ADOPTION VERSUS USE DIFFUSION
Predicting User Acceptance of Mobile TV in Flanders

Tom Evens, Lieven De Marez

Research Group for Media & ICT (MICT-IBBT), Ghent University, Korte Meer 7-9-11, Gent, Belgium

Dimitri Schuurman

Research Group for Media & ICT (MICT-IBBT), Ghent University, Korte Meer 7-9-11, Gent, Belgium

Keywords: User research, adoption diffusion, use diffusion, mutual shaping, mobile TV.

Abstract: In the contemporary changing ICT environment, an increasing number of services and devices are being developed and brought to end-user market. Unfortunately, this environment is also characterized by an increasing number of failing innovations; confronting scholars, policy makers as well as industry with an explicit need for more accurate user research. Such research must result in more accurate predictions and forecasts of an innovation's potential, as a basis for more efficient business planning and strategy implementation. However, the success of a new technology is not only depending on the adoption decision and the number of people actually buying it, but relies at least as much on its actual usage. Hence, the focus of truly user-oriented acceptance or potential prediction should focus on predicting both adoption diffusion and use diffusion. Within this paper, we illustrate the added value of such an interactionist approach for the study of future adoption and usage of mobile TV by the assessment of both a large-scale intention survey and qualitative techniques such as diary studies, focus group interviews, observational and ethnographic methods.

1 INTRODUCTION

In the contemporary changing ICT environment, an increasing number of services and devices are being developed and brought to end-user market. Unfortunately, this environment is also characterized by an increasing number of failing innovations; confronting scholars, policy makers as well as industry with an explicit need for more accurate user research. Such research must result in more accurate predictions and forecasts of an innovation's potential, as a basis for more efficient business planning and strategy implementation.

In most cases however, this need for more accurate user insight only gets translated in a cross-sectional investigation of the innovation's adoption potential. However, the success of a new technology or service is not only depending on the adoption decision and the number of people actually buying it. For example, many people may have bought or adopted a mobile phone with GPRS, UMTS or MMS without using the feature. The success of an innovation is thus not only depending on its

adoption, but at least as much on its usage. Hence, the focus of truly user-oriented acceptance or potential prediction should not only be focussed on predicting adoption diffusion, but also on predicting use diffusion and potential usage. Evidently, the first research question to answer remains up to which degree the innovation has the potential to be adopted. This should always be accompanied with an answer to the question up to which degree the innovation also has the potential to acquire a place in people's and household's daily lives (in terms of time and habits).

In terms of theoretical frameworks, the first 'adoption diffusion' question relies on the diffusion paradigm, while the second 'use diffusion' question relies on the 'social shaping' and 'domestication' paradigm. Too often however, the Social Shaping of Technologies (SST) and Domestication perspective is considered as the alternative to set off the lack of attention for the user and his/her social usage context in the diffusion theory. Traditionally, both perspectives (and the research based on them) have too much been considered as opposites; while they

are perfectly complementary to each other. The purpose of this paper is to illustrate this complementariness and the enrichment of combining the more quantitative generalizing research approach of diffusionism with the more qualitative in-depth SST research approach. Based on user research conducted on mobile TV, we illustrate how this combination of approaches and methods resulted in a prediction of potential as well as usage of this new technology. This way, we intend to illustrate the theoretical, methodological, managerial as well as policy relevance of this plea for a more mutual shaping or interactionist approach on predicting user acceptance (see Boczkowski, 2004: 255).

2 TWO COMPLEMENTARY FRAMEWORKS

The oldest of the two theoretical frameworks is the 'diffusion framework', of which Everett M. Rogers (1962) is assumed to be the founding father. According to this framework, the diffusion of innovations in a social system always follows a bell-shaped normal distribution, in which there can be successively distinguished between Innovators (2.5%), Early Adopters (13.5%), Early Majority (34%), Late Majority (34%) and Laggards (16%). A person's innovativeness is assumed to be determined by the perception of the following set of innovation characteristics: relative advantage, complexity, compatibility, trialability and observability (Rogers, 2003). Since the early 60's the theory's assumptions on segment sizes, diffusion pattern and determinants have been a basis for different types of (mostly) quantitative research such as econometric diffusion modelling or innovation scales (Goldsmith & Hofacker, 1991; Meade & Islam, 2006; Moore & Benbasat, 1991; Parasuraman & Colby, 2001; Venkatsh, Morris, Davis & Davis, 2003).

