

# **Not Another TAM Paper; Relating individual and context characteristics to the adoption of HDTV**

*By Eva Baaren, Lidwien van de Wijngaert & Erik Huizer*

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## **Abstract**

*Within the field of technology adoption research, there is a well-known tradition of using and improving Davis' (1989) 'technology acceptance model' (TAM) or extended versions thereof. This article suggest a break with this tradition by showing that the TAM is limited in its understanding an prediction of technology adoption. Two alternative approaches are proposed that focus at the role of knowledge and specific user-technology matches (approach 1) and the role of temporary dynamical contexts (approach 2) in the process of adoption decision-making. Together with the TAM, both approaches were empirically tested and compared to the TAM by incorporating them in a questionnaire regarding the adoption intention of HDTV in the Netherlands. The results show that the constructs of both approaches show significant relations with the respondents' adoption intentions of HDTV and, together, offer a good alternative to the TAM. This result can be seen as a basis for more future research that uses specific underlying technological and contextual underlying factors as a starting point for adoption research. Using this starting point will contribute to better understandings of, and possibilities of interference with, future technology adoption processes.*

## **1. Introduction**

With every new media technology that emerges our society, scholars from various disciplines such as economics, psychology, social science and communication studies attempt to understand and predict

its success or failure. An important part of the research conducted within these domains, is the study of end-user adoption of technology. A new technology that stands at the beginning of its adoption process, is high definition television, also known as ‘HDTV’. HDTV is a new television broadcast standard, containing a digital image resolution that displays a sharper image (1080 interlaced or 720 progressive scan lines and higher) compared to existing PAL (576 interlaced) and NTSC (525 interlaced) standards. But the transition to HDTV is not a straightforward process, since this new standard needs to be adopted by every party within the television chain in before it can be used. At the end of this chain, the end-users of HDTV (the households) need to invest in new HD-ready television screens, set-topboxes *and* HD-subscriptions in order to successfully receive and view high definition images. While the penetration of television screens is steadily rising, the adoption process of HDTV subscriptions is still very slow. This article aims at understanding current considerations of end-users regarding adoption by analyzing factors that influence their adoption intentions. It also argues that these factors can't be found by using existing models like the Technology Acceptance Model (TAM) and variants of this model that focus on perceptions of ‘usefulness’ and ‘ease of use’ (Davis 1989). Instead, it argues that the adoption rate of HDTV as well as any other new media technology depends on temporary underlying user-technology matches and contextual factors. In the next two paragraphs, this argument will be further explained and two alternative approaches (paragraph 2) and operationalisation methods (paragraph 3) are proposed that work beyond the paradigm of validating the existing TAM-based models.. These approaches were empirically tested among 3100 Dutch households. The results of this test (paragraphs 4 and 5) show that a combination of both alternative approaches give a better understanding of the underlying factors influencing differences in adoption between users, technologies, and times. With this understanding, adoption processes of a certain technology can be better predicted or actively steered by institutions controlling some of these underlying factors.

## **2. Beyond the technology acceptance model**

As the former paragraph has stated, a vast amount of adoption research of IT's in organization and in the home, is centered around perceptions of usefulness and ease of use, first used in Davis' Technology Acceptance Model (1989). The TAM builds upon the theories of reasoned action and planned behavior, both of which argue that an individual's attitude towards a certain kind of behavior and perceptions about the individual's own performance will determine the actual execution of this behavior (Fishbein & Ajzen, 1975, Ajzen, 1985). The TAM has been validated successfully, since scholars that have empirically tested the model found high explained variances between perceived usefulness (PU), perceived ease of use (PEOU) and adoption intentions (e.g. Adams, Nelson & Todd 1992, Szajna 1996, Venkastesh & Davis, 2000, Venkatesh, Morris, Davis and Davis, 2003). In this sense, the TAM is regarded as a trustworthy tool for predicting adoption intentions. However, for researchers that seek to understand the full process of technology adoption, and with that, factors influencing this process, the technology acceptance model has a limited scope. First, the model treats perceptions of usefulness and ease of use as independent factors, leaving the dynamics that determine usefulness and ease of use as a black box. This black box becomes clear in the way TAM-based questionnaires are operationalized; Questions that measure technology perceptions, or technology 'belief constructs' (Bensabat & Barki, 2007) are designed with scale-based items like "I find <the technology or service> useful" and I find <the technology or service> easy to use". The results of TAM-based research can therefore only show *if* respondents find a technology useful and easy to use, instead of *why*. But since adoption processes differ from one technology, timeframe and society to the next (Rogers, 1995), research in this domain should concentrate on exactly these differences and their

underlying factors. This means that a shift of focus from ‘if’ to ‘why’ - and thus moving away from a model that threats perceptions of a technology as independent factors – is necessary.

