis and checked for item reliability. The research model consists of five independent variables, two dependent variables and 27 items. A confirmatory principal component factor analysis using varimax rotation showed a Kaiser-Meyer-Olkin value of 0.821 which indicates the data is suitable for factor analysis. In the first round of the factor analysis (see table 8), PEOU2 shows strong loadings on two other factors and have a factor loading lower than 0.30 on PEOU. To further examine if the item was to be deleted, a scale reliability analysis is performed. The reliability analysis indicated that if PEOU2 were to be deleted, the Cronbach's alpha value would increase from 0.672 to 0.710. Furthermore, PEOU2 is believed to be less related to the actual ease of use but more related to functionality compared to the other three items of PEOU. Based on the latter and both the factor and reliability analysis, PEUO2 is excluded from the analysis. Table 9 displays the mean scores for each variable including the Cronbach's alpha for scale reliability. All remaining variables score a Cronbach's alpha value higher than 0.8 indicating good item reliability.

Table 8 Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
PU1		.740			
PU2		.427	.362		
PU3		.794			
PU4		.741	.417		
PU5		.699	.364		
PEOU1					.703
PEOU2		.403	.489		
PEOU3					.828
PEOU4					.793
C1			.811		
C2			.818		
C3		.350	.781		
ATMA1	.825				
ATMA2	.812				
ATMA3	.776				
ATMA4	.876				
ATMA5	.835				
IPC1				.882	
IPC2				.932	
IPC3				.935	

a. Rotation converged in 6 iterations.

Table 9 Means and reliability of research variables

Variables	Number of items	Mean	S.D.	Alpha
Behavioral Intent (BI)	3	3.06	0.839	0.873
Attitude towards using messenger Chatbots (A)	4	3.06	0.794	0.870
Perceived Usefulness (PU)	5	3.33	0.704	0.821
Perceived Ease of Use (PEOU)	3	3.92	0.548	0.710
Compatibility (C)	3	2.82	0.932	0.862
Internet Privacy Concern (IPC)	3	3.39	0.956	0.920
Attitude Towards Mobile Advertisement (ATMA)	5	1.99	0.755	0.890

Table 10 Hypothesis testing: unstandardized coefficients

Hypothesis	Path	B	t-value	p
H1	PU → A	.769	12.941	<0.01
H2	PEOU → A	.466	4.720	<0.01
H3	C → A	.655	16.665	<0.01
H4	IPC → A	-.155	-2.639	<0.01
H5	ATMA → A	.228	3.087	<0.01
H6	A → BI	.923	24.973	<0.01

To check whether the hypotheses are supported, simple regression analysis are performed. All hypotheses (H1, H2, H3, H4, H5, H6) are supported as observable in table 10. Furthermore, a bi-variate analysis is performed. Based on initial results the variable Perceived Usefulness (PU) and compatibility (C) seem responsible for a large part of the variance in attitude. This is checked by means of a multiple regression analysis using the stepwise method. Regression results (table 11) indicate that PU and C already explain 64.9% of the variance in attitude. IPC is added as third significant variable and brings the total variance explained to 66.1%. The other variables PEOU and ATMA do not contribute in explaining the variance in A while the variables PU, C and IPC are included in the model. Therefore, PU, C and IPC are significant predictors of A (see figure 3).

As proposed in the model, A is a predictor for BI. Regression results, as illustrated in figure 3, indicate that A has a significant positive effect on BI (B=.923, p<0.01) and explains for 76.4% of the variance in BI. The latter indicates that both variables practically measure the same phenomenon, the intention to use a messenger chatbot.

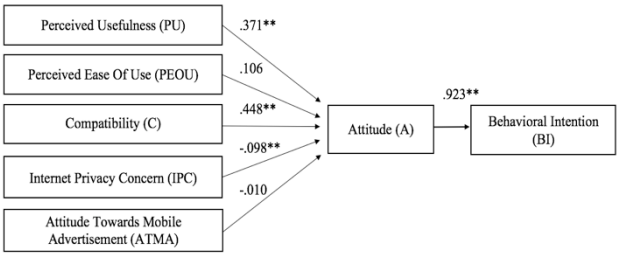


Figure 3 *Multiple regression results for the research model (** p<0.01)*

Table 11 Regression results

Model	R	R^2	Adjusted R^2	Std. error of the estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.768[a]	.590	.588	.510	.590	277.731	1	193	.000
2	.808[b]	.653	.649	.470	.063	34.897	1	192	.000
3	.816[c]	.666	.661	.462	.013	7.609	1	191	.006

