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ANT and Mobile Network Service Adoption in Banking Industry

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Introduction

The expansion of communication and information technologies has led to diversification and development of organizations’ distribution channels to improve customer service as well as gain competitive advantage (Arbatani et al. 2019; Chaouali and El Hedhli 2019). The banking industry around the world is increasingly in turmoil and competition;
so, banks are using new technologies to gain customer satisfaction and minimize their costs and are trying to provide more diverse and more useful services to their customers (Al-Jabri and Sohail 2012). By influencing the lives of billions of people around the world, mobile phones have become an essential tool for many individuals and organizations and have created fundamental changes in the lives of people and the business environment (Ramdhony and Munien 2013; Ebrahim et al. 2019a). Having new facilities and diverse applications installed on it, this device has become a very flexible tool that is used to achieve a wide range of goals. The mobile banking industry has provided highly functional and useful mobile banking services to its customers without any time or place constraints (Baptista and Oliveira 2017). Mobile banking is considered a service innovation that has provided a multi-channel banking strategy by offering a new way to attract customers. This strategy by providing multiple access to services via Short Messaging Service (SMS), browser-based systems (WAP), and client applications or apps has made mobile banking distinct from other services (Mullan et al. 2017).

Despite the efforts of banks to encourage customers to use mobile banking services, acceptance of this technology by customers is still in its primary levels and has a slow pace. A survey of customer use of mobile banking services shows that globally, only 15% of customers use mobile devices to conduct banking transactions (Chaouali and El Hedhli 2019). This fact highlights the need to conduct studies on acceptance of mobile banking.

Traditional theories on acceptance of mobile banking services consider acceptance of this technology with a simplistic view and by considering different variables separately and not in a complex network of multiple actors. This is while due to complexity of service-oriented technologies, including mobile banking, in which a network of social factors and technology have mutual and comprehensive relationships, a careful study of this phenomenon requires adoption of theoretical foundations that do not discriminate human and non-human (economic, scientific, cultural, political, and technological) aspects and do not attach special importance to a particular factor or factors. That is why in studies related to Information and Communication Technology (ICT), compound theories related to IT change are used to understand the dynamic interaction between
human and technology during development and use of IT. One of the most popular and influential theories for studying social and technological changes in researches related to IT acceptance has been Actor-Network Theory (ANT) (Allen 2004). ANT’s strong point is that in understanding acceptance of technology, it emphasizes the study of both human and non-human actors and tries to address the role that technology plays in the social environment and the effects it has on it over time (Eze et al. 2014). The present study aims to, while reviewing ANT theory, discuss the process of accepting service innovation, including mobile banking, according to ANT, and by reviewing common theories in the field of mobile banking acceptance, provide a conceptual model based on ANT.

**Actor Network Theory and Its Socio-Ecological View**

ANT emerged in the 1980s with the work of Bruno Latour, Michael Callon, and John Law in sociology of science and technology. One of the main assumptions of ANT is that science is the process of heterogeneous engineering by which social, natural, and discourse components are involved with each other in the process of translation. This theory opposes social or technological determinism and proposes a socio-ecological approach in which nothing is considered purely technological or purely social (Tabak 2015, p. 35). ANT helps to understand the processes involved in a technological innovation. The purpose of this theory is to combine technology and social processes through an interpretive lens of network-actor. This theory focuses on how networks are formed, how they cohere with each other, and how they are separated. ANT’s goal is to explain how heterogeneous actors come together to form a network. Thus, actors in ANT are not just human beings but also include non-human factors including individuals, groups, texts, and technological structures. According to ANT, in the process of developing a new technology, all human and non-human factors affect the effective actions and the decision-making process. ANT tries to open the black box by pursuing the complex network of relationships between human and non-human actors. ANT is based on the assumption that technology
contains a diverse set of economic, social, and political factors. ANT provides a very powerful tool for better transparency of the dynamics of a technology (Shim and Shin 2016).

ANT theory can be used to discover how networks are formed, maintained, or separated in all disciplines. Creating a network requires simplifying heterogeneous identities within a system of communications called network-actor. These identities or actors acquire their identities through interactions with others that can be human or non-human (Robinson et al. 2010). The actor network is formed through translation process and all actors enter the network through this process. The translation process involves negotiations between human and non-human actors in order to determine their interests and actions in the network (Robinson et al. 2010). In fact, it can be said that social network is through human interactions with each other as well as with other infinite materials such as machines, texts, and technologies (Law 1992).

