

CONDITIONS FOR TECHNOLOGY ACCEPTANCE

Broadening the scope of determinants of ICT appropriation

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*“Consumer research has shown that knowledge about the user tends to be limited ... It is quite self-evident that both social and commercial policies will benefit from **accurate insight** into the different parameters determining the success (acceptance and use) of these technologies according to a user’s point of view.” (Burgelman, 2000: 236)*

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Abstract: Regarding the ICT industry, we have a fast evolving sector being under pressure due to a growing number of failing innovations. Companies are forced to be the first on the market and for that reason thorough insights in user preferences are indispensable. New technological innovations often fail because too much attention is given to (technical) product-related features without taking into account the most important parameters of user acceptance. In this paper we highlight some theoretical considerations on this matter. First of all, we propose an approach in which more traditional and often scattered vision(s) on adoption determinants are broadened into an integrated framework. The approach should provide a stronger base for better targeting of (new) users of technologies. Second, we elaborate on this by rethinking these determinants with regard to the later adopters. Later adopters (or even non-users) are often ignored in technology acceptance research. However, especially for policy purposes, the understanding of why people do not adopt or do not use ICT is strongly relevant in the light of the development of the information society. Both approaches – focusing towards early as well as late adopters – are illustrated by case studies starting from a common framework.

1 INTRODUCTION

Conditions for ‘technology acceptance’ have always been a central pillar in all kinds of approaches of studying the acceptance and appropriation of new innovations: ranging from the diffusion theory-based approaches focusing on perceived technology characteristics since the early 60’s, over more usage-oriented theoretical approaches since the 80’s to more industry-oriented studies/approaches focusing on image- and network-related determinants.

However, in today’s ICT-environment a broader and more comprehensive framework for understanding determinants or conditions for technology acceptance is more than ever needed, in order to obtain the necessary insights to face the challenges of both ICT managers and policy makers. Due to the exponentially increased offer of ICT-innovations (and as a consequence more failing technologies), all stakeholders involved are desperately seeking for accurate insights into adoption determinants as a basis for more effective introduction and targeting

strategies (Lin, 1998: 95; Talukdar et al, 2002: 97; Ziamou, 2002: 366; Chen et al, 2002: 706; Venkatesh et al, 2003: 426). From a policy point-of-view such insights into drivers and barriers for adoption and usage of ICT are necessary in order to set up adequate e-inclusion measures (Chaudhuri et al, 2005: 737-739; Milner, 2006: 177; Trkman et al, 2008: 102).

In this paper we introduce a framework that could help to refine our thinking on this. First, we broaden the scope on adoption determinants by integrating the existing but fragmented approaches into a more comprehensive one. This becomes more important for industrial and marketing purposes, as a thorough understanding of the user – the customer – is necessary for acceptance. Second, we elaborate on this by paying attention to approaches that go beyond adoption diffusion. More specifically, policy makers are seeking to understand parameters that have an influence on the impact of ICT adoption and use, in order to formulate effective measures in the light of overcoming digital inequalities.

2 DETERMINANTS FOR ICT ACCEPTANCE

2.1 Broadening the scope on adoption determinants

With ‘adoption determinants’ we refer to parameters that influence technology acceptance in terms of the actual adoption decision (De Marez, 2006: 189-192). For a long time and to a large extent influenced by the dominant technological deterministic paradigm, demographic variables were supposed to have an important influence on that adoption decision (see Rogers, 1983; Rogers, 2003). However, many scholars have stated that – in addition to the more traditional parameters – this view should be extended to an approach based on ‘attitudinal’ adoption determinants (Bergman et al, 1995; Plouffe et al, 2001; Atkin et al, 2003; Leung, 1998). Attitudinal determinants are related with more subjective perceptions of innovation characteristics and personality traits.

The approach of this attitudinal adoption determinants was mainly inspired by the diffusion theory, in which innovations were supposed to have a set of five characteristics (*relative advantage, complexity, compatibility, trialability* and *observability*) of which the subjective perception determines one’s attitude towards the technology, and one’s innovativeness or timing of adoption decision (Rogers, 1983; Rogers, 2003). The perception of each of these characteristics is assumed to have a strong relationship with the innovativeness of an individual. Innovators and early adopters, for example, are assumed to have a higher perception of relative advantage than the (later) majority segments, together with a lower perception of complexity of the innovation (contrary to the later adopters).

