Considerations and Factors for Consumer Mobile Services Adoption in Populations with Diverse Ages

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Abstract—Research was done to discover what factors prevent or limit consumer adoption of mobile technologies provided by financial institutions. This research continued with a study of what role peers and social interactions have on a person’s intention to adopt mobile financial technology and strived to determine the best method to encourage technology adoption. In the effort to maximize adoption, the research also included why certain users continue to use outdated technology and delivery channels. It was discovered that age, while generally considered a significant factor, is heavily influenced by social factors. This research is has valuable insights into the consumer the resulting conceptual model can be used to formulate a strategy to encourage adoption by incorporating perception management into the technology development cycle. The findings from this study can assist leaders in both information technology and business as they review their future strategic planning in regards to mobile member service technologies.

Keywords—Technology adaption, technology acceptance, mobile devices and mobile technologies

1. INTRODUCTION

From fire and the wheel, to the transistor, technology changes societies in dramatic ways and the move to mobile technologies is no exception. Today, mobile devices are becoming ubiquitous in society with smartphone adoption rising dramatically in recent years. As evidence of this seismic shift a Pew Research Centre[5] survey from 2012 notes that ninety one percent of adults in the U.S. own a mobile phone and fifty-six percent of those who own a mobile phone own a smartphone, this is up significantly from two years ago when the same survey reported that only thirty-five percent of U.S. adults own a smart phone [5].

As a result of this influx of new mobile devices, mobile banking technologies are booming. The Federal Reserve Board noted in 2013, that twenty-eight percent of all smartphone owners used their devices for banking in the past twelve months. This was up from twenty-one percent just a year earlier [5]. While twenty-eight percent might sound like a small number, one should consider that it took approximately 20 years for ATMs to become commonplace and internet banking took about a decade, mobile banking is expected to be adopted much more quickly. At this pace mobile banking is expected to be the norm within five years [27].

Organizations that are assertive in bringing new technology to market and have strong marketing and adoption campaigns are critical, this is especially true today when new disruptive technologies can emerge suddenly and have astonishing impacts.

2. RESEARCH QUESTIONS

This research addresses several questions relating to factors for consumer mobile services adoption in populations with diverse ages. The first question asks what is preventing or limiting consumer adoption of mobile technologies provided by financial intuitions. The second question asks what role peers or other social interactions have in the adoption of new mobile technologies. This question seeks to discover how powerful these social interactions are on an individual’s decision to adoption a given technology and if they could overcome other inhibiting factors. This second question provides the primary foundation for the third question which inquires about the best way to encourage new mobile technology adoption in an age diverse population. This includes whether or not homogeneity of the age ranges matter when it comes to the intention to adopt technology and if so what the best way to capitalize on this may be. Discovering the best way to encourage mobile technology adoption will allow business leaders to transition consumers from older technology to newer technology that is more cost effective.

3. PURPOSE OF RESEARCH

The purpose of this research is to determine the most effective method for financial institutions to introduce new mobile technologies for managing finances, including mobile banking, mobile payments and mobile wallets, into an age diverse population. The major question that needs to be addressed in determining the most effective method for promoting adoption is what is preventing consumers from adopting novel mobile financial technologies and what methods can be used to encourage adoption of new systems. While the study of technology adoption in consumers can be viewed as a largely marketing pursuit, modern organizational leadership needs to cross departmental boundaries to provide a comprehensive review of these important strategies. Because of the pervasiveness of technology, IT leadership finds itself in the unique position of being directly involved in many aspects of an organization that are not strictly, or traditionally considered within that department’s scope of influence.

4. LITERATURE REVIEW

This research brings the revolutionary push towards mobile device adoption together with the desire for financial institutions to capitalize on the market by taking proactive steps to develop an adoption strategy that maximizes end user
adoption and utilization. It will also note the risks that are possible for organizations who do not at least consider mobile technologies in their overall strategy. The focus will then shift to the adoption theory and how understanding these theories can lead to more effective campaigns when engaging consumers with mobile technologies.

Much research has been accomplished in regards to the adoption theory and many of those models have considered age and some have considered the interaction of social interactions. However, the subject of most of the current research has been business related adoption which has left age and social interactions as independent mitigating and generally considered to be limiting, factors to adoption. In this this project it is accepted that smartphone technology permeates society and therefore focuses on the adoption of mobile financial technology, including mobile banking, and mobile wallets, in population of varying ages.