## **2.1. Extended versions of the TAM**

Several theories have already claimed attention for more in-depth, factors influencing adoption processes. Some of these theories, for example ‘TAM2’ (Venkatesh & Davis, 2000) and the ‘UTAUT’ model (Venkatesh et al, 2003) have extended the existing TAM with several other constructs to explain adoption intention and adoption. These constructs refer to personal circumstances (age, gender, experience) as well as contextual factors like social influence and voluntariness of use. While some of this factors may contribute to a better understanding of technology adoption, in these models, they are placed next to the constructs of PU and PEOU (also referred to as ‘performance expectancy’ and ‘effort expectancy’ by Venkatesh et al, 2000/2003). Because PU and PEOU remain intact, these extended models as a whole will not be used in this article. Some of the new constructs that have been added to the TAM can be used, but will be discussed among other theories that focus on the influence of personality traits, knowledge, experience, user-technology matches and/or contextual factors.

## **2.2. Personality traits**

In the domain of psychology, personality traits are seen as important indicators for technology adoption. These personality traits are intrinsic characteristics of individual end-users and contain concepts like ‘venturesomeness’ (Ostlund, 1974) ‘novelty seeking’ (Hirschman, 1980), ‘self-efficacy’ (Bandura, 1994) and ‘personal innovativeness’ (Rogers, 1995). But while the effects of these factors on perceptions of usefulness and actual adoption have been proven viable (e.g. Manning, Bearden & Madden 1995, Lin 1998, June, Yao & Yu 2005), they are still generally measured as ‘belief’

constructs instead of an actual psychological characteristics (Bensabat & Barki, 2007). Furthermore, the share of personality traits in a society roughly stays the same over time. Differences in technology adoption speeds between technologies and times can therefore hardly be seen as the result of swings in a populations general personality traits. To understand these differences in adoption, the focus should be on factors outside personality traits, that are more technology-based and context specific. This means combining theory with, in this case, possible factors surrounding the current on the emergence of HDTV.

## **2.2 HDTV knowledge and visual experience**

According to Rogers (1995), adoption decisions depend on the end users' of how compatible the technology is with personal values, experiences and needs. These values, experiences and needs can only influence an adoption decision when there is some degree of knowledge regarding the existence, uses and meaning of the technology. This knowledge can be actively sought by end-users, but also depends on external factors that surround the specific technology, such as its triability or visibility in society (Rogers 1995). For HDTV, both triability and visibility can be translated into visual experiences with its main characteristic: the high resolution image. These visual experiences can be seen as an important factor influencing adoption intentions; Earlier research on HDTV adoption in the Netherlands has shown that perceptions of usefulness were more positive by respondents that (claimed to) have seen HDTV images (Baaren, van de Wijngaert & Huizer, 2008).

Next to visual experiences, knowledge as the ‘possession of information’ about HDTV devices and subscriptions may also have several consequences for adoption intentions. A study on the adoption process of digital television in the USA found a significant influence of the amount of knowledge regarding the DTV environment on adoption intentions. It was also argued that a lack of knowledge was likely to lead to a delay in making any adoption decision, since potential adopters

were still insecure about possible benefits of the technology (Chan-Olmstead & Chang, 2006). However, as stated in the beginning of this section, knowledge about its functions and conditions for use serve only as a precondition for making a decision (not) to adopt a technology. The rest of the decision-making process depends on other factors that are discussed in the next two sections.

### **2.3 End-user & technology matches**

As stated in section 1, the TAM treats the role of technological characteristics in the adoption process of technology as a black box. But the possibilities and limitations for its use due to the inherent characteristics of the technology, or the product in which the technology is shaped, can be seen as the boundaries within which the end-user does or does not find a proper use for the technology. These boundaries manifest themselves in several ways.

First, according to the theory Media Richness, end-user communication becomes effective when its inherent characteristics of a medium match the communication task(s) a user has to perform. For example, when communication tasks are considered as complex and equivocal, a ‘rich’ medium is sought, that allows instant feedback, multiple cues, natural language and a personal focus (Trevino, Lengel & Daft, 1987). Following the arguments of this theory, adoption of a new technology, then, depends on expectations of task-technology fits. However, media choice theories have been developed to understand choices in two-way end-user communication means such as face-to-face conversations telephone and e-mail. The use of television, that is still mainly based on one-way broadcast communication, calls for other ‘tasks’ than those between end users. A television-specific variant of television uses can be found in the Uses and Gratifications (U&G) approach. This U&G approach is based on the notion that viewers make active choices between the genres, channels and the amount of content they are watching, based on the gratifications they expect to get from their viewing behavior (Palmgreen, Wenner & Rayburn 1980, Palmgreen & Rayburn 1985). These

viewing choices may have an impact on the adoption intention, since image and sound quality can enhance the feeling of ‘being there’ that is often sought in sports, movies and games (Baaren, van de Wijngaert & Huizer. 2008). Similarly, there can also be a absence of needs in the direction for high quality images when the end-user watches other genres, or values the importance of television in his or hers daily life as low.