Model	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	1.210	.117		10.381	.000
	Compatibility	.655	.039	.768	16.665	.000
2	(Constant)	.487	.163		2.990	.003
	Compatibility	.479	.047	.562	10.213	.000
	Perceived Usefulness	.366	.062	.325	5.907	.000
3	(Constant)	.821	.201		4.089	.000
	Compatibility	.459	.047	.539	9.843	.000
	Perceived Usefulness	.382	.061	.339	6.234	.000
	Internet Privacy Concern	-.097	.035	-.117	-2.758	.006

4.5 Watson Analytics cross-validation

SPSS results are cross-validated using IBM Watson Analytics (see table 12). As mentioned, Watson Analytics allows businesses to make predictive analysis based on available data. Besides that, a study by Chen, Elenee Argentinis and Weber (2016) demonstrated IBM Watson's usefulness in speeding insights and accelerating life sciences discoveries. In this study, Watson's predictive capability is compared to that of SPSS's. First, the constructs influencing A are uploaded and the survey data scores 87 out of 100 points for quality. This is considered as excellent data quality by Watson Analyics. Next, a predictive analysis is executed for A. With C selected as predictor, a significant strong main effect is found for C on A with a predictive strength of 58%. A similar linear regression analysis in SPSS finds an adjusted R^2 value of 58.8%. When PU is chosen as predictor, Watson Analytics identifies a significant strong main effect of PU on A with a predictive strength of 45%. Similarly, a regression analysis in SPSS is executed for PU which identifies an adjusted R^2 of 46.2% which is close the Watson value of 45%. This indicates Watson Analytics does a similar job in executing predictions as SPSS. When all constructs are included, the highest predictive strength found by Watson is generated by C and PU with a predictive strength of 67%. There is no significant interaction effect. In SPSS, an adjusted R^2 value of 64.9% is identified. There is a small discrepancy between both values. Lastly, the relation between A and BI is predicted using Watson Analytics. Watson found a significant strong main effect for A on BI with a predictive strength of 70%. In SPSS, an adjusted R^2 value of 76.2% is found. It appears that for relationships between two variables, SPSS finds slightly higher values than Watson. When multiple variables are used to predict, Watson appears to find a slightly higher value. In conclusion, Watson Analytics does a rather good job in predicting similar values as SPSS, although there are some minor discrepancies.

Table 12 Watson Analytics results vs. SPSS results

Prediction	Watson predictive strength	SPSS adjusted R^2
C → A	58%	58.8%
PU → A	45%	46.2%
C and PU → A	67%	64.9%
A → BI	70%	76.2%

5. CONCLUSION AND RECOMMENDATIONS

The present study explores the concept of conversational commerce and studies how Perceived Usefulness, Perceived Ease Of Use, Compatibility, Internet Privacy Concern, Attitude Towards Mobile Advertisement, Attitude towards messenger chatbots and Behavioral Intent are correlated and capable of predicting the consumer's attitude, which in turn predicts behavioral intention to use mobile messenger chatbots. Descriptive statistics demonstrate that the Millennial respondents mostly still use their laptop or computer for online shopping. However, most respondents do have experience in using their mobile phone for shopping at least once. Moreover, they mostly do not contact an organization by means of a messenger app. In addition, about half of the respondents was already acquainted with the concept of a messenger chatbot. After watching the demo video on messenger chatbots, a little more than half of all respondents rated their encounter with a messenger chatbot as positive.

The research question central in this study was defined as follows: 'To what extent will Dutch Millennials adopt mobile messenger chatbots as the next interface for mobile commerce?'. In short, there is no decisive answer to the research question. The scores on attitude and behavioral intent show a normal distribution. The mean score for both attitude and behavioral intent is 3.06 on a scale of 1 to 5 which is just slightly above the mean of 3, a neutral score. The latter indicates there is no single-mindedness in attitude and intention. There is no decisive indication in the data that Millennials will intent to use mobile messenger chatbots and adopt messenger chatbots as the next interface for mobile commerce. A possible explanation for these neutral results might be caused by the currently low popularity of online shopping on a mobile phone. The attitudes and intentions regarding mobile messenger chatbots might differ if these chatbots would be deployed for other purposes, e.g. customer service. Nevertheless, the score distributions are slightly left skewed suggesting a small positive attitude towards messenger chatbots. As the development of messenger chatbots is still in its embryotic phase, future research may conclude differently.

