# Intelligent Mesh Technology Adoption: a Proposed framework for Mesh Service, Mesh app and Conversational Systems Adoption

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## Abstract

There is a rich set of literature related to Information Technology (IT) innovation and adoption theory. There is also a need to revisit and update these theories in order to meet today's challenges of business intelligence and big data analytics. In this context, artificial intelligence (AI) and machine learning (ML) play important roles in connecting business to customers, processes and technologies creating a mesh of integrated and interconnected advanced systems that are not only able to sense the environment, but also learn, predict, adapt and potentially operate autonomously (Panetta, 2016). In this study, we propose a model that integrates the emergent Mesh technology with Unified Theory of Acceptance and Use of Technology to meet challenges of today's business analytics and technology adoption strategies. The adoption of digital mesh technology will be investigated among users who use mesh technology such as conversational systems, mesh app and mesh service for their business purposes.

**Keywords**

Mesh technology, Artificial Intelligent, Big Data, mesh device, adoption.

## Introduction

Emerging technologies enable organizations to continually create technology-based values for customers and develop new business models. Moreover, rapid technology transformation forces organizations to change business strategy fast. Hence, to compete in today's global economy, organizations must learn how to quickly adopt new technologies to ensure that they remain competitive. Gartner (2015) proposed "Continuous next" as the strategy for achieving success in the continually changing business environment. It enables innovation, integration and delivery (Gartner 2015). Particularly in the era of big data analytics, artificial intelligence (AI) and machine learning (ML) play important roles in connecting business to customers, processes and technologies creating a mesh of integrated and interconnected advanced systems that not only understand but also learn, predict, adapt and potentially operate autonomously (Panetta, 2016). In this context, systems can learn and change future behavior, leading to the creation of more intelligent devices and programs. As such the intelligent digital mesh or the mesh technology will require changes to the architecture, technology and tools used to develop new opportunities and solutions. As the mesh evolves, the user experience fundamentally changes as well as the supporting technology and security architectures and platforms (Panetta, 2016).

Intelligent, digital, and mesh are three themes that form the basis for the Top 10 strategic technology trends for 2019 (Gartner 2015). These technologies are just beginning to break out of an emerging state and stand to have substantial disruptive potential across industries. Artificial Intelligence, Intelligent Aps and intelligent things are there evolving technologies that are considered under Intelligent theme by Gartner. Digital theme included in virtual and augmented reality, digital twins and Blockchains. Mesh

covers Conversational Systems, Mesh App and Service Architecture, Digital Technology Platforms, Adaptive Security Architecture. Digital Intelligent Mesh are particularly affects business and people (Hsiao, 2018) since connect people, things and services supporting intelligent digital ecosystems (Panetta, 2016). For example, mesh apps enable people and business to connect multiple devices (e.g., pad, mobile phone, desktop, car, printer etc.) and communicate across the digital device (Cearley, 2016).

Despite of researches on technology adoption, a careful scan of literature shows that factors affecting adoption of the emerging technologies such as mesh needs more exploration.

Technology adoption models such as Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975), Diffusion of Innovation (DOI) theory (Rogers, 2003) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) are developed to investigate values and benefits of information technology to user. However, considering the nature of the technology under investigation, the models need to be customized. For example, Hsiao (2018) proposed a conceptual framework for technology-enabled and technology dependent user behavior toward IoT based device mesh and mesh app. In the proposed framework, Task-Technology Fit (TTF) model is customized considering the role of user motivation in mesh device and mesh app adoption.

Despite of great effort of researchers in the area of technology adoption (theory and practices), it remains questions regarding the adoption of new intelligent technologies. As architectural changes in business models can drastically reshape the landscape and operation of business today. In this study, we offer a framework for mesh technology adoption extending the existing UTAUT adoption model. UTAUT is selected to be customized for mesh adoption because of its potential for customization through adding new moderating construct.

The remainder of this paper is structured as follows: next Section will describe mesh technology using Gartner 10 strategic technology for 2019 report; followed by briefly review of the existing adoption literature and will introduce UTAUT as the most customizable perspective we faced in the literature for mesh adoption. Finally, a qualitative-quantitative approach is proposed for verification of the customized framework.

## Intelligent Digital Mesh

The mesh theme refers to exploiting connections between an expanding set of people and businesses — as well as devices, content and services — to deliver digital business outcomes (Cearley, 2016). The mesh demands new capabilities that reduce friction, provide in-depth security and respond to events across these connections.

*Conversational systems:* Today, conversational systems are deployed in different domains, ranging from hotline support over game environments to educational contexts (Masche and Le 2018). Conversational systems could be find in many application domains, particularly in smartphones that almost everyone uses daily have a natural language speech assistant (e.g., “Siri” for iPads, “S-Voice” for Samsung tablets/smartphones, “Google Now”), which allows the user to give commands or to ask for information (Masche and Le 2018). Recently, “Alexa” speaker of Amazon has been developed and is available for English and German speakers (Masche and Le 2018). We are facing a change in human-computer interaction: the interaction between humans and computer systems is shifting towards natural language-based interfaces.