Over the years, the increasing attention paid to these ‘attitudinal’ adoption determinants resulted in a considerable yet cluttered extension of the original set of five adoption determinants. The convergence with social psychology theories such as the Theory of Reasoned Action (TRA) (Fishbein, 1967; Fishbein & Ajzen, 1975), (Decomposed) Theory of Planned Behaviour ((D)TPB) (Ajzen, 1991; Taylor & Todd, 1995) and Technology Adoption Model (TAM) (Davis, 1986; Davis, 1989) in particular led to an extremely valuable - yet fragmented - increase in (research on) adoption and determinant models. Some scholars consider one or two extra determinants (Holak & Lehmann, 1990), while

others considered eight (Plouffe et al.; 2001), ten (Choi et al., 2003) or more determinants.

Downside of this increased attention is that researchers nowadays are confronted with a ‘lack of overview’, since the increased multidisciplinary interest entails a cluttered and inconveniently arranged entirety of determinants. Evidently, more accurate insight into adoption determinants requires an insight in more than the five determinants of Rogers’ diffusion theory, but it remains unclear how many and which determinants should be taken into account. Since a convenient overview of (potentially) relevant adoption determinants for ICT innovations is still lacking to date (Busselle et al, 1999; Randolph, 1999; Hadjimanolis, 2003 – an exception is the work of Venkatesh et al, 2003) we conducted a meta-analysis on determinants for ICT adoption (De Marez, 2006). Comparable to the development of UTAUT (Unified Theory of Acceptance and Use of Technology, Venkatehs et al, 2003: 446-465), we started from different studies and existing theoretical models (in the field of communication, marketing as well as social psychology) whose central building block was mainly diffusion theory’s set of five determinants. This resulted in an extension to 19 determinants, in which we distinguish ten innovation-related characteristics (perceptions), eight adopter-related characteristics, and the impact of the marketing strategy (see table 1 below).

Table 1: Extension of adoption determinants (De Marez et al, 2007: 82)

ADOPTION DETERMINANT	ASSUMED RELATION WITH INNOVATIVENESS
INNOVATION RELATED CHARACTERISTICS	
Compatibility	+
Complexity	-
Cost	-
Enjoyment	+
Observability	+
Relative advantage	+
Reliability	+
Tangibles	+
Trialability	+
Visibility	+
ADOPTER RELATED CHARACTERISTICS	
Control/Voluntariness	+
Image/Prestige	+
Innovativeness	+
(product) Knowledge	+
Opinion leadership	+
Optimism	+
Social influence	+
Willingness to pay	+
IMPACT OF MARKETING STRATEGY	
Marketing (impact)	+

Clearly, innovativeness and adoption decisions seem to be determined by more characteristics than the original five initiated by Rogers' diffusion theory. The perception of 'relative advantage' for example, can express itself in several dimensions. The 'perceived cost' and 'tangibles/aesthetics' are the most important of them. Most scholars relegate to Rogers' work in his conceptualization of 'observability' in terms of the perceived result demonstrability, while some others distinguish the latter from 'visibility' as the degree to which the innovation is visible to others in its own right. It is also important to account for the 'perceived enjoyment' of using the innovation (the so-called likeability), and 'reliability' as a dimension of perceived risk that is not covered by other determinants ('reliability' in this context refers to 'performance risk'). 'Innovativeness', on the other hand, is the most important personality characteristic. It covers a multitude of sub dimensions such as 'venturesomeness', 'novelty seeking', 'cosmopolitanism', 'variety seeking', 'information seeking', etc. 'Opinion-leadership' needs to be considered as a separate dimension, just as a person's 'optimism' towards technology, 'product knowledge', 'willingness (and ability) to pay', the 'perceived impact on one's personal image', the 'perceived control', 'impact of social influences' and the 'impact of marketing, advertising and promotional strategies'.

If industry strategies nowadays require more profound insight in more than the traditional five determinants, it will largely boil down to an insight in these 19 determinants. It will probably never be the case that all these determinants are relevant, but if prior-to-launch research could reveal which determinants are the most important drivers and barriers for which segments, this would allow to adjust the approach of different segments. Question remains, however, how to acquire such prior-to-launch insight?