Since the mid 80's however, questions about its technological determinism and lack of attention to the user and usage of the innovation have induced Rogers to adjust his approach to the adoption decision process, but have also led to the rise of new paradigms such as domestication focussing on the *'way the use in households is being socially negotiated and becomes meaningful, within the social context of class, gender, culture or lifestyle'* (Van Den Broeck, Pierson, Pauwels, 2004: 103; Haddon, 2007; Silverstone & Haddon, 1996) or *'the process of taming and house training 'wild' technological objects, by adapting them to the routines and rituals of the household and thus giving them a more or less natural and taken-for-granted*

place within the microsocial context of that household' (Frissen, 2000: 67; Jankowski & Van Selm, 2001: 37). Domestication thus refers to integration of new technologies in the daily patterns, structures and values of users, relying on a more social determinism (Bouwman, Van Dijk, Van den Hooff & van den Wijngaert, 2002). Methodologically, the SST and domestication paradigm relies more on a qualitative tradition of methods such as in-depth interviews, ethnographic observation and diary studies.

In the past, these two major paradigms have mostly been regarded as opposite and competing, with convinced advocates from the two sides engaging in vicious debates. However, with diffusionism as the more quantitative tradition with the focus on acceptance and adoption decisions and the domestication tradition as more qualitative with a focus on the use and appropriation of technologies, both paradigms are clearly complementary (Punie, 2000). Or, as Boczkowski (2004: 255) states, *'two sides of the same innovation coin'*. To date a dialectical approach, which considers the development and diffusion of ICT innovations as *'joint processes of technological construction and societal adoption'* (Boczkowski, 2004: 257), gains ground. Instead of thinking in terms of diffusionism or social shaping, the mutual shaping or interactionism approach (Boczkowski, 2004; Lievrouw & Livingstone, 2006; Trott, 2003) appeared in the late 90's as a dynamic middle path between the two previous linear deterministic predecessors. By integrating both quantitative and qualitative research outcomes within this paper, we aim to illustrate the enrichment of such an interactionist approach for the development and roll-out of mobile TV in Flanders, the northern and Dutch-speaking part of Belgium.

Relying on the difference between 'adoption diffusion' and 'use diffusion' (Shih & Venkatesh, 2004), we believe that the prediction of 'adoption diffusion' should rely on (1) a quantitative diffusion approach by means of (intention) surveys and modelling to gain insight in the innovation's potential in terms of percentage of the target market, penetration pattern and profiles of the different adopter segments; and (2) the prediction of 'use diffusion', based on more qualitative techniques such as diary studies, focus group interviews, observational and ethnographic techniques (if possible in a field trial or living lab setting).

3 RESEARCH DESIGN

The empirical findings are based on the two-year MADUF project which studied the possibilities of mobile TV using DVB-H in Flanders. In first instance, a large-scale user survey (n: 575) was set up in order to forecast the market potential, or to predict the 'adoption diffusion' potential for mobile TV in Flanders. By applying the Product Specific Adoption Potential (PSAP) scale, we were able to map the size and nature of the future mobile TV market in Flanders. The PSAP scale is an intention based survey method in which respondents are allocated to Innovator, Early Adopter, Majority and Laggard segments based on the stated intentions on a general intention question and on respondent-specific formulated questions gauging for their intention for 'optimal' and 'suboptimal' product offerings (De Marez & Verleye, 2004; Verleye & De Marez, 2005). The scale was compared on its reliability with five other adoption models and has been applied to and validated for a diversity of ICT innovations such as digital TV, 3G, mobile TV and mobile news (De Marez, 2006; De Marez, Vyncke, Berte, Schuurman & De Moor, 2008).

In second instance, a representative panel of test users was randomly selected from the 575 survey respondents to experiment with mobile television devices in a 'living lab' setting during two weeks. Due to practical reasons (the DVB-H network was operational in the city of Ghent only, so the panel contained people exclusively living but not especially working in Ghent) and because of the rather explorative nature of this field trial, the amount of test users was limited to 30. With this field trial, we aimed at achieving a first realistic view of how future users will integrate mobile TV in their everyday practices. Users were asked to document their experiences in diaries while logging their activities, noting their comments and taking pictures of their usage situations.