Second, gratifications or needs regarding television can also be found outside of specific viewing behavior of television genres. The relative advantage (Rogers 1995) that end-users do or do not see for HDTV is also related to the way this technology is valued amongst other existing technologies. The extra value that end-users see for HDTV is questionable since HDTV is, technically speaking, no more than an upgrade of the existing television image resolution and sound quality. This raises the question if a better image and sound quality are desirable at all. This question becomes even more viable since the diffusion of HDTV goes hand in hand with that of standard digital television (DTV), which also has a promise of an image quality improvement, and contains other use options like video-on-demand (VOD) and interactivity. The way HDTV is values amongst existing and emerging television features can be measured by analyzing wishes for image- and sound quality improvement and comparing them to wishes for other new television uses made possible by digitalization. The strength of these wishes can, in turn, be related to the television signal (analog or digital) that end-users receive: For consumers that have switched to DTV, the idea of having a better image quality may already have been achieved.

Third, the characteristics of the HDTV reception devices (in turn determined by the supply side of the television chain) makes the adoption of the technology rather complex: As it is currently offered, HDTV adoption requires purchasing HD-compatible screens, set top-boxes and subscriptions, which then also need to be used by understanding the remotes controls that come with the devices. Complexity of HDTV adoption and use should therefore be measured as a possible factor

influencing adoption intentions. But instead of measuring general beliefs of HDTV complexity and falling back into the use of TAM-based constructs (e.g. “I find the use of HDTV very difficult”), questions should ask for attitudes towards adoption of specific HDTV characteristics (e.g. arranging a new subscription) and HDTV uses (e.g. handling the remotes controls and the decoder).

In sum, next to visual experience and knowledge, the match between the needs, uses and gratifications of the end-user on one hand, and the characteristics of technology on the other should be incorporated in adoption research. In the case of HDTV, looking closely at the context in which HDTV needs to be adopted can do this. This context has, so far, been based on characteristics and use behavior of existing technologies (analog and digital SDTV) and devices. In the next section, contextual factors are discussed that work beyond end-user & technology matches.

## **2.4 Contextual factors**

In the three sections above, we have explained the limitations of TAM and provided alternative list of factors influencing adoption intentions based on theories that take technology specific characteristics and uses as a focal point. What have sofar been left out, are contextual ‘system factors’ (Lin, 2003) that surround the emergence of a technology in a society. Whereas the TAM model is lacking explanations for perceptions of usefulness and ease of use, the approach of personal and person-technology matches lacks recognition of the social and economic contexts wherein adoption intentions are formed. First of all, adoption intentions can be socially influenced by ‘opinion leaders’ or ‘salient’ others (Rogers 1995). These groups of actors can impose a postive or negative attitude towards the technology upon the end-user. There a two forms of social influence. First, social influence can come from partners, friends, peers and relatives (Venkatesh et. al. 2003, Quiring 2006). Second, on an macro level, organizations that sell the technology, sell competing technologies, or represent consumers can also influence attitudes by giving the technology public attention and a

certain preferred meaning. Also, news media can influence public discourses towards the technology. A comparative study between Britain, the United States and Australia has shown that different national discourses (measured by the extent of media coverage and language structures) regarding digital television caused differences in adoption speeds (Weber & Evans, 2002). Both influences form the direct social environment and existing organizations (including news media) should be taken into account in adoption research.

Apart from influence by communication as described above, the supply side of the television chain also presents the technology as a product, accompanied by certain prices and conditions for use. For HDTV adoption in the Netherlands, these prices and conditions are highly changeable and depend on policy choices of broadcasters and distribution parties. During this research, with four foreign channels and no national content other than major international sports events, the amount of content that is offered in high definition is still low. This limited amount of HD content forms a recurring topic in HDTV news articles, and is seen as a major threshold for adoption (Ammelrooy 2006, Hijink, 2008, Briel 2008). Second, as already stated, the emergence of HDTV is only one of the events surrounding digital television. As a result, distribution parties offer television subscriptions with VOD or set top-boxes with hard disc recorders next to, or instead of, HDTV. This situation is likely to change in the future when more content becomes available and existing subscriptions of HDTV and VOD are turned into new subscriptions that combine these elements. These changes, in turn, can lead to a more positive attitude towards HDTV, but also a more positive new coverage regarding the introduction of HDTV.