The widespread adoption of mobile technologies has created an age of consumers who want to have information at their fingertips, and financial institutions are working to find ways to meet the challenges of providing financial services in a way that consumers will embrace [2] [9] [13]. Mobile technologies can be a great benefit to the consumers that choose to adopt them. Mobile banking and especially mobile payments are expected to become the norm within the next five to seven years [3] [12] [15]. Primarily this will be because mobile technologies will be more convenient than other technologies, not only will financial information be available to consumers anywhere at any time but mobile payments will prove to be far more convenient than other forms of payment due to their high portability and the utilitarian features that mobile devices provide [13]. Mobile payments also offer flexibility, which traditional payment methods cannot match because they are not constrained by a single payment method. This allows mobile payments to be incorporated across multiple card accounts, online accounts such as PayPal, linked directly into accounts at financial institutions and may even be able to debit directly from a consumers cellular carrier. This flexibility would allow consumers to customize their purchasing experience and maximize their control over their finances [13].

Factors limiting adoption of mobile technologies.

With all of the benefits that mobile technologies can bring to consumers organizations are still realizing that high levels of adoption are difficult to come by. In 2012 study from Japan showed that 30% of those surveyed used contactless payment cards with the vast majority using these cards on a regular basis. This same study noted that only 9% of the survey respondents use their mobile devices as payment systems [2]. Many factors that prevent or limit adoption can be found in__(attitude toward technology). These early adopters are the primary focus of another study which reviewed the impact of three groups; these groups are the “Influentials, Imitators, and Opponents”. In the case of this study the Influentials were classified as those early adopters who became proponents of the new technologies and perception effect. This relates to the second research question which asks what role peers of other social interactions have in the adoption of new mobile technologies and this question proves to have the most complex result. Peers, and social interactions in general appear to be a strong factor in the potential adoption of a technology, however, the final determination seems to be based heavily upon the potential adopter’s perception of a multitude of criteria.

Perception itself is vital in the adoption of technology if users do not believe that a technology will fulfill their needs they will not adopt that technology [4] [6] [8] [9] [16] [17] [18] [20] [22][31]. The TAM methodology notes that perceived ease of use is a vital component to any adoption scenario. Attitude toward technology: Directly related to perception is the idea of an “attitude” toward technology. In 2013 the Institute for Interdisciplinary Business Research published a comparison of a number of diffusion and adoption models [11] which provided evidence from TAM [8], the Theory of Planned Behaviour[1] and the Intention of Adopting Information Technology theory [10] that perception and attitude are closely related. Both TAM and the Intention of Adopting Information Technology theory note that perception is a key component in attitude and all three theories strongly link attitude with the intention to adopt a given technology. According to TAM attitude might be superseded by a strong enough perceived utility, while both TPB and the Intention of Adopting Information Technology theory hold that perception creates attitude and that attitude holds the key to adoption. In either case, perception holds intrinsic value when considering an individual or a group’s intention to adopt a given technology.

Peer influence on the adoption of new mobile technologies.

It is clear from the preponderance of source material that a user’s perspective is one of the key determining factors of whether or not a user adopts a given technology. This would indicate that changing a potential user’s perspective would be the largest factor in gaining adoption. One potential method of changing viewpoints would be using positive social interactions as a way influencing perceptions. With increased emphasis on the role of peer cohorts a number of other studies considered the factors involved in the rising importance of these social groups.

Forces in adoption.

These early adopters are the primary focus of another study which reviewed the impact of three groups; these groups are the “Influentials, Imitators, and Opponents”. In the case of this study the Influentials were classified as those early adopters who became proponents of the new technologies and...
Opponents were classified as those opposed to the technology itself or some part of it and inhibit the adoption. The final group, the Imitators, was classified as those looking to gather information from both of the opposing groups and is undecided as to whether or not to adopt a given technology. The research in this study indicated that influence was the primary driver of adoption patterns within the Imitators. The study concluded that the number of members in the influential or opponents groups mattered less than the trust and influence the Imitators had in the individual members of each group.

Social influence.
This study dovetails with another 2010 study which promotes the Social Influences Model (SIM) of technology adoption. This model developed from the previous research of technology adoption, but noted that the traditional sources of authoritative information have begun to erode with the rise of social computing and social media. To this end the SIM asserts that the adoption diffusion of new technologies will be driven primarily from peer sources [28].