*Mesh App and Service Architecture*: MASA architecture connects different apps from the different devices such as mobile apps, web apps, desktop apps and Internet of Things (IoT) apps (Cearley, 2016). These connected apps form a broad mesh of services that enables devices such as mobile, wearable, consumer and home electronics, and automotive and environmental devices, to be connected with each other through the Internet of Things (IoT) (Masche and Le 2018). People, apps and devices expose themselves to the mesh with direct connection and response through time and space creating a seamless user experience (Masche and Le 2018).

*Digital Technology Platforms*: According to Cearley (2016) digital technology platforms refer to platforms that provide the basic building blocks for operation of a digital business. Five major focal points to develop new digital business models are defined by Gartner including: information systems, customer experience, analytics and intelligence, the IoT, and business ecosystems. It is concluded that every

organization will have some mix of these five digital technology platforms. As such companies need a strategic plan for implementation of these platform technologies in order to support their business strategy and achieve organizational objectives.

*Adaptive Security Architecture*: Above-mentioned technologies, architectures and platforms needs adaptive security architecture particularly in Internet of Things (IoT) platforms in which security is challenging (Cearley, 2016) since it needs monitoring for both users and entity behavior.

The objective of this research is to evaluate adoption of mesh technology in particular adoption of mesh services and app as well as conversational systems for business related needs of users.

## Adoption theories

Each of the adoption theories and models offer a range of factors influencing the adoption of new technologies. In addition, when we look deeper into the factors that have been considered in previous researches, we can understand that some of the researchers preferred to focus more on behavioral factors (Dahlberg & Oorni, 2007) and some on technical factors (Mallat, 2007; Rogers, 2003). Although, some of the researchers, such as Sukkar and Hassan (2005), used both technical and behavioral factors, they did not separate these factors when investigating their impacts. Therefore, while we want to investigate mesh technology adoption, we choose to use both technological and behavioral factors. In addition, we will consider the moderating factors that affect adoption factors (technological and behavioral factors) and the intention to use mesh.

### *Unified Theory of Acceptance and Use of Technology*

The unified theory of acceptance and use of technology (UTAUT) in proposed by Venkatesh in 2003 (Venkatesh et al., 2003). The theory seeks to explain the user intention to use an information system, as well as the subsequent behavior of users. The theory has its background in a number of other theories, combined to produce a more complete model of user behavior (Venkatesh et al., 2003).

The UTAUT theory holds the belief that there are four main factors determining user behavior and eventually the user acceptance. These factors are performance expectancy, effort expectancy, social influence and facilitating conditions. The first three constructs create a behavioral intention to act and, thus, jointly affect use behavior. The fourth construct, facilitating conditions, does not affect user intentions, but directly influences use behavior (see Figure 1 below). In addition to the four constructs that directly impact use behavior, there are four moderators that indirectly impact behavioral intention and use behavior. The four moderators are gender, age, experience and voluntariness of use. Each moderator impacts one or more of the four constructs (Venkatesh et al., 2003).

#### More moderating constructs

Venkatesh et al. (2003) have considered gender, age, experience and voluntariness of use as the moderating factors that affect relationship between UTAUT model construct. Because of the different nature of mesh technology comparing with technologies that we have used before, we have added more moderating variables including motivation, privacy and security, innovation, and big data based analytics and AI problem solving to the model. Importance of moderators is well investigated in the literature of technology adoption (Hsiao, 2018; Sgora, 2016; Engin, 2017), particularly in emerging technology context.

*Motivation*: Hsiao (2018) proposed an integrated framework of TTF and motivation theory (mainly expectancy-value theory) to explore how mesh technology can create benefits for people. The integrated theory emphasis on the importance of expectation and subjective value in activity and task engagement, and proposed a conceptual framework. Such a framework successfully portrays the future technology as a supportive role in helping people complete activities and achieves performance. Considering Hsiao (2018) proposed framework, we have included motivation as a variable that moderates relationship between performance expectancy and behavioral intention to use of the future technology.

*Privacy and security:* Vulnerability to security attacks is one of the main challenges in the mesh of IoT (Sgora, 2016). Because of mesh network characteristics, such as the open medium, the dynamic network topology, the multi-hop nature, and the lack of concentration points where traffic can be analyzed, mesh poses new challenges in achieving security. For example, mesh app attacks concern viruses, worms,

malicious codes, application abuses, and so on (Sgora, 2016). Also, when unencrypted data are transmitted, they are vulnerable to packet sniffing, as well as, to attacks against applications (Sgora, 2016). Concerning privacy, according to Fogel and Nehmad (2009), women are more concerned about identity disclosure and privacy related risks than men. As such it seems likely that people who are privacy-sensitive concern to adopt mesh app and mesh device. Hence privacy and security is considered as a moderator on relationship between social influence and intention to use constructs.