In short, next to end-user & technology matches, adoption intentions cannot be understood without regarding the dynamics of contextual system factors. Researching these contexts requires a specific method for two reasons. First, adoption decisions are not based on considerations of one contextual factor at the time, but on the whole context: Prices, services and surrounding opinions are

bundled by end-users, and then turned into an (non-) adoption decision. Second, the contextual factors mentioned above tend to quickly change over time, making it hard to research their influence at a fixed point in time. The effects of contextual changes can therefore only be measured hypothetically. Comparable to studies that take a 'policy capturing', 'factorial suvery' or 'conjoint measurement' approach (Bouwman and Van de Wijngaert, 2005), scenario's in which context factors change systematically can be used to test the influence of context factors on adoption intention. A detailed description of these scenarios and will be given in the next section.

### 3. A framework with three approaches

The factors described in the former paragraph and the differences in methodology that are needed to research these factors, have resulted in a framework that has three approaches for empirical quantitative research. The first approach studies TAM-factors, the second studies 'individual' underlying factors and the third studies the influence of contextual factors on the adoption intention of HDTV. This framework is represented in figure 1.

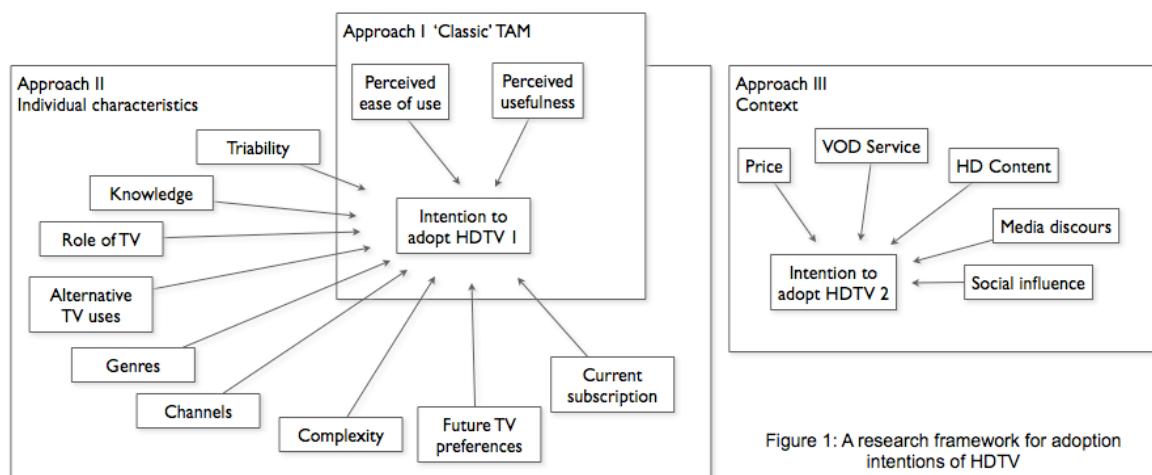


Figure 1: A research framework for adoption intentions of HDTV

#### 3.1. Operationalisation

The first approach tests the influences of the independent TAM-based variables (PU and PEOU) on the adoption intention of HDTV. We expect both constructs to have high explained variance in relation to the adoption intention. All questions are based on a five-point Likert-scale and focus on *beliefs* of usefulness and ease of use of HDTV (see section 1 for examples). Adoption intention is measured by *behavior* (e.g. “I plan to switch to HDTV in the future”, “I’m keeping an close eye on the HDTV developments”).

The second approach focuses on the relation of the construct of adoption intention with ‘individual’ constructs, containing knowledge trailability (the visual experience with HDTV), subscription ownership, future TV preferences (including the need for better image and sound quality), viewing behavior of channels & genres, alternative TV uses, and the general importance of television in daily life. With these factors, explained variance and coefficients are expected to be lower than for PU together with PEOU, but influences are expected to still be significant. When possible, the independent variables measured *behavior* towards specific (HD)TV characteristics, instead of beliefs. The dependent variable ‘adoption intention’ is the same as the ‘adoption intention’ measured in the TAM approach.