Theoretical consequences and practical implications of this study are described in the next section. Results might have implications for messenger chatbot developers, advertising companies, organizations implementing messenger chatbots and researchers interested in the extension of TAM and/or the acceptance of mobile messenger chatbots.

5.1 Theoretical consequences

Looking at all hypothesis individually, all hypotheses are supported. Nevertheless, the proposed research model is partially supported. Results of the present study indicate PU, C and IPC are significant predictors to measure the attitude towards mobile messenger chatbots. Compatibility, the extent to which mobile messenger chatbot is perceived compatible with the consumers believes, needs and online shopping behavior is the strongest predictor for A and explains 58.8% of the variance in A. Consequently, consumers who are open to alternative methods of communication, gathering information or online shopping are more likely to adopt mobile messenger chatbots. This result is in line with research by Wu and Wang (2005) who concluded that C is the most important predictor for BI in their TAM-based study on the drivers for mobile commerce.

PU is also an adequate predictor for A, and combined with C, both variables explain 64.9% of the variance in A. Moreover, if the construct IPC is included, the research model explains 66.1% of the variance in A. Accordingly, if the behavioral intention of using messenger chatbots is to be measured, the three dimensions PU, C and IPC are sufficient to make a prediction as there is a strong correlation between A and BI. PEUO has no significant effect on attitude, a similar conclusion is also recognized by Vijayasarathy (2004) in a TAM-study on online shopping.

5.2 Practical recommendations

Results of this study may provide insights and understanding for chatbot developers, researchers and organizations on the consumer's attitude towards, and intention to use messenger chatbots. Although not significant in the research model, the Millennials attitude towards mobile advertisement is believed an important factor to be considered when implementing or exploiting messenger chatbots. Especially when messenger chatbots are to be deployed for push-based marketing purposes. With the lowest average mean score of 2 on a scale of 1 to 5, the attitude towards mobile advertisement can be considered negative. As theory suggest, advertisement through a personal device such as a mobile phone can be found intrusive. The attitude of Millennials towards advertising is also examined by

Syrett and Lamminman (2004). They state the Millennials are cynical, more aware of manipulation through advertisement and less tolerant to deceit and hypocrisy. This may also explain the overall negative attitude towards mobile advertisement as presented in this study.

Another important factor to consider is internet privacy concern. With a mean score of 3.39 this factor has the second highest score. The latter indicates that the Millennial is concerned about what happens with the information they send via messenger chatbots. Organizations who consider implementing messenger chatbots should consider means to reassure their customers' privacy concerns. More prominently, for messenger chatbots to succeed, using and interacting with a messenger chatbot should fit the consumer's lifestyle. Developers should closely examine their audience to create a chatbot that is highly compatible with the way their audience likes to shop and look for information.

5.3 Limitations and future research

Despite some meaningful results, this study knows some limitations which should be considered when interpreting results and conclusions. This study made an effort to explore the concept of conversational commerce, messenger chatbots and its consumers' acceptance. Due to its explorative nature, the research model only consists of five constructs of which three significant constructs explain 66.1% of the variance. Extending the research model with additional constructs on privacy, trust or enjoyment might provide a more comprehensive research model. Moreover, the translation of the constructs to the Dutch language may cause a minor deviation in the results as compared to the original constructs. Furthermore, this research is subject to sample bias as respondents are mostly higher educated Millennials contacted by means of snowball sampling. The latter, combined with a relatively small sample size, has limitations with regards to external validity as results cannot be generalized to different generations or a population. Other audiences and measurement tools could be used in the future to obtain a deeper understanding regarding the concept of messenger chatbots and conversational commerce.

When testing user acceptance in an early stage of the development process, it is a challenge to realistically express what the proposed system will look like (Davis et al., 1989, p. 1000). As conversational commerce and the development of messenger chatbots are still in its embryotic phase, there a currently few fully functional and established messenger chatbots available which offer a full one-stop shopping experience. The demo video explaining the concept of a messenger chatbots just shows several basic functionalities of an existing messenger chatbot. The latter may cause different evaluations than a real-life experience with a messenger chatbot. An experiment using fully functional messenger chatbots might provide additional and more accurate results.