2.2 Elaboration of determinants with regard to 'later adopters'

Another challenge of research concerning the acceptance of new technologies – especially for policy strategies – is how to gain insight in the profiles of later adopters. That are individuals to whom traditionally less attention is given in innovation studies (Selwyn, 2003: 100-101; Roe & Broos: 91). People who step later into the innovation circle or who even resist to do this, are often left aside. However, research of non or later adoption

could offer fundamentally added value. First, industry or managers could learn substantially not only of why people adopt a new technology but also why they are not willing to adopt. This could provide insights in how to adjust the innovation (in all its dimensions: product, distribution, communication) in order to stimulate appropriation by the overall population. On the other hand, in view of the pervasiveness of ICT in society and the increasing dependence on ICT in everyday life, policy makers are obliged to think about policies that prevent exclusion of groups of citizens in the development of the information society. Insights in the parameters of adoption by later adopters is therefore of crucial importance.

The adoption of a certain technology (as for which the determinants are discussed in 2.1.) however, cannot be the sole focus when studying the factors that influence technology acceptance. This would be too much a technology deterministic and diffusion-based approach, mainly serving 'industry purposes' (*how to approach the most interesting segments of innovators, early adopters, early majority as good and as soon as possible?*). A more elaborated focus on technology acceptance not only requires a focus on adoption, but also on usage determinants. In addition, a thorough understanding of technology acceptance not only asks for a focus on the first segments in the diffusion curve, but also on the later segments in that curve (late majority and laggards).

Attention for digital inequalities is, both in scholarly publications as well as in political studies and in the popular press and media is, an obvious result of the euphoric 'cyberbole' that characterized much of the rhetoric of new technologies since the mid-1980's (Gunkel, 2003: 500). Hence, profound insights in why people lag behind in the adoption and use of new technologies, are important in view of the development of the information society for all. More insights are necessary, especially when we can conclude that business strategies and policies that were successful in, for instance, increasing internet penetration in the early days, may no longer be appropriate to reach the rest of the society. And this is most probably so in societies where a majority of people are already connected to the internet. Thus, policies also need insights in the most important drivers and barriers that have an impact on the individual's decision to appropriate an ICT product.

3 CASE STUDIES

3.1 Broadening for industry & marketing purposes

The above-mentioned question was also the central question in two recent case studies conducted by Research Group MICT-IBBT. Both studies were set up to acquire the necessary insights in attitudinal adoption determinants for two ‘mobile innovations’, in preparation for their commercial launch in Belgium. In the first case-study (2006) a sample of 269 respondents was questioned about their attitudes towards a new ‘mobile news’-application in the context of the IBBT-project ROMAS. In the second case study (2007) a representative Flemish sample of 405 respondents was questioned about their attitudes towards mobile television services. In the first study, data were collected by means of an online survey (after a two months period in which the respondents could test the mobile news application). In the second study, data were collected by means of 40 minutes during CAPI-interviews (in which respondents were shown short movies on DVD in order to familiarize them with mobile tv applications and usage moments). In both studies potential adopter segments (innovators up to laggards) for the innovations were forecasted by means of the Product Specific Adoption Potential scale (De Marez, Verleye, 2004a,b), and the 19 determinants were transformed into a battery of 47 Likert statements (cf. table 2), to be answered on 5-point agreement scales (varying from 1: ‘I do not agree at all’ to 5: ‘I fully agree’).

Table 2: Operationalisation of determinants in 47 Likert statements (applied to the mobile news/TV cases)

COMPATIBILITY — LIFESTYLE AND PERSONALITY
7. Consultation of mobile news/TV services fits my lifestyle
39. If I buy a new mobile, it has to be a model that fits my personality
COMPATIBILITY — (TECHNOLOGICAL)
30. I am interested in subscribing to mobile news/TV services? but I would mind if that would imply an investment in a new device.
13. Mobile news/TV services are only interesting to me as a part of the subscription on other mobile services.
COMPLEXITY/COMFORT LEVEL
8. I fear that mobile new/TV services application offers different possibilities, which makes It rather complicated.
20. The mobile news services application seems very user-friendly to me.
29. The mobile news/TV services application offers different possibilities, which makes it rather complicated.
CONTROL/SELF-EFFICACY
46. I have no problem to sort out on myself how mobile