The third approach tests the influence of contextual factors on the adoption intention. As the former paragraph has pointed out, using scenarios can test these factors by systematically varying the values of each of these variables. In the scenarios used here, four factors are incorporated that vary in the amount of HD content (30, 60 or 100% of the respondents favorite content), HD subscriptions (with or without VOD), opinions in the media (positive or negative) and the social influence from an acquaintance (positive or negative). This leads to a set of 72 hypothetical scenarios. When respondents are randomly presented with one of these scenarios, they are asked to estimate the chance they will adopt HDTV subscriptions based on the scenario. An example of such a scenario is as follows:

*“Imagine a television subscription that offers 30% of your favorite programs and movies in HDTV quality (high image sharpness’ and sound quality). It also contains extra on-demand services for reviewing missed programs. In newspapers and on television, you read/hear positive messages about HDTV. A trustworthy acquaintance, however, already has this subscription and tells you the subscription is definitely worth having. The subscription costs will be 5 euros extra on top of your current subscription costs. Furthermore, a decoder is needed with a price of 300 euros. Based on these scenarios, what is the probability of you getting such a subscription within a year? “*

We expect the explained variance for TAM-based factors to be higher than with individual factors, since TAM measures general beliefs of usefulness and ease of use, containing all kinds of unexplained underlying factors. For the other two approaches that focus on (some of) these underlying factors, we expect a lower explained variance, since some of the factors might turn out to be relevant while others might not. Also, there may be relevant factors that have not been incorporated in the current framework. Still, if significant relations are found between individual and/or contextual factors and adoption intentions, then they do give a deeper understanding of the complex backgrounds from which a technology adoption decision is formed. This understanding makes it possible for institutions that can profit from the adoption of HDTV to actively change specific underlying factors and influence the adoption process of end-users.

#### **4. Research & Results**

To test influences of factors within this framework, a survey was conducted in the early summer of 2008 among 3100 Dutch households. Because adoption decisions of new television subscriptions and screens are household matters rather than individual decisions, only respondents that regarded themselves to be in charge of the adoption decision were asked to fill out the questionnaire. Of those respondents, 60% was male and 40% was female. Most of the respondents (41%) were between 31

and 60 years old and had education on college (56%) or academic level (13%). After the collection of data, the responses were weighted by Dutch television subscriptions using infrastructure (cable, satellite, terrestrial, IP) and reception of the signal (analogue or digital). Also, the scale-questions were recoded in new variables. Table 1 in the appendix shows the questions and Cronbachs Alpha's as were after recoding. For viewing behavior of genres and channels, we conducted an exploratory factor analysis that resulted in a division between two groups of viewers: Commercial channel viewers, mostly interested in entertainment, and public channel viewers, mostly interested in news and documentaries. Tables 2 and 3 show correlations between items. Tables 4, 5 and 6 show the results of the regression analyses for all three approaches.

From these tables, the hypothesis can be confirmed that explained variance is the highest with the TAM approach ( $R^2 = 0.48$ ), followed by accumulation of individual constructs ( $R^2 = 0.34$ ) and the analysis of contextual factors ( $R^2 = 0.05$ ). The relative small amount of variance coming from contextual factors, can be explained by the fact that the contextual constructs had to be measured on a hypothetical basis. Respondents were asked to imagine a situation, which may have been more difficult than when the situations presented were actually present. Still, when influences of both contextual factors and individual factors are counted together and compared with TAM-constructs, the differences in explained variance is only 0.09. A combination of approaches testing individual and contextual factors thus provides a good alternative to the TAM approach, especially since this alternative approach is likely to *explain* constructs that are central to the TAM by underlying factors.

#### **4.1. Influences of TAM-based and individual constructs**

The constructs that were tested within the TAM-model show similarities with other TAM research: The construct of PU has the highest coefficient (0.64) followed by PEOU (0.12). Again, the TAM model keeps its claims of having strong constructs. When it comes to individual underlying factors,

the results in table 5 show that six out of nine constructs show significant relations with the adoption intention of HDTV: The wish for HDTV characteristics, knowledge, alternative television uses, preferences in genres and channels, visual experiences and ownership of digital television subscriptions all partly determine the HDTV adoption intention. The mean of the adoption intention variable is relatively low, with 2.8 on a 5-point scale. For most respondents, adoption of HDTV subscriptions, at this point in time, is still rather unlikely. But a change in (some of) the significantly influential factors mentioned above may change intentions to adopt HDTV. The next section will explain the results per factor, their sources and their possible consequences for the adoption of HDTV.