5.4 Acknowledgments

First of all, I sincerely want to thank my first supervisor, Dr. Efthymios Constantinides. His academic interest and knowledge on (digital) marketing and innovations got me acquainted with the subject of this research. His expertise and feedback were of great value during the completion of this research. Secondly, I would like to express my gratitude to second supervisor Dr. Harry van der Kaap who was of great value for his feedback and skills in research methodology and statistics.

APPENDIX B
Levels of education translated from Dutch to English

Education	Translation
MAVO	Lower general secondary education
HAVO	Higher general secondary education
VWO	Pre-University Education
MBO	Intermediate Vocational Education
HBO	Higher Vocational Education
WO Bachelor	University education Bachelor
WO Master	University education Master
PhD	PhD

APPENDIX A Variables and measures

Variable	Measure	
Behavior Intent (BI)	I intent to use mobile messenger chatbots in the near future	(BI1)
	I believe my interest in messenger chatbots will increase in the future	(BI2)
	I recommend others to use mobile messenger chatbots	(BI3)
Attitude towards using mobile messenger chatbots (A)	Using messenger chatbots seems a good idea.	(A1)
	Messenger chatbots makes online shopping more interesting	(A2)
	Using a messenger chatbot seems fun.	(A3)
	I would like online shopping with messenger chatbots.	(A4)
Perceived usefulness (PU)	I think using messenger chatbots would make it easier for me to shop for products	(PU1)
	I think using messenger chatbots would make it easier for me to follow up on my orders	(PU2)
	I think using mobile messenger chatbots enables me to shop for products online more quickly	(PU3)
	I think using mobile messenger chatbots enables me to shop for products online more effectively.	(PU4)
	I find mobile messenger chatbots very useful in shopping for product	(PU5)
Perceived Ease of Use (PEOU)	I think learning to use a mobile messenger chatbot is easy	(PEOU1)
	I think finding what I want via a mobile messenger chatbot is easy*	(PEOU2)
	I think becoming skillful at using a mobile messenger chatbot is easy	(PEOU3)
	I think using a mobile messenger chatbot is easy	(PEOU4)

*item excluded from analysis after confirmatory factor analysis

APPENDIX A Variables and measures (continued)

Compatibility (C)	Using a messenger chatbot is compatible with most aspects of my online shopping	(C1)
	Using a messenger chatbot fits my lifestyle	(C2)
	Using a messenger chatbot fits the way I like to shop or seek for product information online	(C3)
Internet Privacy Concern (IPC)	I am concerned that the information I submit via messenger chatbots could be misused.	(IPC1)
	I am concerned about submitting information via messenger chatbots, because of what others might do with it.	(IPC2)
	I am concerned about submitting information via messenger chatbots, because it could be used in a way I did not foresee	(IPC3)
Attitude Towards Mobile advertisement (ATMA)	I consider mobile advertising is useful as it promotes the latest products	(ATMA1)
	Through mobile advertising I got to know more innovative ideas	(ATMA2)
	I refer to mobile advertising because it allows me to enjoy the best deal out of the competing products advertised	(ATMA3)
	I support mobile advertising because it plays an important part in my buying decision	(ATMA4)
	My general opinion of mobile advertising is positive	(ATMA5

6. REFERENCES

Atwell, E., & Shawar, B.A.. (2007). Chatbots: Are they Really Useful?. *LDV Forum, 22*, 29-49.

Amir, A. (2016, June 7). The rise of chatbots: Why brands are embracing conversation - Marketing Tech News. Retrieved from http://www.marketingtechnews.net/news/2016/jun/07/rise-and-rise-chatbots-why-brands-are-embracing-conversation/fb

Balasubraman, S., Peterson, R. A., & Jarvenpaa, S. L. (2002). Exploring the Implications of M- Commerce for Markets and Marketing. *Journal of the Academy of Marketing Science*, *30*(4), 348-361. doi:10.1177/009207002236910

Barnes, S. J. (2002). The mobile commerce value chain: analysis and future developments. *International Journal of Information Management*, *22*(2), 91- 108. doi:10.1016/s0268-4012(01)00047-0

Barnes, S. J., & Scornavacca, E. (2004). Mobile marketing: the role of permission and acceptance. *International Journal of Mobile Communications*, *2*(2), 128. doi:10.1504/ijmc.2004.004663

Bauer, Hans H. and Barnes, Stuart J. and Reichardt, Tina and Neumann, Marcus M. (2005) *Driving consumer acceptance of mobile marketing: a theoretical framework and empirical study*. Journal of Electronic Commerce Research, . ISSN 1938-9027.