**ANT and Acceptance of Innovation in the Field of Services**

Innovation is an important concept in business services (Ebrahimi and Mirbargkar 2017; Ebrahimi et al. 2018a, b, 2019b). Services consist of social and technical (human and technological) factors. Service networks are used to transfer resources and competencies, but these networks remain infrastructural undiscoverable and invisible (Khajeheian and Ebrahimi 2020). Where technology is used to manage the processes required to deliver a particular service, service networks become increasingly complex and make it one of the most difficult environments to manage and review. Although the science of services has been formed to guide the design, implementation, and management of service systems, but the social and technical dynamics within these systems have still remained unclear. ANT theory provides a good theoretical perspective for understanding social and technical dynamics within a service system (including mobile banking) (Carroll et al. 2012).

ATN can be used to explain how technology is accepted in societies and human beings. Technology, in addition to technological advances and innovations, is the result of social structure. Therefore, its success
and acceptance within an organization or society depends on both technical and social aspects. Technical superiority of a technology cannot necessarily guarantee its success, but its social acceptance on a large scale depends on people’s positive perceptions toward using it and the presence of a large number of users. When people take a positive view about the use of a communication technology, its use will become part of their work and life, and they will also recommend the technology to their friends and colleagues. In fact, people will begin to use information and communication technologies including mobile phones and electronic services without knowing how it is done (McBride 2003).

By adopting an actor-network approach in mobile banking environment, it can be said that several actors are active in this field each of which has different motivations and goals. Banks seek to maintain their position as suppliers of banking services in financial markets. Mobile operators are looking to create larger and higher traffic markets for offering mobile services and applications; and technology providers are looking to create standards that using them they can produce more advanced applications. In addition, each of these different stakeholders has different core competencies and strong points. The power of banks is in the management of account-based payments, macro-payments, and mediation of payments. Telecom operators have strengths in handling small payments, collecting payment information, and providing network-based services. Technology providers also have unique qualifications for deploying terminals, application infrastructures, and telecom switch features (Mallat et al. 2004).

Presence of multiple actors with different interests and features in mobile banking environment highlights the importance of using actor network approach in explaining the acceptance of mobile banking services.

**Understanding Innovation as an Actor-Network**

The dominant paradigm in innovation research is the Diffusion of Innovation Theory, which identifies four main elements: characteristics of innovation, the nature of communication channels, passage of time, and social system (Rogers 2010). The researcher, focusing on this approach
in explaining success or failure of innovation, focuses on details of the new system, performance of change factors in accepting innovation, and how to accept or reject implementation of innovation. ANT has been proposed as an alternative approach to innovation that the central core of which is translation process. The assumptions of ANT translation model are quite different from what is true about the theory of innovation diffusion. Latour (1986) argues that an actor merely having power is not able to apply change unless other actors are encouraged to take appropriate action in support of innovation. The idea that power is a feature adopted by an actor is one of the basic principles, but from Latour’s point of view, the amount of power that can be exercised depends on the number of people who have entered the business. He claims that in innovation translation model, the flow of an innovation is in the hands of individuals each of whom may react to it in different ways (correcting, eliminating, betraying, adding to, or abandoning). This way of diffusion applies to any innovation, from goods and products to ideas. Thus, acceptance of an innovation occurs following unconscious actions of all individuals in the chain of actors. In addition, each of these actors changes innovation proportionate to their own goals, but if no one accepts the innovation, the flow simply stops (Tatnall 2005).

The Process of Innovation Translation

In ANT, the translation process involves four stages of problematization, interessement, enrollment, and mobilization (Callon 1984). In the problematization stage, the innovator defines the problem or opportunity for which the solution is proposed. At this stage, the innovator requires himself that the process under his control must take place in such a way that all actors achieve their goals. Callon calls this process Obligatory Passage Point (OPP), which is generally in line with pursuing personal interests of the innovator (Shim and Shin 2016).

The second stage involves processes during which the innovator tries to link other actors to their predetermined roles for problem-solving (Aka 2019). Enrollment involves a set of strategies in which the innovator seeks that the interested actors try to find the solution to the problem.
Enrollment is considered a successful interessement process. An actor network is configured by the enrollment of human and non-human allies, and this is achieved through the use of negotiations in which a group of actors seek to impose roles and definitions on others. In an innovation translation model, movement of an innovation is in the hands of people who react to it in different ways.

Therefore, instead of transference process, we are faced with a process of continuous evolution that obtaining an accepted innovation requires strategies aimed at enrollment of others (Tatnall and Lepa 2003). If the third stage is successful, enrollment will be pursued through a process of coercion, seduction, or satisfaction in which a group of actors impose their will on others (Tatnall and Lepa 2003). This stage of the process is called mobilization and includes methods through which the innovator ensures the ability of the selected individuals to represent different groups (Aka 2019). The process of translation and its main concepts are summarized in Fig. 9.1.