Next to these data, we also gained insight in their personal evaluation of the trial phase by means of a post-measurement. Comparing these results with the findings of the market forecast before testing the device allowed us to see whether user attitudes towards mobile television had changed as a result of the trial. In this manner, we aimed to measure the effect of trialability, the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003: 266). Explanations for possible shifts between the pre- and the post-measurements can be found in the usage diaries and two organised focus groups. Figure 1 illustrates this interactionist approach combining both quantitative user attitude research and qualitative ethnographic techniques.
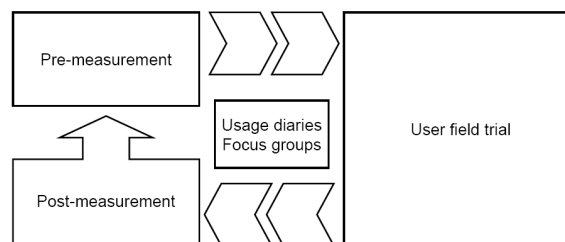

Figure 1: Interactionist research design.

4 RESULTS: PREDICTING ADOPTION DIFFUSION

By applying the PSAP scale to 575 rich cases, we obtained a reliable view on the size and nature of the various adoption segments for mobile TV in Flanders in the following segmentation forecast. While traditional fixed segment sized methods are reflected by the black line (in this case Rogers' Diffusions of Innovations), the red line represents the adoption potential for mobile TV. The latter is contrasted to the potential of 3G (De Marez, 2006), which allows TV programmes to be received over a unicast architecture network. Figure 2 clearly shows that there is little demand for mobile TV over DVB-H compared to Rogers' full market approach and even compared to the take-up of 3G services. Due to the lack of substantial innovative segments (Innovators and Early Adopters), we would recommend a partial market approach or even a niche strategy for the introduction of mobile TV in Flanders. This implies a specific introduction strategy for a limited market potential to serve the chosen segments in an optimal manner (about a 20% market penetration). Since the Late Majority and Laggard segment are clearly not willing to pay for this mobile service, we will define the maximal target group as Innovators, Early Adopters and Early Majority promising a 16,7% segmentation forecast.

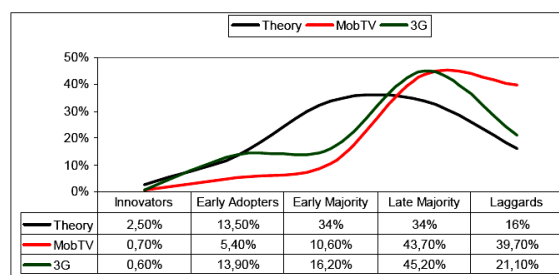|	Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Theory	2,50%	13,50%	34%	34%	16%
MobTV	0,70%	5,40%	10,60%	43,70%	39,70%
3G	0,60%	13,90%	16,20%	45,20%	21,10%

Figure 2: Segmentation forecast mobile TV.

In general, we witnessed a rather dual profile within the innovative segments with on the one hand well-earning, older executives (little time, potential

for snacking) and on the other hand low educated young couples without children (much time, complementary to heavy TV viewing behaviour). Although especially executives are facing a shortage of time, most of them seem to be heavy television viewers, watching both entertainment and information programs. Especially Innovators and Early Adopters (joint for statistical reasons) possess advanced mobile phones (with camera, MMS, WAP, MP3, FM radio…), which they use in an innovative manner (e.g. sending e-mails on mobile phone, see Figure 3). Generally, these people show the highest willingness to pay for mobile TV while most of them consider a mobile TV device (with integrated mobile phone) as a substitute for their current mobile phone.

	EA	EM	LM	L	Total
Never	60.6%	74.1%	87.4%	96.0%	87.9%
1-2/year	3.0%	10.9%	4.0%	1.8%	3.9%
1-2/month	15.2%	6.7%	3.6%	2.2%	4.0%
1-2/week	6.1%	1.7%	2.8%	0.0%	1.8%
Daily	15.2%	6.7%	2.0%	0.0%	2.5%

Figure 3: Sending e-mails on mobile phone

Clearly, such quantitative research may provide reliable estimations of the adoption potential and diffusion (in this case of mobile TV in Flanders), but does not provide us with in-depth information regarding the domestication and potential use diffusion of mobile TV. What place will it take in the lives of the consumers, how and when will it be used?

5 RESULTS: PREDICTING USE DIFFUSION

To answer the latter questions, one needs a more qualitative 'use diffusion' and domestication oriented research framework. In the case of mobile television a combination of diaries, focus group discussions, pre-post test comparisons and photo elicitation within the boundaries of a **living lab setting** was used to get further insight in people's usage patterns of mobile TV. Although we are aware these results are not statistically representative due to the very limited sample of 30 test users, they nevertheless allow us to identify some explorative usage patterns for mobile TV amongst our field trial participants.