Bickmore, T. W., Schulman, D., & Sidner, C. (2013). Automated interventions for multiple health behaviors using conversational agents. *Patient Education and counseling*, *92*(2), 142-148. doi:10.1016/j.pec2013. 05.011

Britz, D. (2016, April 6). Deep Learning for Chatbots, Part 1 – Introduction – WildML. Retrieved from http://www.wildml.com/2016/04/deep-learning-for-chatbots- part-1- introduction/

Chen, L., Gillenson, M. L., & Sherrell, D. L. (2002). Enticing online consumers: an extended technology acceptance perspective. *Information & Management*, *39*(8), 705-719. doi:10.1016/s0378-7206(01)00127-6

Chen, Y., Elenee Argentinis, J., & Weber, G. (2016). IBM Watson: How Cognitive Computing Can Be Applied to Big Data Challenges in Life Sciences Research. *Clinical Therapeutics*, *38*(4), 688-701. doi:10.1016/j.clinthera.2015.12.001

Constine, J. (2016, April 12). Facebook launches Messenger platform with chatbots | TechCrunch. Retrieved from https://techcrunch.com/2016/04/12/agents-on- messenger/

Davis Jr, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation, Massachusetts Institute of Technology).

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, *35*(8), 982-1003. doi:10.1287/mnsc.35.8.982

Desaulniers, S. (2016, April 10). Chatbots rise, and the future may be 're-written'. Retrieved from http://www.cnbc.com/2016/04/08/chatbots-rise-and-the-future- may-be-re-written.html

Dinev, T., & Hart, P. (2006). An Extended Privacy Calculus Model for E-Commerce Transactions. *Information Systems Research*, *17*(1), 61-80. doi:10.1287/isre.1060.0080

Dwyer, R. J., & Azevedo, A. (2016). Preparing leaders for the multi-generational workforce. *Journal of Enterprising Communities: People and Places in the Global Economy*, *10*(3), 281-305. doi:10.1108/jec-08-2013-0025

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: an introduction to theory and research*. Reading:Addison-Wesley.

Griol, D., Carbó, J., & Molina, J. M. (2013). AN AUTOMATIC DIALOG SIMULATION TECHNIQUE TO DEVELOP AND EVALUATE INTERACTIVE CONVERSATIONAL AGENTS. *Applied Artificial Intelligence*, *27*(9), 759-780. doi:10.1080/ 08839514.2013.835230

Hassanein, K., & Head, M. (2007). Manipulating perceived social presence through the web interface and its impact on attitude towards online shopping. *International Journal of Human-Computer Studies*, *65*(8), 689-708. doi:10.1016/j.ijhcs.2006.11.018

Hill, J., Randolph Ford, W., & Farreras, I. G. (2015). Real conversations with artificial intelligence: A comparison between human–human online conversations and human–chatbot conversations. *Computers in Human Behavior*, *49*, 245-250. doi:10.1016/j.chb.2015.02.026

Hollister, S. (2016, April 15). Why does Facebook want me to chat with dumb robots? CNET. Retrieved from http://www.cnet.com/news/chatbots-facebook-bots- are-super-stupid-right-now/

Häubl, G., & Trifts, V. (2000). Consumer Decision Making in Online Shopping Environments: The Effects of Interactive Decision Aids. *Marketing Science*, *19*(1), 4-21. doi:10.1287/mksc.19.1.4.15178

IBM (2016). IBM Watson Analytics. Retrieved from

https://www.ibm.com/hk-en/marketplace/watson-analytics/resources#product-header-top

Kaasinen, E. (2005). User acceptance of mobile services: Value, ease of use, trust and ease of adoption.