*AI Problem solving:* the relationship between data presentation and visualization and problem solving is well studied in the literature (Engin, 2017) mainly using Cognitive fit theory (CFT) that was developed by Iris Vessey from a general theory of problem solving (Vessey 1991). Cognitive fit proposes that problem solving is "an outcome of the relationship between problem representation and problem-solving task" (Vessey 1991:220). According to CFT, the solution to a problem is derived from the mental representation, which is formulated from the problem representation and the problem solving task, and the interaction between the two (Vessey 1991). Hence, when the process used to act on the representation and completing the task match, the entire problem solving-process is facilitated. This means that the problem solving performance will be superior to any task where the processes are not facilitated. Mesh technology changes the landscape of data collection and data presentation. In the era of big data, according to Hsiao (2018) new technologies are expected to provide an automatic unconsciously environment of data collection and decision making in which new devices respond automatically to data they collect enriching users' experiences. For example, Google Now can discover patterns in users' life by detecting historic data of their search history from their mobile phone. As such when people typically leave work to drive home, they receive among others alerts about the status of traffic (Hsiao, 2018). Because of the effect of mesh on changing the decision making environment we have hypothesized that decision making could affect relationship between facilitating conditions and use behavior constructs and also moderate relationship between performance expectancy and behavioral intention.

Figure 1 depicts UTAUT with new moderating variables and their relationship with other constructs in dotted line shapes.

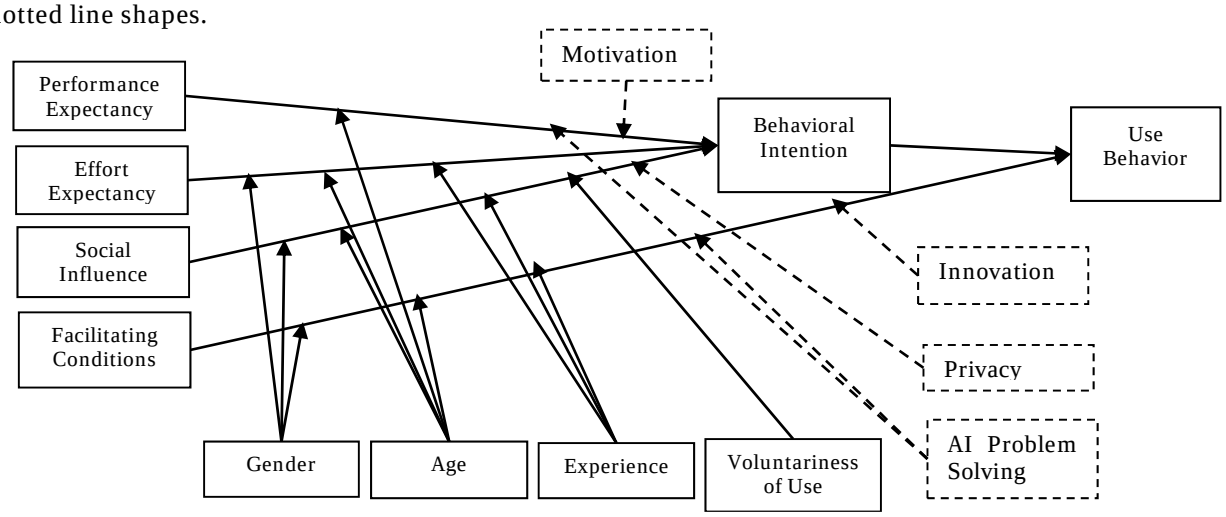


Figure 1: Customized UTAUT model for mesh app, service and conversational systems adoption

## Proceeding steps

The proposed framework needs verification and validation. We will conduct a mixed qualitative-quantitative approach to customize UTAUT for mesh technology adoption.

### *Data collection*

An interview guide will be developed for semi-structured interviews with experts of technology adoption to customize the proposed framework. A questionnaire will be prepared which comes from the customization of previous related questionnaires of adoption researches.

A statistically significant sample of mesh users and nonusers will be selected, and questionnaires will be sent to them through electronic and physical channels. Respondents would use mesh technology for their business purposes.

### *Analysis*

The method of analysis will be conducted at three distinct levels. First, data will be examined, and some descriptive statistics will be extracted in order to get an overview of the characteristics of the sample in terms of values of mean and standard deviation. This analysis examines the scales as independent entities to determine the sample demography and the extent of importance of each factor influencing technology adoption. Second, bivariate correlations between variables will be analyzed with respect to the correlation between factors and intention to use mesh app and mesh devices. Moreover, bivariate correlation between adoption factors and respondents' demographical characteristics will be examined in this level of data analysis. This aspect of the analysis forms a basis to examine the existence of association between the dependent, independent and intervening variables. In the final stage of the analysis a hierarchical regression analysis will be applied. This procedure facilitates an analysis of effects of groups of variables in an incremental, controlled manner (Albadvi et al. 2007). In order to test the moderating effect of each of the new moderating constructs hierarchical regression equations will be applied and analyzed.

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