On average, people watched approximately eleven times via their mobile television device during the two-week test period. However, it is possible that people being part of a panel within a test environment felt obliged to experiment more with the devices than they would do within a more natural context. Although we cannot ignore this trial effect, it plays a less important role within this research set-up because we aim to generate explorative rather than statistically representative findings. In terms of this usage frequency pattern, we can distinguish three kinds of viewers: *light viewers* watching less than 10 times (n: 15), *medium viewers* watching between 10 and 20 times (n: 13) and *heavy viewers* watching more than 20 times (n: 2). These two heavy viewers were identified as Innovator and Early Adopter within our large-scale sample.

Within our user panel, we only found two heavy viewers while the rest of the panel was about equally divided among medium and light viewers. One important finding during our test period is that the different types of viewers used the mobile TV device in a different way. Figure 4 represents all watching moments and divides them amongst the periods people watched mobile TV. In terms of the moments people watched mobile TV, we identified six different time slots: night (0-6h), morning (6-12h), noon (12-14h), afternoon (14-18h), evening (18-22h) and late evening (22-24h). When analysing the figure, we see that, except for the light viewers, trial participants are not inclined to watch mobile TV while having breakfast. This is probably due to the strong position in the morning of the medium radio, which is '*together with the water and the stove, the first thing that is turned on in the morning'* (Winocur, 2005: 325). Light viewers are also more likely to watch mobile television at noon while having dinner.
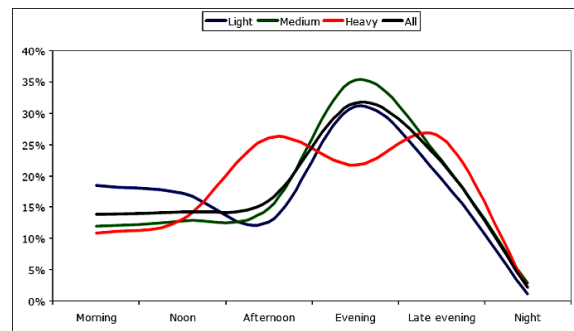

Figure 4: Usage patterns (per time slot).

Heavy viewers are most likely to watch mobile during the afternoon, while most of the other types of viewers only switch their device on in the evening after coming home from work or school (see Figure 4). While light and medium viewers are watching mobile TV in the evening, we notice a remarkable

decline in viewing of the heavy viewer-segment during this time slot (see red line). Nevertheless, we see that this segment starts watching again in the late evening, the moment where the other segments switch their device off. This results in peaked watching patterns that differ quite much between the three user segments. While light and medium users show one viewing peak during the evening, heavy viewers have two peaks: one in the afternoon and one in the late evening. The latter two-peaked pattern is rather complementary with traditional TV, as its peak time comes right in between the mobile peak times. We can conclude that heavy viewers used mobile TV complementary to their regular television and therefore watched the device in a manner it was meant to be watched: on the move. In contrast, light and medium viewers watched mobile TV at home as a substitute for regular television.

The previous findings are supported by the usage locations indicated in the diaries. Light and medium viewers especially watched mobile TV at home. Undoubtedly, the most popular place was the living room where people are used to watch regular television while relaxing in their sofa. This also seemed the case for mobile TV: most people watched television in their natural habitat. Instead of watching the large screen, our test users watched mobile TV, albeit for a rather short period. After having tested the mobile device, they switched to the large screen again to enjoy their favourite programs. Here, we witnessed a <u>substitution</u> of the classical screen at traditional peak times with mobile TV was considered a second TV (see also Schuurman et al., 2008). This was especially the case for the light and medium users in our sample. This does explain the similarities between peak times for mobile and regular TV for these groups.

Another popular location for watching mobile TV was the kitchen. People seem to enjoy watching mobile TV while eating in the kitchen, where most of the time no TV set is at hand. We also witnessed that a lot of people used the mobile device while working at their desk or sitting behind the computer. These people used mobile TV rather as a <u>background</u> medium or as tertiary activity (see Jacobs, Lievens, Vangenck, Vanhengel & Pierson, 2008). When they heard something interesting, they switched attention from their work to the mobile device. Although they watched mobile television, these people considered the mobile television device often as a radio, which is in most cases also used as a background medium. Here mobile TV was clearly used in combination with other activities such as doing the dishes or working (multitasking).