![ANT key concepts and translation moments](Source Rhodes 2009)
Defining the Main Concepts of ANT

ANT has key concepts which are summarized in Table 9.1.

| Table 9.1   | The main concepts of ANT |
|------------|--------------------------|
| **Actor networks** | Related actors in a heterogeneous network of aligned interests (Carroll 2012, p. 68) |
| **Actors/actants** | any element which bends space around itself, makes other elements dependent upon itself, and translates their will into the language of its own (Sarker et al. 2006) |
| **Translation** | The process of the alignment of the interests of a diverse set of actors with the interests of the focal actor (Callon 1986) |
| **Problematization** | The first moment of translation during which a focal actor defines identities and interests of other actors that are consistent with its own interests, and establishes itself as an Obligatory Passage Point (OPP), thus rendering itself indispensable (Hui 2012, p. 105) |
| **Obligatory Passage Point (OPP)** | The situation that has occur in order for all the actors to satisfy the other actors interests (Carroll 2012, p. 68) |
| **Interessement** | The second moment of translation which involves a process of convincing other actors to accept the definition of the focal actor (Hui 2012, p. 105) |
| **Enrollment** | The third moment of translation at which other actors accept their roles and interests that determine on interestedness moment (Hui 2012, p. 105) |
| **Mobilization** | The fourth moment of translation that is achieved when the actors are successfully enrolled (Hui 2012, p. 105) |
| **Inscription** | A process of creation of artifacts that would ensure the protection of certain interests (Hui 2012, p. 105) |
Table 9.1 (continued)

| Term          | Definition                                                                 |
|---------------|-----------------------------------------------------------------------------|
| Irreversibility | Degree to which it is subsequently impossible to go back to a point where alternative possibilities exist (Hui 2012, p. 105) |
| Convergence   | The extent to which the process of translation leads to an agreement as measured by the degree of accord resulting from a series of translations (Rhodes 2009, p. 7) |
| Stabilization | Results from a sequential process where new circumstances or a changing membership leads to successive moments of agreement (Rhodes 2009, p. 7) |
| Black box     | When the networks and the relationships between actors are accepted, the actor-networks can be simplified and depicted as a black box (Rodger 2007, p. 7) |

Socio-Ecological View of Actor-Network Relations

ANT adopts a socio-technical perspective for designing and analyzing technological systems, according to which the world consists of a network of technical and social actors. Socio-ecological models can well describe the dynamic interactions between contextual, technological, and individual factors (Fig. 9.2). This model considers the complex...

Fig. 9.2 Socio-ecological model of ANT (Source Shin 2016)
interaction between individual, network, political, and social factors (Shin 2016). Accordingly, in order to examine the process of accepting a new innovation, it is required to consider the major environmental factors affecting it and the interrelationships between them.

**Theories Related to Mobile Banking Acceptance**

There are several theories to consider acceptance of mobile banking services. These theories have addressed acceptance of this technology from different perspectives. Table 9.2 shows the most important theories related to technology acceptance, the main variables of these theories, and examples of related research in the field of mobile banking. In addition to these main theories, some studies have used a combination of these theories with other theories to examine acceptance of mobile banking. For example, Aboelmaged and Gebba (2013) combined Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB); Ramdhony and Munien combined TAM and Diffusion of Innovation Theory (Ramdhony and Munien 2013); and Zhou et al. (2010) combined Unified Theory of Acceptance, Use of Technology (UTAUT) and Task-Technology Fit (TTF) to explain acceptance of mobile banking services.

The studies on acceptance of mobile banking services, by use of traditional theories related to acceptance of information and communication technologies, have focused on consumer behavior and have emphasized the impact of several factors on intention, attitude, and usage of mobile banking services (Shaikh and Karjaluoto 2015). These studies are based on the simplistic assumption that if providers of mobile banking services are able to provide user-friendly and satisfactory services to customers, mobile banking technology will be accepted by consumers. But the real situation is more complicated and difficult than this simple assumption. The fact is that the value chain of mobile commerce is very complex and consists of interconnected sets of multiple actors, each of whom seeking to meet their own personal interests. Many active actors in the field of mobile banking services are required to form allies with other actors in
Table 9.2  Common theories in acceptance of mobile banking

| Theory                                            | Proposer          | Variables affecting technology acceptance | Researches related to mobile banking |
|---------------------------------------------------|-------------------|------------------------------------------|------------------------------------|
| Technology acceptance model (TAM)                 | Davis (1980)      | Perceived ease of use, perceived usefulness, Attitude | Aboelmaged and Gebba (2013)        |
| Diffusion of Innovation (DOI)                     | Rogers (1983)     | Characteristics of Innovation (Relative advantage, Compatibility, Complexity, Trialability, Observability), Communication Channels, Time, Social system | Cheng (2017)                       |
| Unified Theory of Acceptance and Use of Technology (UTAUT) | Venkatesh et al. (2003) | performance expectancy, effort expectancy, social influence, facilitating conditions | Tan et al. (2010)                  |
| Theory of Planned Behavior (TPB)                  | Ajzen (1985)      | Attitude, Subjective Norms, Perceived Behavioral Control | Aboelmaged and Gebba (2013)        |
| Task-technology fit (TTF)                         | Goodhue and Thompson (1995) | task-technology characteristic | Tam and Oliveira (2016)            |
| Ubiquitous Computing Framework (UCF)              | Jungals and Watson (2006) | Perceived convenience | Saeed (2011)                       |