news/TV application work and must be installed.
COST (RELATIVE ADVANTAGE)
1. Subscription on mobile news/TV services seems expensive to me.
5. Mobile news/TV services will probably cost too much for many people.
EFFECTIVENESS (RELATIVE ADVANTAGE)
36. Mobile news/TV services will certainly make some things easier for me.
ENJOYMENT
4. Mobile news/TV service seems very user friendly to me.
IMAGE PRESTIGE
33. Subscribing to mobile news/TV services applications would have a positive impact on my image and social status.
38. Subscribing to mobile news/TV services beams out a certain standing.
INNOVATIVENESS
6. I think to be among the first to subscribe to such mobile news/TV services.
34. Based on what I already knew about the application and what I have learned today, I will certainly search for more information about subscribing to these services.
MARKETING STRATEGY
26. If I would subscribe to a mobile news/TV application, it would be important to me that it is provided by a well-known 'brand'.
27. If I would consider mobile news/TV adoption, I would first check the ads, brochures and promotions.
OBSERVABILITY — RESULT DEMONSTRABILITY / COMMUNICABILITY
24. I am perfectly able to explain the strengths and the weakness of mobile news/TV services to others
OBSERVABILITY — VISIBILITY
12. One of the nice things of a mobile news/TV application is that it is something to show off with among friends.
17. I see many people in my environment who use mobile news/TV services.
OPINION LEADERSHIP
15. If mobile news/TV would be introduced on the market, people in my environment will certainly come to me for advice.
OPTIMISM
44. The fast technological developments are a good thing.
45. If you don't want to run behind, adoption of new technologies is necessary.
PERCEIVED RISK (FINANCIAL)
18. I fear that subscribing to a mobile news/TV application would be way above my budget.
PERCEIVED RISK (IMPLEMENTATION)
23. If I would have to use such mobile news/TV applications on my own, I don't think I would manage.
PERCEIVED RISK (SOCIAL)
21. If I would use mobile news/TV services, people in my environment would look odd at me.
PRODUCT KNOWLEDGE
19. I recently send something about mobile news/TV services or recently talked to someone about it.
35. I consider myself well-informed about the possibilities and (dis)advantages of mobile news/TV services.
RELATIVE ADVANTAGE
11. The advantages of mobile news/TV services are clearer to me than the disadvantages.
40. I don't see where or when to use mobile news/TV services.
RELIABILITY
31. I doubt the reliability and proper functioning of the mobile news/TV services application.
SOCIAL INFLUENCE

9. Most people in my environment will certainly be enthusiast about the mobile news/TV application.
SOCIAL INFLUENCE — COMPLIANCE
2. If 'mobile news/TV usage' would be considered as 'trendy' in my environment, I would certainly consider subscribing to it.
10. My direct environment will probably expect me to be one of the first to use mobile news/TV services.
32. Even if I am interested, I would not subscribe if my environment would be negative about mobile news/TV applications.
SOCIAL INFLUENCE — IDENTIFICATION
47. If I would use mobile news/TV services, it would certainly tell something about me and my personality.
SOCIAL INFLUENCE — INTERPERSONAL COMMUNICATIONS
3. Before subscribing to a mobile news/TV application, I would like the advice of some people.
16. Mobile news/TV services will certainly be a topic of discussion among my friends and family.
SOCIAL INFLUENCE — NETWORK EXTERNALITIES
37. I am interested in subscribing to mobile news/TV services, but only if there are sufficient people in my direct environment doing so. Otherwise, the application wouldn't have much value to me.
TANGIBLES (RELATIVE ADVANTAGE)
25. As the mobile news/TV services is presented and testable now it has an attractive design and style.
14. If I would consider buying a new mobile, design would be a very important buying argument to me.
TRIALABILITY — PHYSICAL
41. I would like to try out mobile news/TV services before subscribing to them.
TRIALABILITY — VICARIOUS
28. Before subscribing or adopting mobile news/TV services I prefer to look around for a while and see how others are experiencing the application.
VOLUNTARINESS
42. If I would subscribe to mobile news/TV services, it would completely be my own decision. No one would influence me in making that decision.
WILLINGNESS-TO-PAY
22. Even if it costs a bit more, mobile news/TV is something I really want.