Especially heavy viewers made use of the <u>complementary function</u> of mobile TV and considered it as an extra supply next to their regular television. This is illustrated by the fact that heavy viewers watched significantly more in public space and on the move. We found that watching in the car is a rather popular activity to kill time, sometimes as fellow passenger but also as driver. These people driving to their work and back, spend a lot of time in their car and have to suffer traffic jams. It is hardly surprising that in such cases mobile television is seen as a simple time killer although the radio can serve this purpose as well. Other persons preferred watching mobile TV while waiting for or travelling with public transport services (bus, metro and train). Taking into account the massive success of the iPod, mobile TV devices can be the next big thing to spend time while commuting.

After the trial period, we asked our 30 test users to fill out the same **questionnaire** they had previously taken. Based on the combined results of both pre- and post-trial measurement, we were able to compare the findings and see whether user expectations and attitudes had changed during the mobile TV field trial. The findings from the qualitative part of this research project (i.e. focus groups and ethnographic methods such as usage diaries) enabled us to explain possible shifts.

General interest for mobile TV slightly increased during the field trial. However, persons who originally intended to purchase a mobile TV device soon, now preferred to wait a bit longer. On the other hand, the amount of people certainly not willing to purchase a mobile TV device declined as well. A slightly increased average score (from 3,70 to 3,80) suggests that overall attitude towards mobile TV became a little bit more positive. Also the average price people are willing to pay increased from €233 to €294. But it is striking that we witness a converging shift towards a non-decisive average. Convinced believers start to doubt while disbelievers might have seen some possibilities after all due to the trial.

In other words, less people are showing an innovative attitude towards mobile TV, but many others shifted from 'never' to 'maybe'. It thus seems that the field trial has raised awareness of mobile TV and that a lot of people do not consider the medium as a luxurious product any longer, making it less appealing to the more innovative but more likely to consider for the less innovative. Although these people are not likely to purchase mobile TV soon, they are not longer against mobile TV since they have experienced it as a handy medium to catch up television content quickly. Innovators and early adopters on the other hand were somehow disappointed by the lack of interactive and

interesting content, resulting in their downgrade. Despite the shift towards a more positive attitude, the potential for mobile television remains dramatically low, as the sample does not contain any Innovators or Early Adopters anymore and that the least innovative segments (Late Majority and Laggards) remain largely overrepresented.

6 CONCLUSIONS

With this paper, we intended to reconcile two opposing traditions: adoption diffusion and use diffusion. Within the MADUF-project, we combined research techniques from both traditions in an interactionist way in order to get a more holistic view on the possible success of mobile TV in Flanders. By means of a PSAP-estimation, it became clear that mobile TV is not ready yet for total market acceptance so that a partial market or even niche strategy was suggested. By means of a diary study, combined with a pre-test and post-test survey during a mobile TV-trial in a living lab environment, we were able to get a better understanding of the possible use diffusion of mobile TV. We found that for most test persons traditional television remains the reference point for evaluating mobile TV. Television undoubtedly is one of the most domesticated technologies within the home and became so dominant that people often schedule their behaviour in function of the TV-set. We found that light and medium mobile viewers used the device at home as a second TV with watching behaviour in line with traditional TV. Heavy users on the contrary watched mobile TV in a truly mobile and much more complementary way with traditional television. This resulted in mobile peak times coinciding with regular TV for the former two groups, while for the latter mobile TV allowed to extend the regular TV viewing peak with two mobile peaks: one before and after the regular peak. Finally, we witnessed the (modest) overall positive effect of trialability through a slightly increased general attitude towards mobile TV during the field trial.

By combining these two paradigms, we were able to draw a clearer picture of the potential success of mobile TV and the different factors influencing this success. While a quantitative potential estimation can identify adoption segments and describe them for targeting purposes, the qualitative usage diffusion-research provides input for the fine-tuning of the technology in terms of usage patterns, features and content. We believe this methodological plea for more interactionist research designs has theoretical as well as industry and policy relevance for the prediction of ICT user acceptance. For instance, in the current debate of digital dividend such predictions could help policymakers to get insight in the feasibility of new communication technologies and for which new technologies they should preserve space in the future radio spectrum. These estimations also allow marketing managers to decide in which market segments they should invest and with what offer these segments should be targeted. Finally, for researchers we hope this paper gives some food for thought about the added value of an interactionist approach and inspires them to work out more creative innovations research designs in the future.