Encouraging new mobile technology adoption in an age diverse population.
Common belief is that as consumers age they become more resistant to change. Research into aging and its effects on technology adoption have been researched extensively and in 2000 the Journal of Personnel Psychology published research that probed just how age differences affect the decisions of workers to adopt new technology introduced into the business. This study discovered that the differences in adoption behaviors between age cohorts were based primarily on differing perspectives[20]. Computer and technology acceptance from older adults was also studied in 2012 by researchers from the University of Kassel. This study found that for aging adults, much like their younger counterparts, performance expectancy was the leading determiner of whether or not a technology was adopted. While these studies differ it is possible that these differences are based on the cultural climate, which can also influence the adoption patterns overall.

Adoption seeding.
With the knowledge that individuals of all age ranges have similar motivations and intentions when it comes to technology adoption one method of increasing adoption seems to present itself. This method proposed by [25], offers a comprehensive approach to adoption improvement. “Seeding”, as it is called, employs a method of gaining adopters who are statistically valuable to an organization or peer group and utilizing these users to influence others to adopt the same technology. This seeding methodology requires the utilization of influencers by reaching out to those adopters that are considered to have well respected opinions and it also brings in “we-ness” as an inclusive factor of group participation. In this way seeding would not only use the influencers for their authority and trust factor but also for the prestige that they would bring into a group.

The overall conclusions that can be drawn from this research indicate perceptions are driven by a number of forces and today one of the most significant forces is social interaction between individuals. These interactions can be between peers or family and are often initiated over the internet through social media. These powerful social interactions cut through the generations and are critical when assessing an appropriate adoption strategy.

5. DISCUSSION AND SOLUTION MODEL
While there are many solutions that can be applied to the challenge of improving the adoption of a novel technology, this research focuses on the adoption of mobile technologies in diverse ages ranges. To this end a motivational adoption model is proposed. This model is derived from the decades of research into adoption theory and newer theories on the integration of information technology and business strategy. The primary foundations of the model are derived from the TAM [8], Technology Adoption Propensity, TAP, [24] and UTAUT2 [29] models which focus on general motivations for adoption. However subsequent research which focuses on workplace adoption of technology [14] [19] [20] [21] [26] have been incorporated as well. This model provides a graphic representation of motivations influencing adoption behavior by adults of diverse ages and why social interactions are vital to the intention to adopt a given technology.

The figure 1 illustrates the driving factors for technology adoption as considered by this model. There are four major factors considered in this model which are divided into two categories, personal factors and external factors. The factors of age, incumbent technology inertia, and technology perception are considered personal factors while social interaction is considered an external factor.
Age Factor

Age is the basic consideration of this model; traditionally age has been considered a very significant factor in whether or not a technology is adopted by an individual. It has been cited that older individuals are less likely to adopt technology because of a combination of factors. Most commonly these are predicated on the idea that older adults have less interest in technology or a higher resistance to change than younger adults [9] [19] [20] [26] [29]. This model challenges that assertion and argues that while age may be a factor in adoption other factors may be more influential in determining the adoption patterns of older adults. A 2009 study on the adoption of mobile phones by older adults determined that, when attitude was removed from consideration, the motivations for the adoption of mobile phones in older adults were very similar to the motivations in younger adults [7]. This supports the argument that age, while still an important factor is not necessarily a limiting factor. In this model age is only one consideration in the intention to adopt a given technology.

Incumbent Technology Inertia

Incumbent technology inertia is based on retaining the status quo, incumbent inertia, also known as change resistance, attempts to account for the difficulty some have at changing processes or systems. Those that are using a particular system may find it difficult to change [23] resulting in a resistance to adoption for reasons other than the technology itself. This factor aggregates the vast range of possible reasons why a person would resist change and distils it to a single factor. Incumbent Technology Inertia is considered an expected hurdle to any new implementation and can prevent better technology from being utilized to its full potential.

Technology Perception

Throughout the research of technology adoption the theme of perception continues to appear. It is proposed the perception of technology is the primary motivation behind any technology adoption. A majority of research on technology adoption shows that perception of technology is nearly always directly connected to the intention to adopt a given technology [4] [6] [8] [9] [16] [17] [18] [20] [22] [31]. To complicate matters perception is, perhaps, the most widely variable factor within the model. Perception is critical to this model and the interest in this fact is not that it exists but that it can be drastically influenced by social interactions which organizations must manage to leverage adoption and continued use of a given technology.