The transformation of determinants into a scale of 47 items is the combined result of desk research and qualitative research by means of focus group interviews. A first phase of desk research resulted in a long list of statements of 19 determinants used in other studies and models (both diffusion theory based models as well as social psychology based models). In addition to this, the long list was verified in four focus group interviews with the goal to select the best way to translate the item into a statement.

All 269 (mobile news study) and 405 (mobile television study) respondents completed the entire questionnaire. The most important results show a striking difference between the attitudes or determinants for both innovations. In the average agreement scores, for example, it can be noticed that a determinant as 'tangibles' (14, 25) is more important for mobile television than for mobile

news. Regarding 'reliability' (31) people seem to be more sceptical for mobile news, while the 'perceived control' (46) seems to result in a higher score for this new mobile application. 'Product knowledge' (19, 35) on the other hand is lower for mobile television; etc With an R² ranging between .503 and .795 for the earlier adopters and early majority, these 47 'determinant operationalisations' certainly seem to be a good set of variables to explain the variance in the dependent variable 'adoption intention'. Even for the later adopter segments this R² still ranges between .34 and .42. Detailed information about the psychometric reliability and validity can be found in De Marez et al (2007: 86-88).

Thus, for both technological innovations, this set of attitudinal determinant statements explains adoption intentions quite well, but there remain many differences in the significant determinants for the different innovations and adopter segments. 'Lifestyle compatibility' (39) for example is only significant for the mobile television's innovators, not for mobile news. Also the 'cost perception' (1) is only significant in the mobile television case (laggards). 'Trialability' (41) then is significant in both cases, but not for the same segments. Other determinants such as the perceived impact of adoption on one's 'image' (33) was only significant for mobile news' innovators and laggards. So, we can notice many differences in attitudes, as well when compared over the two cases, as compared over the different adopter segments. This emphasizes the need for a product- and segment specific approach when studying adoption determinants.

3.2 Elaboration for policy purposes: analysis of non-adopters

The need for more profound insights in why people do not use ICT innovations, for instance computer and internet, is an important question for policy makers. For instance, as more people are connected and taking full advantage of new possibilities that are offered via internet, government cannot ignore those groups that are not yet connected. So, policy makers should at least take the initiative to set up measures that can help people – who risk to be excluded – to enhance their participation in the information society.

Research Group MICT-IBBT was commissioned with this research question by Fedict (The federal public agency for information and communication technology) of the Belgian federal government. As

the responsible agency for stimulating ICT acceptance and use in society, Fedict needed a scientific supported base for setting up new initiatives. The research results presented below draw on the experience that the Belgian government has acquired through the 'Internet for all' project in 2006. The latter was set up in collaboration with ISPs, PC manufactures and retailers, and entailed the provision of an affordable package (€750 - €1000) deal to customers, consisting of a PC, an internet connection plus a training session. It was calculated that the project contributed to 16% of the increase of new internet connections over a period of one year (Verdegem & Verhoest, 2008: 38). A critical evaluation of the 'Internet for all' project revealed different elements, two of which inspired our research. The first was merely the confirmation of what could be expected. Not all of the groups in society were equally well served by the campaign. For instance, for some individuals the proposed offering was too expensive. The second source of inspiration was an incidental call of a representative of a professional organization of physical therapists that proposed to target the campaign also towards the members of his organization. These two observations triggered a reflection that inspired the new policy approach and adjoining research.

The new approach is articulated around the concept of 'relative utility', a sociological reinterpretation of the economic concept of 'marginal utility'. Contrary to the other case studies illustrated in this paper, of which the goal was to broaden the insights concerning adoption determinants, this case is focused on the elaboration and interpretation of parameters of ICT appropriation. By paying attention to both the adoption as well as the usage decision we wanted to provide input for measures that would help to stimulate ICT adoption and use. Following the relative utility approach, the assumption is that the specific combination of conditions in terms of access to ICT, skills to master the devices and attitudes towards the technology, has an impact on whether people will use ICT or not. More specifically, based on the combination of perceptions of people towards access, skills and attitudes (ASA) it becomes possible to determine a hypothetical 'turning point' for ICT use, namely the point at which the benefits will outweigh the cost of appropriating an ICT product for a certain category of users.