ACKNOWLEDGEMENTS

REFERENCES

Boczkowski, P.J. (2004). The Mutual Shaping of Technology and Society in Videotex Newspapers: Beyond the Diffusion and Social Shaping Perspectives. *The Information Society, 20*(4): 255-267.

Bouwman, H., Van Dijk, J., Van den Hooff, B. & van de Wijngaert, L. (2002). *ICT in organisaties. Adoptie, implementatie, gebruik en effecten.* Amsterdam: Boom.

De Marez, L. (2006). *Diffusie van ICT-innovaties: accurater gebruikersinzicht voor betere introductie-strategieën.* Gent: Universiteit Gent.

De Marez, L., Verleye G, (2004). Innovation Diffusion: the need for more accurate consumer insight. Illustration of the PSAP-scale as a segmentation instrument. *The Journal of Targeting, Measurement and Analysis for Marketing, 13*(1): 32-49.

De Marez, L., Vyncke, P., Berte, K.; Schuurman, D. & De Moor, K. (2008). Adopter segments, adoption determinants and mobile marketing. *Journal of Targeting, Measurement & Analysis for Marketing, 16(*1): 78-95.

Frissen V. (2000). ICTs in the rush hour of life. *Information Society, 16*(1): 65-75.

Goldsmith, R.E. & Hofacker, C. (1991). Measuring consumer innovativeness. *Journal of the Academy of Marketing Science 19*(3): 209-222.

Jacobs, A.; Lievens, B.; Vangenck, M.; Vanhengel, E; & Pierson, J. (2008). Mobile television or television on mobile? In: A. Urban; B. Sapio & T. Turk (Eds.) *Digital Television Revisited. Linking Users, Markets and Policies*, 68-75.

Jankowski, N. & Van Selm, M. (2001). ICT en samenleving. Vier terreinen voor empirisch onderzoek. In: Bouwman, H. (Ed.), *Communicatie in de informatiesamenleving* (p. 217-249). Utrecht: Lemma.

Lievrouw, L. & Livingstone, S. (Eds) (2002). *The Handbook of New Media*. London, Thousand Oaks, New Delhi: Sage Publications.

Meade, N. & Islam, T. (2006). Modelling and forecasting the diffusion of innovation. A 25-year review. *International Journal of Forecasting, 22*: 519-545.

Moore, G.C. Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research 2*(3): 192-222.

Parasuraman, A. & Colby, C.L. (2001). *Techno-reading marketing: how and why your customers adopt technology*. New York: Free Press.

Punie, Y. (2000). *Domesticatie van informatie- en communicatietechnologie. Adoptie, gebruik en betekenis van media in het dagelijkse leven: continue beperking of discontinue bevrijding?*. Vrije Universiteit Brussel: Vakgroep Communicatiewetenschappen.

Rogers, E.M. (1962). *The diffusion of innovations*. New York: The Free Press.

Rogers, E.M. (2003), *Diffusion of innovations* (5th ed.), New York: The Free Press.

Schuurman, D.; De Marez, L. & Evens, T. (2008). *Mobile TV: content is king, but who's to be crowned*? Proceedings of International Technology, Education and Development Conference. March 3-5, Valencia, Spain.

Shih, C.-F. & Venkatesh, A. (2004). Beyond Adoption: Development and Application of a Use-Diffusion Model. *Journal of Marketing, 68*(January): 59-72.

Silverstone,R. & Haddon, L. (1996). Design and domestication of information and communication technologies: technical change and everyday life. In: Silverstone, R. & Mansell, R (Eds.), *Communication by design. The politics of information and communication technologies* (p. 44-74). Oxford: Oxford University Press.

Trott, P. (2003). Innovation and Market Research. In: Shavina, L.V. (Ed.), *The International Handbook on Innovation* (p. 835-844). Oxford, UK: Pergamon, Elsevier.

Van Den Broeck, W.; Pierson, J. & Pauwels, C. (2004). *Does interactive television imply new uses? A Flemish case study*, Conference Proceedings, Second European Conference on Interactive Television. 'Enhancing the experience', 31/03/2004-02/04/2004, University of Brighton, UK: 101-112.

Venkatesh, V.; Morris, M.G., Davis, G.B. & Davis, F.D. (2003). User acceptance of information technologies: toward a unified view. *MIS Quarterly, 27*(3): 425-478.

Verleye G., De Marez, L. (2005). Diffusion of innovations: successful adoption needs more effective soft-DSS driven targeting. *The Journal of Targeting, Measurement and Analysis for Marketing, 13*(2): 140-155.