Karjaluoto, H., & Alatalo, T. (2007). Consumers' attitudes towards and intention to participate in mobile marketing. *International Journal of Services Technology and Management*, *8*(2/3), 155. doi:10.1504/ijstm.2007.012866

Kerly, A., Hall, P., & Bull, S. (2007). Bringing Chatbots into education: Towards Natural Language Negotiation of Open Learner Models. *Applications and Innovations in Intelligent Systems XIV*, 179-192. doi:10.1007/978-1-84628-666-7_14

Kuligowska, K. (2015). Commercial Chatbot: Performance Evaluation, Usability Metrics and Quality Standards of Embodied Conversational Agents. *PCBR*, *2*(02), 1-16. doi:10.18483/pcbr.22

Kumar, B. (2016, March 28). How Conversational Commerce Is Forever Changing the Way We Shop. Retrieved from https://www.shopify.com/blog/113660229-how-conversational-commerce-is-forever-changing-the-way-we-shop

Lee, M. (2009). Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications*, *8*(3), 130-141. doi:10.1016/j.elerap. 2008.11.006

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, *40*(3), 191-204. doi:10.1016/s0378-7206(01)00143-4

Ling, K. C., Piew, T. H., & Chai, L. T. (2010). The determinants of consumers' attitude towards advertising. *Canadian social science*, *6*(4), 114-126.

López-Nicolás, C., Molina-Castillo, F. J., & Bouwman, H. (2008). An assessment of advanced mobile services acceptance: Contributions from TAM and diffusion theory models. *Information & Management*, *45*(6), 359-364. doi:10.1016/j.im.2008.05.001

Martignoni, R., Stanoevska-Slabeva, K., Mueller, D., & Hoegg, R. (2008). Evaluation of future mobile services based on the technology acceptance model. *Research Platform Alexandria*, 1-13.

Messina, C. (2016, January 19). 2016 will be the year of conversational commerce — Chris Messina — Medium [Web log post]. Retrieved from https://medium.com/chris- messina/2016-will-be-the-year-of-conversational- commerce-1586e85e3991#.bsdskkyji

Mhatre, N., Motani, K., Shah, M., & Mali, S. (2016). Donna Interactive Chat-bot acting as a Personal Assistant. *International Journal of Computer Applications*, *140*(10), 6-11. doi:10.5120/ijca2016909460

Moatti, S. C. (2016, November 4). Expect more chatbots as businesses generate more data | VentureBeat | Bots | by SC Moatti. Retrieved from http://venturebeat.com/2016/ 11/04/expect-more-chatbots-as-businesses-generate-more-data/

Mott, B., Lester, J., & Branting, K. (2004). Conversational Agents. *The Practical Handbook of Internet Computing*. doi:10.1201/9780203507223.ch10

Müller, A. (2016, April 23). Be careful what you tell a chatbot -- it could come back to bite you | VentureBeat | Mobile | by Aike Müller, Keezel. Retrieved from http://venturebeat.com/2016/04/23/be-careful-what-you-tell-a-chatbot-it-could- come-back-to-bite-you/

Newman, D. (2016, May 24). Forbes. Retrieved June 13, 2016, fromhttp://www.forbes.com/sites/danielnewman/2016/05/24/ chatbots-and-the- future-of-conversation-based-interfaces/#6c40cc51220d

Ngai, E., & Gunasekaran, A. (2007). A review for mobile commerce research and applications. *Decision Support Systems*, *43*(1), 3-15. doi:10.1016/j.dss.2005.05.003

Pavlou, P. A., Lie, T., & Dimoka, A. (2007). What Drives Mobile Commerce? An Antecedent Model of Mobile Commerce Adoption. *SSRN Electronic Journal*. doi:10.2139/ssrn.2380712

Perez, S. (2016, April 13). Facebook's new chatbots still need work | TechCrunch. Retrieved from https://techcrunch.com/2016/04/13/facebooks-new-chatbots-still-need-work/

Persaud, A., & Azhar, I. (2012). Innovative mobile marketing via smartphones. *Marketing Intelligence & Planning*, *30*(4), 418-443. doi:10.1108/02634501211231883

Ram, S., & Sheth, J. N. (1989). Consumer Resistance to Innovations: The Marketing Problem and its solutions. *Journal of Consumer Marketing*, *6*(2), 5-14. doi:10.1108/eum0000000002542

Rohm, A. J., Gao, T., Sultan, F., & Pagani, M. (2012). Brand in he hand: A cross-market investigation of consumer acceptance of mobile marketing. *Business Horizons*, *55*(5), 485-493. doi:10.1016/j.bushor.2012.05.004

Rogers, E. M. (1983). *Diffusion of innovations*. New York: Free Press.