#### *The wish for HDTV characteristics*

As table 5 shows, the wish for HDTV-related characteristics has the strongest influence on the adoption intention. This wish includes a sharper image quality, a better sound quality and a bigger flat screen TV in the future. Not only is there an influence, but the wish for a an improvement of image sharpness and sound is also relatively high: A sharper image quality (mean= 3.7) and better sound (mean 3.6) were found most important compared to other television developments such as a growth of channels, VOD and interactive services. Despite the threat of other digital developments and services, the characteristics that HDTV offers can be seen as an incentive for adoption.

#### *Knowledge and visual experiences*

The presence of knowledge (either false or correct) has the second biggest positive influence on the adoption intention<sup>1</sup> This can be explained by the argument that an increase of knowledge decreases insecurity, and this makes it possible to actually form an attitude towards adoption (Rogers, 1995).

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<sup>1</sup> After respondents had marked certain statements as correct, incorrect or ‘don’t know’, these questions were recoded into a scale item, ranging from lack of knowledge (the amount of don’t knows) to false knowledge (incorrect answers) to correct knowledge (correct answers).

However, there is still a big lack of knowledge: Of 17 multiple choice (quiz-like) questions, the mean amount of questions that respondents did not know the answer to, was 7.5, compared to 5.6 for correct answers and 3.5 for incorrect answers. In particular, topics about the amount and character of broadcasted HD content as well as the status of current HDTV subscriptions showed a big gap in knowledge. Many respondents claimed not to know if the famous French bicycle tour (74%), the Euro-2008 soccer championship (64%) and the Olympics (60%) were or would be broadcasted in High Definition. Also, 54% claimed not to know if their television distributor already offered HDTV subscriptions, and 51% did not know if decoders for digital television were also capable of receiving and decoding an HDTV signal. This lack of knowledge can be explained by an absence of public attention that was given to HDTV other than commercials for HD-ready TV sets.

Further down in table 5, the construct of visual experience (of which 64% of the respondents claimed to have seen HDTV in practice) also shows a positive influence on the adoption intention. Table 3 shows that this variable partially correlates with the variable of knowledge (43%), the wish for HDTV characteristics (18%) and alternative TV uses (15%). But another 8% in the regression analysis comes from significant differences in visual experiences with HDTV alone. A possible explanation may be its visibility or presence in society itself, causing the idea that the transition to HDTV as the new television standard is inevitable. Adoption, then, is no longer a choice. In any case, with a further increase of both knowledge and visual experience, adoption intentions are likely to rise. This increase can be stimulated by institutions on the supply side, that are able to spread information through, for example, marketing, or by offering free HD content as a trial.

### *Viewing behavior & television uses*

Next to needs for HDTV characteristics, knowledge and experience, differences in adoption intentions can be explained by current television uses, in two ways. The first way is the frequency with which the television set is used for alternative purposes such as watching DVD's, watching recorded or downloaded content and gaming. These uses highly correlate with each other ( $\alpha = 0.99$ ) and together explain 13% of the adoption intention. Second, viewing habits of channels and genres also partially influence the adoption intention. Public channel viewers that frequently view 'serious' content such as news and documentaries have a higher adoption than less frequent viewers in this group, whereas viewing frequencies of commercial channels and entertainment viewing variable did not show significant differences.

#### *Television subscriptions, complexity and the importance of television*

The last significant individual variable contains television subscriptions. After differences in wishes, knowledge and viewing frequencies have been filtered out, respondents with a digital subscription still have a more positive adoption intention of HDTV than respondents that still use an analogue signal. An explanation may lie in idea's of lack of choice, as was stated in the former paragraph. Respondents that belong to this group may have adopted digital television out of an idea of inevitability, and may now also prepare themselves for HDTV as the next step for the same reason. A second explanation can be found in possible dissatisfaction with the existing digital signal, which also promises the user an improvement of the image quality. End-users that still have an analog signal may still be satisfied with the quality of their signal.

Finally, the role of television in daily life and complexity of specific HDTV uses does not play a significant role in HDTV adoption intentions. For the latter variable, table 3 shows that this, in part, may be due to relatively high correlations (0.31) between complexity and the wish for HDTV characteristics. However, the rest of the non-significance remains unexplained.

### *Summary*

To sum up, the results based in the individual factors model show that wishes for HDTV characteristics are high and have the biggest influence on adoption intention among other individual factors. Furthermore, frequent viewing behavior of news and ports programmes, frequent alternative uses of the TV set and the use of digital TV also positively relate to HDTV adoption intentions. However, most knowledge about HDTV uses and adoption still lacks. While knowledge shows the second-biggest influence on the adoption intention measured in this research, it can slow down adoption intentions of HDTV, even for the end-users that would have seen HDTV as an enrichment of their current television use gratifications.

