Income Divide: a Determinant of Technology Acceptance

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Abstract: *Research in the area of technology acceptance focused more on certain variables, and explored more traditional theories in the area. Income is a critical factor in developing countries as this area defines the capacity of people to utilize Internet services and especially electronic banking. This study extended the technology acceptance model with social influence and investigated the moderation effect of income. Results indicated that income moderated the relationship between perceived usefulness and intention to use electronic banking; but failed to do so between ease of use and social influence and intention to use. Conclusions and future work are stated at the end of this paper.*

1. Introduction

Information technology is overwhelming our lives and driving many businesses and governments to utilize the capabilities of technology to reach more customers and provide existing ones with better services. A crucial factor preventing such phenomenon is the adoption of information technology by users. Research in the area of technology acceptance explored a huge set of variables and explored many technologies and yielded a set of factors that are important in technology adoption. Theories proposed in this area ranged from simple models like the technology acceptance model (TAM) to more complex models that included large number of variables. All models tried to predict the intention to use certain technologies and explain the variance related to this variable. The Unified Theory of Acceptance and Use of Technology (UTAUT) is a model proposed by Venkatesh, Morris, Davis and Davis [45] and tested by many researchers since the year it was published [3]. The UTAUT used four moderators: gender, age, experience and voluntariness. This work is trying to explore the influence of income as a moderator on the relationships between intention to use a technology and three constructs used in TAM and UTAUT and they are: usefulness, ease of use and social influence. A comprehensive survey was collected in the context of electronic banking (Internet banking); where income is an important factor influencing the utilization of technology and influencing the social context of individuals regarding technology. This empirical work is trying to explore these relationships using one moderator only in a try to explore its predictability and explore new factors related to technology adoption. In the banking sector,

there has been a fundamental shift towards utilizing new technologies since the mid of the 1990s.

2. Literature Review

2.1. Electronic Banking Technology

Electronic banking is defined as using computer and telecommunications to enable banks perform their transactions without human intervention [7]. Sarma and Singh [41, p. 67] defined Internet banking as systems that enable bank customers to access and manage their accounts to gaining information, services and products through a personal computer (pc) or other means via Internet." With a mouse click, customers can access a bank portal to benefit from banking services, such as paying bills, checking accounts, making investments, or even applying for a loan [39]. These services benefit customers and banks; customer can access bank services anytime and from anywhere and easily conduct their transactions electronically [40][46]. According to Flavian, Torres and Guinalíu [18], using the Internet services and capabilities in financial transactions is not the way to gain a competitive advantage, but also is becoming a competitive necessity.

To access banking services, you need to a have a computer and Internet connection. Several factors affect computer purchases and Internet connectivity such as age, gender, experience, education level, and income. According to Chang [12], these factors will have a reduced impact as the technology matures. The wide development and diffusion of e-banking has two main reasons: first, banks aim at reducing their operational costs by offering electronic services [36]. Also, banks reduce the number of branches, and so

reduce the number of employees and reduce cost [33]. Second, these services save time, money and offer convenience, where customers can enjoy banking services regardless of geographical area and time.

Despite these benefits, the majority of private banks lagged in using e-banking. Reasons behind such phenomenon include the penetration of Internet within societies, and also banks' customers needed to learn how to use e-banking services [31]. Also, customers might not be served in the same level compared to face-to-face interaction [9], so e-banking has no social dimension [30]. Also, site quality can be a predictor of adoption and e-banking trustworthiness [11]. Finally, trust in the service and the security levels of the system are important factors that are preventing customers from using the service [11, 17, 32, 34, and 47].

2.2. E-Banking Adoption

E-banking has improved since the advent of communication technologies, especially the Internet. Many studies investigated the influence of new technologies on the banking sector and the development in providing their services [10 and15]. Most research supports the fact that the use of e-banking improves operations and benefit both banks and customers.

Research implied the existence of many types of benefits from e-banking use. Benefits include the quality of services provided to customers, and customers' loyalty to banks. Studies show that e-banking plays a critical role in employment and also foreign currency [8, 25, and 44].

In the United States, 91% of US households have bank accounts, and 93% of them performed one or more financial transaction. In addition, 495 million transactions per month are performed on points of sale terminals (POS) in the year 2003. Electronic Payments International (2001) reported that 39% of US households had access to online banking, and only 18 percent have used it [22].

In Jordan, using new communication technologies has a positive impact on Jordanian banks, and an increased customer satisfaction [29]. Also, many studies indicate that using e-banking is the cheapest way to deliver bank services [38, 19, and42]. Banks can reduce the number of branches and hence their staff size, using online self-service channels, thus resulting in a substantial reduction in expenses and an increase in margin [36].