On a practical level, in order to set up effective e-inclusion measures, the advantage of this method is that groups of individuals with relatively homogeneous ASA-profiles, can easily be identified

and reached by policy makers. Very often they are represented by professional or social organizations that know how to reach them and are willing to cooperate with government. A specific offering can then be proposed to these groups, taking into account the specificities of their ASA-profile and socio-economic background.

The approach draws upon the assumption that members of socio-demographically and socio-economically homogeneous groups yield similar perception in terms of access, skills and attitudes towards ICT. This hypothesis was tested by means of a quantitative survey (personal interviews with 184 respondents). The research population was composed of a theoretical sampling, meaning that we selected individuals based on a limited number of characteristics, i.e. variables of which previous research has shown that they are of major importance for (non-)adoption of ICT. In the research we recruited individuals (non-users) from ten groups, varying from single mothers with children to physical therapists. This resulted in certain prototypical profiles, exemplary for the societal diversity without being representative for the overall population (for detailed information see Verdegem & Verhoest, 2008).

In order to map the respondents' perceptions of computer and internet use at home, we presented them with a list of statements. The statements were based on the same adoption determinants that are mentioned above (see table 2). A number of these statements aimed at obtaining information about the respondent's specific ASA-profile: 1) positive or negative attitudes towards computer and internet at home; 2) the presence or lack of skills and competences towards using ICT and 3) the presence or absence of barriers to access ICT. Other statements served as measurement scales to gain insights in more generic factors such as, for example, the influence of social networks or marketing strategies of the ICT industry.

Based on the answers of the respondents on the statements cluster analysis revealed five distinctive groups of domestic non-users of computer and internet:

- Incapable refusers;
- Self-conscious indifferent;
- The willing but incapable;
- Skilled ICT-lovers with limited access;
- Price sensitive pragmatists.

The clusters demonstrate that non-adopters or non-users should not be seen as one generic group. Each profile represents a different combination of the factors investigated, in which each factor carries a

different weight. Statistical testing was also conclusive about the relationship between the group membership (from theoretical sampling) and the membership of the ASA-profiles (Pearson Chi-Square $p \leq 0,01$). As such, we found empirical foundation for the assumption that homogeneous groups – in terms of socio-demographic and socio-economic characteristics – result in generic ASA-profiles.

Following on this quantitative research qualitative in-depth interviews and focus group interviews were organized to refine our thinking of why people do not use ICT and to examine which leverages could lift them over the turning point between non-usage and usage. The results of both research stages show the advantage of the approach proposed and offers the opportunity for policy makers to set up measures to stimulate later adopters to ICT appropriation. These measures could be more effective as they are based on strategies of segmentation and differentiation, taking into account the different profiles of these individuals. The elaboration of adoption and usage determinants is thus necessary to gain insight in a group of individuals that are often ignored in innovation research.

4 CONCLUSIONS

Our research results clearly show the need for a thorough understanding of user attitudes towards ICT acceptance. As more technological innovations are introduced in rapid succession and an increased number of those innovations is failing, accurate insights in the determinants towards adoption and use become increasingly important. We could state that both our theoretical reconsiderations as well as the empirical foundations of them, provide ICT managers as well as policy makers with useful input in support of their innovation strategies. As a matter of fact, the development of an information society for all serves both economic as social purposes.

The approach proposed started from the same common framework, i.e. more traditional adoption determinants who are founded by technological deterministic inspired paradigms. We illustrated that these parameters, who have an impact on technology acceptance, should be reconsidered. The described elaboration contains both an exercise of broadening and deepening.

First of all, it is important to examine which determinants are of major relevance in order to forecast how new innovations should be brought to

the market to persuade the potential (first) adopters, or those interested in the product. Not only the product development in terms but also the targeting and marketing campaigns strongly ask for accurate insights into user preferences. Particularly in the (pre-)launch phase.

In addition, the framework of adoption determinants should also be re-evaluated with regard to later adopters. People who enter the adoption process in a later stadium – or who even resist to adopt – may have clear reasons for that. However, deep understanding of who is making less (or even no) use of information technologies remains weak. Nevertheless, this is of major importance for both policy makers, as well as for ICT managers.

So, in a nutshell, our approach contains both a managerial as a policy relevance. Furthermore, we also hope that this paper contributes to both theoretical reconsiderations as well as the methodological foundation of technology acceptance research.

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