## **4.2. Influences of contextual factors**

The results of the third approach are displayed in table 6 and also show some striking results. First, the dependent variable of this model (adoption intention 2) shows a lower mean (2.2) than the adoption intention based on the former approaches (mean = 2.8). This indicates that, when respondents become conscious of certain situational conditions, adoption intentions can change. Furthermore, all tested factors show significant results, except for the factor varying in the amount of broadcasts in high definition. Instead the amount of content, opinions from acquaintances have the highest coefficient, followed by the price of the subscription, media opinions and, finally, the presence of VOD services in the HDTV-subscriptions. These results have several implications. First, the significance of social influence shows that communication or persuasion between end-users has a greater effect on adoption intention than institutional communication though news media. However, opinions of end-users are also partly based on knowledge and opinions of others,

including those of institutions. Institutional communication towards end-users therefore remains an important factor. Second, institutions also play a role in the determination of prices and conditions of subscriptions; Despite of a general need for a sharper image quality, VOD-services appear to be of more greater importance than having a big amount of HD content available. This does not mean that the amount of high definition content does not matter at all. First, because the scenario's in this research have set the minimal amount of HDTV content to 30%. This means that differences in adoption intentions may still appear when the amount of HD content rises from 0% to 30%. Second, an increase of HD content can also have an indirect effect on adoption intentions through an increase of the positive media attention and positive opinions of salient others.

In sum, although the overall explained variance of the contextual model is low, the model is valuable in explaining significant contextual factors of price, social influence, media discourse and concurrent technologies and/or services. As differences in means of adoption intention variables has shown, these contextual factors can also make the final difference between positive and negative adoption intentions.

## **5. Conclusion**

The purpose of this article was to show the additional value of researching individual underlying factors and changing contexts in order to better understand and predict adoption intentions of new media technology. Three approaches were empirically tested in a survey that contained questions aiming at general beliefs towards the concept of HDTV (PU, PEOU, adoption intention), specific attitudes towards aspects of the technology (complexity, wish for HDTV characteristics), specific behavior (knowledge, television use, viewing habits, importance in daily life), and hypothetical scenario's (social influence, amount of HD content, presence of VOD and media discourse). While the explained variances for individual and contextual factors were lower than that of the TAM

approach, both alternative approaches show significant results for most factors. Together, they also offer a better alternative to the TAM-approach, since they do not only describe contemporary attitudes towards adoption of a technology, but also explain them and offer possibilities for active stimulation of adoption. Research regarding adoption decisions of new (media) technology should therefore concentrate on individual and contextual based factors and, given the explained variances, preferably in combination with each other. The TAM model can still be used as an indicator of future adoption, but the perceptions of usefulness and ease of use are will only be symptomatic of the presence of underlying factors that vary from one technology and one context to the next.

From the results of the multi-theory, multi-method approach conducted in this research, several conclusions can be drawn regarding the near future of HDTV adoption. First, adoption intentions are still low with a means of 2.2 and 2.8 on a 5-point scale. Current positive intentions come from respondents that have seen HDTV work, have a strong wish for a sharper image quality and a better sound quality, respondents that frequently watch public channels with news and documentaries, respondents with a digital television subscriptions, and/or respondents that frequently use the television device for alternative purposes (including Internet movie downloads, that are often seen as a threat to HDTV rather than an incentive for adoption). should in this case be regarded as *incentive* for the adoption of HDTV subscriptions. What still lacks, is sufficient knowledge surrounding the use and adoption of HDTV subscriptions. The strong relation between knowledge and adoption intention indicates that an increase of knowledge can have a profound positive influence on the adoption intention of HDTV. The direct social environment of the end-user and institutional campaigns can change the amount of knowledge. These actors can also change attitudes towards HDTV through persuasion or by altering conditions for HDTV subscriptions. If costs drop and combinations with VOD become available, not only potential adopters themselves may become more

positive regarding adoption of HDTV, the opinions of neighbors, friends and media that these potential adopters value, might do the same.

## **6. Limitations, further research and future HDTV developments**

Based on the results of this article, further research regarding HDTV adoption is needed. First, the way we varied the contextual factors within the scenarios for this research was rather extreme. For example, opinions of acquaintances were either positive or negative, and the amount of HD content in a scenario could be 30%, 60% or 100%. This leaves the question open what happens between these extreme situations. Second, since scenarios were hypothetical, answering the question required some extra imagination from respondents. Next to hypothetical situations, changes in contextual factors should therefore, if possible, also be studied by longitudinal research. Such a study allows changing contextual factors to show their effects on adoption decisions. Third, the results of this study call for future research that combines the two alternative approaches by not only counting up their outcomes, but also measuring the influence of individual factors on the adoption decision *via* the awareness of contextual factors. Such a combination will contribute to an even more in-depth explanation of adoption decisions of a specific technology at a specific moment in time. Forth, research has focused on finding factors that influence the adoption intention for HDTV specifically. But the approaches used in this research are also an indicator for further research on other (media)technologies. The message that this article gives is that it remains important to keep distracting factors from contemporary situations instead of using only those that have been tested before. In addition to statistical research, methods of qualitative nature, for example through face-to-face interviews with end-users can help define these and further explain the nature of these factors.