Social Interactions

Social interactions are widely known to influence decisions however; common theory on technology adoption has largely left this avenue of influence unexplored. It has been believed that a person’s internal motivations create a stronger force than external ones. This model challenges that assertion, especially when it comes to older individuals. Two relationships have a considerable impact when it comes to influencing perception. The first type is close personal relationships, these relationships, be they family, friends or trusted peers seem to have the most influence on decision making [21] especially on older adults. This seems to be because of a certain trust factor in the relationship and influences decision making considerably. The second type is professional relationships, these relationships are based on specific knowledge and have a varied influence depending on factors such as age variance, knowledge and comfort level [25] this means that these social interactions can have an array of influences on the intention to adopt a technology.

Outcomes of the Model and Solution Application

This model suggests that adoption can be improved based on certain factors which heavily contribute to overall adoption rates in adults across age ranges. Especially important in these factors are social interactions which coalesce to create a person’s perception of technology. This model demonstrates that age should not be considered a limiting factor when reviewing mobile technology proliferation. It also supports the assertion that motivations for the adoption of technology are quite similar across age ranges. This model also indicates that incumbent technology inertia is a significant hurdle to the adoption of newer technologies however this resistance can be overcome by utilizing peer relationship structures to encourage adoption.

It has been found that adoption patterns based on social interactions have a varying effect on individuals. The more important the relationship is to the individual the stronger the impact of the social interaction becomes. It is also suggested that age homogeneity plays at least a small role in enhancing these interactions in regards to technology. These interactions then either support or diminish the perception of a given technology and this perception is a very strong force in determining adoption intention. While there is no clear evidence that educated professional relationships can overcome significant negative perceptions it is known that perceptions can be altered and over time these opinions are subject to change.

When these factors are added together they create a likelihood of adoption with a given technology. This adoption, as noted in the model can, to a degree, is assessed from only a few factors. While it is understood that human behaviour is a complex series of interactions it appears that motivational forces for adopting many new technology are astonishingly simple. Perception seems to hold the key to successfully deploying a technology across a diverse ages and perception can be driven in many ways. The model provides information as to why social interactions are the best way to influence perception and how they are vital to the intention to adopt a given technology. This is why the theory of “Seeding” [25] is
an appropriate method to improve mobile technology adoption across age ranges. “Seeding” assumes that the organization will utilize influential individuals and “seeded” throughout a given population and use their influence to drive adoption by encouraging a positive perception of both the organization and the technology. While this has been long considered merely the realm of marketing professionals, senior technology leaders and indeed senior leaders of all departments need to understand the importance of being able to support the perception created by the influential individuals. Because perception is subject to change every touch-point that a customer has with an organization needs to support the organization.

When one considers this from the perspective of businesses working toward improve adoption of a given technology it becomes clear that educated and effective staff are not only important to adoption they are vital. Influential individuals can only drive the initial adoption; continued use of the technology depends on providing consistent performance through all aspects of an individual’s interactions with an organization. After all perception of a technology is not merely based on the technology, it is also based on the human element within the organization, on how customers are treated when they come into the office, how they are treated when they call and what they hear in press. Therefore it is vitally important to ensure that each of these touch-points are managed and carefully considered when utilizing this model. This model should also encourage organizations to review themselves internally and consider how each department can support the overall mission and improve the perception of the organization. The days when departments can isolate themselves into functional silos which only interact at high levels of management have faded and today to ensure the overall health of the organization every employee must strive to put forth a positive perception of the organization.

This model is similar to TAM [8] and UTAT2 [29], however, it has been streamlined to focus on three key variables. These variables are Age, Incumbent Technology Inertia and Technology Perception which align with a number of adoption theories including the seeding theory put forth by [25], in this theory it is postulated that properly placed “seeds” will influence technology adoption by driving positive social interactions which will create positive perceptions of a given technology thus adoption will be increased. As well as the Sequential Adoption Theory (Walden & Browne, 2009) which states that early adopters, or influentials, lead the way in terms of adoption learning.

How this Model Should be Implemented
This model can be implemented by business leaders of all functional units and provides senior management teams with strategies to overcome possible age related hurdles. Each factor of the motivational model should be reviewed as they work independently, as well as, in conjunction with each other to create an end result.