Rowley, J. (2000). Product searching with shopping bots. *Internet Research*, *10*(3), 203-214. doi:10.1108/ 10662240010331957

Sadeddin, K. W., Serenko, A., & Hayes, J. (2007). Online shopping bots for electronic commerce: the comparison of functionality and performance. *IJEB*, *5*(6), 576. doi:10.1504/ijeb.2007.016472

Scharl, A., Dickinger, A., & Murphy, J. (2005). Diffusion and success factors of mobile marketing. *Electronic Commerce Research and Applications*, *4*(2), 159-173. doi:10.1016/j.elerap.2004.10.006

Schlicht, M. (2016, April 20). The Complete Beginner's Guide To Chatbots — Chatbots Magazine. Retrieved from https://chatbotsmagazine.com/the-complete-beginner-s-guide-to-chatbots-8280b7b906ca#.5vs9cl5ut

Shebat, A. (2016, April 29). 5 scenarios for how humans and bots will work together | VentureBeat | Bots | by Amir Shevat, Slack. Retrieved from http://venturebeat.com/2016/06/15/5-scenarios-for-how-humans-and-bots-will- work-together/

Shopify. (2016). Conversational Commerce Definition - What is Conversational Commerce. Retrieved from https://www.shopify.com/encyclopedia/conversational-commerce

Smith, M. D. (2002). The Impact of Shopbots on Electronic Markets. *Journal of the Academy of Marketing Science*, *30*(4), 446-454. doi:10.1177/009207002236916

Statista. (2016). Leading global social networks 2016. Retrieved from http://www.statista.com/statistics/ 272014/global-social- networks-ranked-by-number-of-users/

Sultan, F., Rohm, A. J., & Gao, T. (2009). Factors Influencing Consumer Acceptance of Mobile Marketing: A Two-Country Study of Youth Markets. *Journal of Interactive Marketing*, *23*(4), 308-320. doi:10.1016/ j.intmar.2009.07.003

Syrett, M., & Lamminman, J. (2004). Advertising and millennials. *Young Consumers*, *5*(4), 62-73.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption- implementation:

A meta-analysis of findings. *IEEE Transactions on Engineering Management*, *EM-29*(1), 28-45. doi:10.1109/tem.1982.6447463

Van Bruggen, G. H., Antia, K. D., Jap, S. D., Reinartz, W. J., & Pallas, F. (2010). Managing Marketing Channel Multiplicity. *Journal of Service Research*, *13*(3), 331-340. doi:10.1177/1094670510375601

Van Manen, T. (2016, April 14). Bot or not: dit is waarom Facebook inzet op chatbots |Marketingfacts [Web log post]. Retrieved from http://www.marketingfacts.nl/ berichten/chatbots-facebook-inzet-chatbots- messenger

Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research*, *11*(4), 342-365. doi:10.1287/ isre.11.4.342.11872

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Vijayasarathy, L. R. (2004). Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model. *Information & Management*, *41*(6), 747-762. doi:10.1016/j.im.2003.08.011

Watson, C., McCarthy, J., & Rowley, J. (2013). Consumer attitudes towards mobile marketing in the smart phone era. *International Journal of Information Management*, *33*(5), 840-849. doi:10.1016/j.ijinfomgt.2013.06.004

Wu, J., & Wang, S. (2005). What drives mobile commerce? *Information & Management*, *42*(5), 719-729. doi:10.1016/j.im.2004.07.001

Zadrozny, W., Budzikowska, M., Chai, J., Kambhatla, N., Levesque, S., & Nicolov, N. (2000). Natural language dialogue for personalized interaction. *Communications of the ACM*, *43*(8), 116-120. doi:10.1145/345124.345164

Xiao, B., & Benbasat, I. (2007). E-commerce product recommendation agents: Use, characteristics, and impact. *Mis Quarterly*, *31*(1), 137-209.

Zarmpou, T., Saprikis, V., Markos, A., & Vlachopoulou, M. (2012). Modeling users' acceptance of mobile services. *Electronic Commerce Research*, *12*(2), 225- 248. doi:10.1007/s10660-012-9092-x