To conclude this article, exiting times are waiting for the adoption process of HDTV; the public broadcasters have announced to start broadcasting HDTV programs on a regular basis in the

first half of 2009 (NRC Handelsblad, 2009). When this happens, the first 30% of HD content will or will not prove a shift in adoption intentions. Also, a major cable distributor in the Netherlands has launched new a set-topbox that can be used for HDTV, as well as on-demand services *and* hard disc recording (Ziggo.nl, 2008). This may be a small indication that VOD services and HDTV subscription packages will, in time, likely be combined. While prices of subscription are likely to rise instead of sink when more content becomes available, this combination may be well needed for distribution parties that are eager to speed up the adoption rates of HDTV subscriptions.

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**APPENDIX I:** Operationalisation & correlations of TAM, individual and vignette constructs.

**Table 2.** Bivariate Correlations for Variables in the Analysis I

	(1)	(2)
(1) Perceived usefulness	1	-
(2) Perceived ease of use	0,36	1

**Table 3.** Bivariate Correlations for Variables in the Analysis II

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Wish for HDTV_characteristics	1	-	-	-	-	-	-	-	-
(2) Visual experience with HDTV	0,18	1	-	-	-	-	-	-	-
(3) Current subscription	0,05	0,09	1	-	-	-	-	-	-
(4) Television in daily life	-0,04	-0,02	-0,05	1	-	-	-	-	-
(5) Complexity use & adoption	0,31	0,04	0,06	0,03	1	-	-	-	-
(6) Knowlegde	0,24	0,43	0,22	-0,04	0,02	1	-	-	-
(7) Commercial channels viewers	0,24	0,03	0,03	-0,16	0,21	0,02	1	-	-
(8) Public channel viewers	0,17	0,20	0,09	-0,01	0,09	0,24	0,00	1	-
(9) Alternative TV uses	0,17	0,15	0,13	-0,07	0,06	0,16	0,18	0,07	1

## APPENDIX II: Regression results for TAM, individual factors and vignette analysis

**Table 4.** Coefficients and values from regression on Adoption Intention 1 (mean = 2.8)

Independent Variables (TAM)	Mean	R <sup>2</sup>	F-value	t-value	St. Beta
<b>Model Summary</b>	-	<b>0.48</b>	<b>493.42**</b>	-	-
- Perceived usefulness	3.4	-	-	27.10	0.64**
- Perceived ease of use	3.3	-	-	4.96	0.12**
- <i>Constant</i>	-	-	-	- 0.51	-

\* p<0.05; \*\*p<0.01 (two tailed)

**Table 5.** Coefficients and values from regression on Adoption Intention 1 (mean = 2.8)

Independent variables	Mean	R <sup>2</sup>	F-value	t-value	St. Beta
<b>Model summary</b>	-	<b>0.34</b>	<b>86.23**</b>	-	-
- Knowledge	-	-	-	8.97	0.27**
- HDTV characteristics	3.5	-	-	11.27	0.30**
- Alternative TV uses	4.3	-	-	4.79	0.13**
- Public Channel viewers	-	-	-	3.51	0.09**
- Visual experience with HDTV	-	-	-	3.12	0.09*
- Current subscription	-	-	-	2.96	0.08*
- Role TV	2.9	-	-	-1.13	- 0.04
- Commercial channel viewers	-	-	-	-1.85	- 0.06
- Complexity of adoption & use	4.0	-	-	0.85	0.03
- <i>Constant</i>	-	-	-	0.92	-

\* p<0.05; \*\*p<0.01 (two tailed)

**Table 6.** Coefficients and values from regression on Adoption Intention 2 (mean = 2.2)

Independent variables (conjoint)	Mean	R <sup>2</sup>	F-value	t-value	St. Beta
<b>Model summary</b>	-	<b>0.05</b>	<b>15.80**</b>	-	-
- Social influence	-	-	-	4.98	0.14**
- Price of subscriptions	-	-	-	- 4.65	- 0.13**
- Media discourse	-	-	-	3.35	0.10**
- VOD service	-	-	-	2.04	0.06*