Age obviously plays a factor in this model and while marketing departments can focus their efforts on a specific demographic to limit the scope of this factor; the ultimate goal of any organization should be to expand their market penetration. To account for this factor age ranges should be considered in all phases in a mobile technology deployment, TAM [8] states that technology needs to provide potential adopters with a “perceived usefulness” and a “perceived ease of use” in order to be successful. It has been discovered that usefulness, in terms of the motivation to adopt mobile technologies, may not vary significantly between age demographics [7] and seems to be relatively consistent between those over 65 and younger adults. This would indicate that usefulness, as a factor, may prove easier to achieve than previously thought.

Perceived ease of use, however, finds itself dependent on many other factors. When considering perceived ease of use, the age of the consumer may not be as important as the other considerations that may age bring with it, such as diminished eyesight and other possible mental of physical limitations. While these issues are not necessarily roadblocks to the usage of mobile technology, the perception by consumers that they are makes this a very significant consideration. To overcome these hurdles technology leaders should work to ensure that all mobile technology is developed and tested in age diverse groups which allow for the possibility of those with some diminished capacity to utilize the device or application. A multi-layered strategy can be used to improve perceptions with a four pronged strategy can be employed.

The first prong of the strategy focuses on the target population and the other prong will be used within the organization to strengthen the ability of staff to influence behaviour. In this phase organizations should also begin to uncover the influential within the target population, these may be individuals of high respect or social standing; however they could also be everyday people who believe in the organization. The second prong of this strategy should permeate the organization and involve all departments. This prong involves training staff on the new technology. It is especially important to train age diverse groups as research notes that in general people trust the opinion of those of similar ages [25]. The third prong is effectively seeding an environment. To accomplish this, a number of focus groups should be created each concentrating on a different age group from the existing consumer base. These focus groups would allow for the training members of the target population thus developing the first adopters, who should be leveraged to provide constructive feedback from the target population. The fourth and final prong of the strategy involves accepting feedback from staff, focus group participants and general consumers. This feedback will allow technology leaders to follow up on
gaps in the technology, improve core services, and build increased functionality into the product.

**Benefits**

This research improves the body of knowledge on technology adoption by incorporating age and social influence into the equation. These factors have been considered in other research such as UTAUT2 [29] however this motivational model provides a stronger tie between social interactions and technology adoption. This research also indicates that age, while still important in technology adoption, may not be as significant of a factor as previously thought. Perhaps the single most interesting concept that this research brought forth was that this perception of age as a critical factor in adoption of technology is merely a perceived notion that is unique to individuals. This model looks to improve not only the technology adoption percentage but also the usage and satisfaction of the given technology.

6. LIMITATIONS

Since there is little research focusing on the interactions of age and social influence in technology adoption there is insufficient evidence to fully understand the depth of the connections between age, social interaction, perception and technology adoption. Cultural aspects may prove a limitation that may make this method more or potentially less effective in certain regions of the world. This determination could be based on the level of technological sophistication, the strength of social ties and the overall perceptions of business and its interrelated technologies.

7. RECOMMENDATIONS FOR FUTURE RESEARCH

Further information into the effects of age on technology adoption needs to be gathered. Primarily more research should be done into the relationship of social interaction and age on mobile technology adoption. This model was created without a functional study and such a study would improve the findings significantly. The study should address the model and relate to the interaction between age, perceptions and social interactions or pressures when it comes to determining whether or not a technology gets adopted. Current research places a great deal of emphasis on the adoption of technology in the workplace; however to expand this body of knowledge further reviewing technology adoption by consumers should continue and specifically the adoption and usage of mobile applications for functional purposes like financial services could be investigated.

8. CONCLUSION

This research shows that, while technology adoption is a significant challenge to all organizations. Those that wish to leverage new mobile technologies have a number of methods available to improve their adoption rates. The research questions that were asked as part of this project examined the available literature and found the literature indicates that what is preventing or limiting consumer adoption of mobile technologies provided by financial institutions, relates strongly to a few key items primarily whether the technology is perceived useful, secure and reliable and the consumer’s feelings about the institution.

Business leaders, in IT and all aspects of business can take away from this project a simple idea. The consumer’s perception of the organization, combined with the perception of its offered technology drives adoption. Whether the perception is true or not does not seem to matter when it comes to individuals utilizing a given technology. Therefore, ensure that technology lives up to the marketing impressions, teach the consumer about the new technology by utilizing those of similar ages and strive to improve upon the technology by listening to the consumer and filling gaps where needed.

**REFERENCES**