2.3. Technology Acceptance Model (TAM)

Organizations invest in new technologies for several reasons, mainly to gain a competitive advantage; increasing revenues, reducing cost, and improving customer satisfaction. It has been noticed that users' attitudes towards accepting such new technology has a very important effect on the success of adopting these

new technologies. It is very important to find the reasons that make the users use the new technology or not. Some researchers classified these factors into two groups: negative factors and positive factors [26]. Determining these reasons will help the developers and designers of banks' websites in their work [36].

Many models and theories explored the acceptance of new technologies, where they vary with respect to the utilized predictors of using a technology. One of the most popular models is the Technology Acceptance Model (TAM) proposed by Fred Davis [13]. The TAM incorporates two main constructs into a model of technology acceptance; perceived usefulness and perceived ease of use [13, 14]. The majority of research on TAM focuses on individual users' beliefs, attitudes, and behavioral intentions toward technology use. New technology use is determined mainly by perceived usefulness (PU), and perceived ease of use (PEOU) relating to the attitude toward using the technology, which relates to intention, and finally to behavior [1]. Perceived usefulness refers to users' perception that adopting the new technology will increase performance, which could be near-term or long-term PU. Perceived ease of use refers to users' perception that the potential system will be free of effort [13, 14, 22, and 36]. Perceived usefulness could be influenced by perceived ease of use and external variables that could be system features, training, documentation, and user support.

This study will use TAM as the main model for exploring the influence of PU and PEOU on intention to use e-banking. There are many models that can be applied to measure the acceptance of new technologies. This study adopted TAM because of its simplicity and parsimonious nature. Also, TAM has the ability to make powerful predictions, when applied to different situations and with different technologies. Finally, the main objective of this study is to test the influence of income on this model, thus it is easier to test income with a strong and simple model [6].

In 2003, the same authors of many papers in the area of technology acceptance proposed a model called the Unified Theory of Acceptance and Use of Technology (UTAUT), where two variables where added to the model and they are social influence and facilitating conditions [5 and45]. The first was hypothesized to influence intention to use, where the second was directly connected to usage. This study adopted social influence from the UTAUT to influence intention to use.

2.4. E-Banking Adoption and Income

Studies utilized TAM concluded to different variables and attitudes towards technology acceptance within the context of the environment of study [21]. Various factors influence the technology acceptance like: the number of people accessing the Internet, the cost and

speed of Internet connection [27, 43]. Li and Worthington implied that the customers' confidence in e-banking technology is also important, thus banks should increase customers' satisfaction to improve their acceptance [27].

Other independent variables related to demographic measures such as home ownership, age, gender, marital status, region, presence of children and income. According to Kolodinsky, Hogarth and Shue [23], a study at the University of Michigan showed that users of e-banking have high income.

The banking sector is one of the growing sectors in Turkey. A Turkish study on customers' acceptance of electronic banking was conducted in 2001. The transaction volume of e-banking in Turkey was about 1.2 billion, and 5 billions in the years 1997 and 2001 respectively. A consumer survey administered among IB customers of Garanti Bank, where 724 successful questionnaires were sent to the bank customers. The majority of the customers (around 73%) were medium-high or high income class [37].

Another research integrated TAM and adoption of innovative framework to predict online banking acceptance. They put different hypotheses to be tested, and one of them related to the demographic characteristics of customers especially income. The study concluded that customers who are considered as innovators have in general higher levels of income than others. Data collected indicated that 19% of household incomes were less than 20K$, 36.7% had income between 20K$ and 50K$, 28.7% had income between 50K$ and 100K$, and the remaining 15.6% reported household incomes of more than 100K$. Results showed that income level has positive and significant effect on e-banking adoption. The study utilized other demographic factors such as age, educational level, and gender, but surprisingly, the only demographical characteristic that influenced the adoption of e-banking was income level [24].

Another study conducted in 2006 in one of biggest cities in Brazil included about 300 Internet bank users, 150 Internet but not Internet bank users, and 150 neither Internet nor Internet bank users. The study deduced that 46% from the interviewers had monthly income more than $750.00, and they use top Brazilian banks [20]. Another study collected data randomly using 7.4 million e-mail addresses covering Taiwan [35]. The study aimed to find how gender, age, income, and other factors may influence individuals' adoption of e-transactions such as e-banking within different cultures. In Taiwan, 43.5% of all e-transactions are used for e-banking. In China, the percentage of using e-banking was 66.7% of all e-transactions, and in Hong Kong, the percentage was 67.8% of all e-transactions. The study also showed that Hong Kong users of e-banking have the highest income, Taiwan comes next, and China last. The study also indicates that income is one of the major factors that influence the adoption of e-transactions in general. Also, the average income of e-transaction users is much higher than the average national income.