the field to provide their services (for example, dependence of banks on mobile operators to provide content via mobile Internet), and this has made the process of acceptance of mobile banking more complex (Lee
et al. 2015). Accordingly, it is necessary to pay attention to this complex network in addressing acceptance of mobile banking.

By reviewing the common theories and models in the field of technology acceptance, including mobile banking services, it can be found that each of these models has addressed certain variables as the factors affecting acceptance of mobile banking. In fact, these theories have given special importance to specific actors in the actor network of mobile banking. This is while ANT theory provides a holistic framework for examining acceptance of mobile banking in which it attaches equal importance to all human and non-human actors active in the mobile banking actor-network, and considers the interactions between them in the process of acceptance of this technology.

**Conclusion**

Looking at mobile banking services from a supply perspective, several actors including banks, telecom operators, and technology providers can be named that have different interests, motivations, core competencies, and weaknesses and establish complex interactions with each other. In addition to supply-side actors, in terms of demand also customers are considered key actors in the network each having different interests and demands in using banking services. Different characteristics of customers in terms of personality, culture, demographics, and psychology affect their consumption behavior of mobile banking services, which adds to the complexity of actor-network in mobile banking. In addition, adoption of a socio-ecological perspective in mobile banking emphasizes attention to major political, economic, social, cultural, technological, demographic, and biological flows that affect all human activities and businesses. For example, the recent crisis caused by the outbreak of coronavirus can be mentioned which has led to fundamental changes in behavior of humans, communities, and businesses. From the point of view of consumers’ use of mobile banking services, it can be said that this new crisis has further strengthened the need to use remote services, including mobile banking. Also, this process by creating an economic crisis for all organizations, including banks, will affect as a chain on other
actors of banking network and will have major impacts on business and non-business activities as well as their relationships.

According to the above, it can be argued that studying the process of acceptance of any kind of technology without taking into account the many active actors in the network of relations related to it cannot explain the process well. Traditional theories in the field of technology acceptance have each looked at this phenomenon from a specific perspective and have given special importance to the role of specific actors. This is while actor-network approach in ANT emphasizes the equal importance of all human and non-human actors in acceptance of the new technology. ANT offers a good framework for studying acceptance of mobile banking services that can provide more accurate analyzes and help researchers to understand the dynamics of mobile banking services actor-network. The conceptual model presented in Fig. 9.3, considering the socio-ecological view of the process of acceptance of mobile banking services, can be useful as a framework for use of ANT in explaining acceptance of mobile banking services. It should be noted that the following figure shows a limited number of mobile banking network actors, and many other human and non-human actors in this network must be considered.

Fig. 9.3 Conceptual model (Source Authors suggestion)
The conceptual model emphasizes the network of active actors in the banking industry, those who can be effective in the process of accepting mobile banking services. The factors involved in the far and near loops comprehending the translation process in the model have depicted the factors of the macro environment, the industry environment as well as the actors in the internal environment of the banks. In the farthest loop, we see the economic, political, social, biological, cultural, and technological macro environment factors in which the trends in these variables influence the process of accepting mobile banking services through affecting indirectly the banking industry. In addition, the competitive environment of the banking industry has actors such as customers, competitors, government and software and hardware analysts of mobile; the interests of these actors will have a direct impact on the acceptance of mobile banking services. Other actors in the mobile banking service network include the internal environmental factors of banks, including human factors such as employees, managers, marketers, and other beneficiaries who will affect the process of accepting mobile banking services. We also emphasize formally the role of other factors, including infrastructure factors, applications, contents, and telecom operators in the process of accepting mobile banking services. It is noteworthy that we can identify several other factors affecting the process of accepting mobile banking services in the macro environment, industry environment, and internal environment of the banking industry. The internal part of the model shows the stages of the interpretation process in accepting mobile banking services. Human and non-human actors influence the process of accepting mobile banking services through the process of interpretation, which has four stages: problem finding, member finding, recruitment, and equipping members. During the interpretation process, a network of actors is formed; they have been fully accepted and revision is not possible. In other words, a black box has been formed; the main actors are confident in the support of other components and will repeat this process in order to attract more support from other actors, and others will be mobilized to stabilize this goal.
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