In the Arab world, many developments are encountered in the field of Information and Communication Technology (ICT). Many transactional and e-commerce platforms over several countries in the Arab world are built. So, many Arabian banks started to use e-banking services. Despite of little readiness in credit card penetration rates in the whole area, many regulations are designed for the online payments. This includes Jordan, UAE, and Lebanon. More than 20% of banks utilize online services; most of these banks are foreign banks with regional presence. Also, Arab banks suffer from the absence of house alternatives to central bank branches [16]. In a study that compared two samples in Chile and UAE, income came a significant moderator in relating PU and PEOU to intentions to use [4].

3. Research Method

3.1. Research Model and Hypotheses

This study imported three major predictors that were utilized in the technology acceptance area and they are: perceived usefulness (PU) and perceived ease of use (PEOU) from the TAM, and social influence (SI) from the UTAUT. The research model proposed is depicted in Figure 1.

Based on such depiction, the following hypotheses were proposed:

- H1a: Perceived usefulness will have a significant positive effect on intention to use.
- H1b: Perceived ease of use will have a significant positive effect on intention to use.
- H1c: Social influence will have a significant positive effect on intention to use.
- H2a: Individuals with higher income will have higher influence between perceived usefulness and intention to use.
- H2b: Individuals with higher income will have higher influence between perceived ease of use and intention to use.
- H2c: Individuals with higher income will have higher influence between social influence and intention to use.
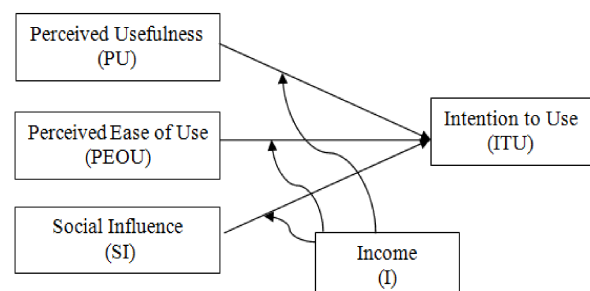

Figure 1. Research Model.

3.2. Sample and Data Analysis

This research utilized bank users regardless of their e-banking technology experience. The sample size is 878 bank users where income data was in four categories: 1 for less than 500 JDs, 2 for 500-1000 JDs, 3 for 1000-5000 JDs, and 4 for more than 5000 JDs. The data used for the rest of the variables utilized a 7 point Likert scale. This study used the data utilized in a study by Abu-Shanab and Pearson [2], with some modifications as we omitted some redundant items and utilized the researchers' effort in the process of validating the instrument.

Regression analysis was conducted on the data and yielded the results shown in table 1. The results show a significant model without the moderation influence, with an adjusted $R^2 = 0.354$ ($F_{3,874} = 161.348$, p<0.001). On the other hand, when adding income as a dependent variable, the increment addition on the explanation of variance (value of adjusted R^2) was only 0.2% only (Adjusted $R^2 = 0.356$, $F_{4,871} = 122.132$, p<0.001).

The table indicates that all three variables are significantly related to intention to use, which means a support for the first hypothesis H1 in its three parts (H1a, H1b & H1c). The largest beta value was associated to PU (consistent with the findings of Liao & Landry [28]), which supports many studies in this area. On the other hand, SI was second in its importance with a beta value of 0.235.

Table 1. The coefficient table of the research model analysis.

Constructs	Unstand. Coeff.		Stand. Coeff.	t	Sig.
	B	Std. Error	Beta		
Constant	.079	.231	-	.339	.734
Perceived Usefulness	.425	.046	.324	9.194	.000
Perceived ease of use	.236	.049	.168	4.808	.000
Social Influence	.251	.033	.235	7.569	.000

Independent variable: Intention to use

When regressing income as a moderator into the research model; the data of income was recomputed into two categories as the last keyed category totaled only 7. The following table shows the original data and the conversion into the new Income variable. Such unbalanced sample sizes will fail to yield any appropriate results for inference for such category and will distort the results for other categories or variables.

Results of the regression equation are shown in Table 3, where only perceived usefulness is the only significant component of the three moderation segments of the regression table. The data generated from the three predictors was multiplied by income and yielded three new variables and all seven variables were regressed on intention to use electronic banking.

Table 2. Income variable conversion.

Old Variable		
Category	Old value	Total
< 500	1	524
500 - < 1000	2	253
1000 - < 5000	3	92
>= 5000	4	7
Missing	Missing	2
Total		876
New variable		
Category	New Value	Total
< 500	0*	524
>= 500	1**	354
Total		878

*Original category # 1   **All other original Categories

Table 3. Coefficient table for the moderation regression test.

Constructs	Unstand. Coeff.		Stand. Coeff.	t	Sig.
	B	Std. Error	Beta		
Constant	.338	.286		1.179	.239
Perceived Usefulness	.360	.056	.274	6.484	.000
Perceived ease of use	.244	.060	.173	4.076	.000
Social Influence	.248	.043	.232	5.769	.000
Income	-.650	.490	-.180	-1.326	.185
PU * Income	.201	.100	.336	2.007	.045
PEOU * Income	-.032	.104	-.050	-.307	.759
SI * Income	-.029	.069	-.042	-.414	.679

Independent variable: Intention to use

On the other hand, to better interpret the result another test was used using a tool called Chris Calculator. It is an Excel sheet that compares coefficients of regression with different samples, but keeps the betas easy to explain. Results are shown in Table 4 below. The results shown in the table indicate the same result, only PU relationship was moderated, and we can see that the beta value was improved when using income as a moderator. On the other hand, the other two relationships were not significant when moderated by income, but we can see that both were negatively influenced by income. This result supports hypothesis H2a, and failed to support H2b and H2c.

Table 4: Comparisons of beta coefficients for income.

Low Income			High Income			Z value
Beta	SE	St. Beta	Beta	SE	St. Beta	
.360	.058	0.287	.561	.078	0.399	2.068
.244	.062	0.178	.212	.080	0.147	-0.316
.248	.045	0.226	.219	.051	0.209	-0.426

Cutoff point = +/- 1.96 to be significant at the 0.05 level

4. Conclusion

This study replicated the TAM and UTAUT and TRA, but with modifications to all by proposing a new model that yielded a similar R^2 and an equal explanation of variance. This study explained the variation in ITU by 35.6% (TAM explained 36%). This result was not the major part of our research but supported the first three hypotheses (H1a-H1c).

Based on the literature review we have seen many socio-demographic factors that influence bank customers in adopting electronic banking. Based on this literature review, income was one of the important factors affecting technology adoption. Results were consistent with the literature in its direction as income positively moderated the relationship between PU and ITU (H2a was supported). On the other hand, income negatively moderated the other two relationships, but no significant evidence was generated from the data (H2b & H2c were not supported). Finally, income did not predict ITU and dropped from the model. Thus the research model resulted in this study when entering income yielded the following betas shown on the research model depicted in Figure 2.

It is obvious that the same model direction is kept and only beta values are decreased when entering income into the model. It is obvious that rich people are keen on the usefulness of the technology to use it. Other than that, they don't care about the ease of technology and what people think about. We need to understand that to some extent this is evidenced keeping in mind that both categories of income deal the same with respect to relationships shown in our research model in Figure 1 (i.e. they build their decisions of adopting technology based on its usefulness, ease of use and social influence.)
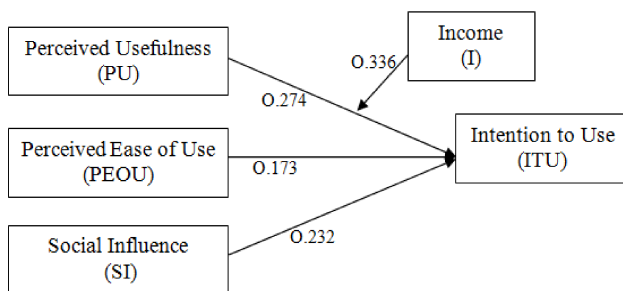

Figure 2. Research model when moderated by Income.

Finally, the TAM is supported and extended by social influence. Also, all relationships in the original model were significant, which indicates the robustness of the TAM. Finally, income is related to technology acceptance based on the cost of technology and its socioeconomic influence in societies. The maximum variation in ITU explained by this proposed model is 35.6%, which is considered acceptable in social sciences research.

5. Limitations and Future work

This study competed with TAM, TRA and UTAUT in the explanation of technology adoption decisions. Still, many variables exist that might increase our explanation power, and different environments might yield different results. An excellent research would address how to prioritize demographic variables (i.e. what should banks care for more; gender, income, experience…etc. electronic banking is a financial tool and should be closely related to income. Research can focus more on income by exploring a larger sample (or a forced stratified sample) to explore more variability in income and address such variation and its influence on the TAM relationships. More research and replication of this work should be conducted to emphasize results and explain more why income did not moderate all model relationships. The limitation of this study, which is consistent with the literature, is that low income users are less reluctant to use electronic banking, but they are the majority of bank customers.

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