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ICT-innovations today: making traditional diffusion patterns obsolete, and preliminary insight of increased importance

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Abstract

Two main lessons that can be learned from the current ICT's environment, are that the traditional adoption and diffusion pattern cannot be taken for granted anymore, and that preliminary user insight is becoming of increased importance. The first aim of this paper is to present an adjusted form of this traditional theoretical pattern that better fits today's practice. A pattern that is double-peaked, instead of the smoothly bell-shaped one we are familiar with. Secondly, we would like to present the PSAP (Product Specific Adoption Potential)-scale as a tool to obtain the necessary consumer insights before the actual introduction of an ICT-innovation. These insights enable communication and marketing departments to be better prepared for innovation introductions, in order to have the best chances on reaching both peaks in the adoption curve. Illustrations are based on two cases in which an innovation segmentation is made for digital television (2001, $N = 624$) and third generation mobile telephony (2003, $N = 1006$) in Belgium.

Keywords: Diffusion; Innovation; Segmentation; PSAP-scale

1. Introduction: ICT-innovations today

"We can also now focus marketing effort on targeting innovators. Once we have singled them out and understood what drives them, we can write and design our

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communications specifically to recruit them. We can also choose whatever media are best to reach them with greatest efficiency. In short, in the late 1990s, we have the capability to focus on innovators. But we still have to know who they are.” (Carter, 1998)

The quotation above illustrates the prevailing conviction within the ICT-environment that a good introduction strategy for ICT-innovations is a strategy of effective segmentation and targeting. Postulating that a supply-push approach is susceptible to criticism, and that preliminary user insight is an absolute necessity for such segmentation and targeting, is consequently not very ‘new’. Yet, together with the assessment of failing introduction strategies, it still is the starting point for this paper. We do aspire however, to contribute with something ‘new’ on the domain of obtaining the necessary preliminary insight to reach more effective segmentation and targeting. With ‘*But we still have to know who they are*’, the quotation clearly ends with an open ended question for methods to obtain such insight. In this paper, we suggest a new segmentation tool to do that, but we also suggest an adjustment of the theoretical diffusion pattern. Two aspects that should enable one to be better prepared for more effective introduction strategies in the current ICT-environment.

That ICT-environment started with the so-called ‘information revolution’ (Jankowski and Van Selm, 2001: 217) or ‘Technological revolution’ (Sheth, 1994: 11); the evolution from ‘industrialism’ to ‘postindustrialism’ (Lyon, 1995; Burgelman, 1993: 64), or from an industrial society towards an ‘information society’ (Toffler, 1980; Servaes and Heinderyckx, 2002: 92; Ricci, 2000: 142). Today, we still live in that society, but that does not imply that things have stayed the same since its beginning of it. On the supply-side, as well as on the demand-side, things kept evolving, making traditional assumptions not that self-evident anymore in the current ICT-environment.

On the supply-side, no one will contest the fact that the offer of ICT-innovations has exponentially increased during the last years (many of them being incremental innovations, [1] or products of the current ‘diffusion’-era) (McBurney et al., 2002: 225; Choi et al., 2003: 161; Van Cuilenburg, 1998: 7; De Bens, 2002: 3). WAP, digital and interactive television, mp3-players, X-box, GPRS, UMTS, i-mode, wifi, flat-tv, … are only a few of the innovations we are confronted with nowadays. Despite the promising prophecies however, this increased offer goes hand in hand with an increasing number of failing ICT-innovations. Experiences with digital television for example in the Netherlands, Spain, Portugal, … showed more than disappointing adoption rates. WAP was even a bigger failure. When looking for explanations for these failures, many of them are related to a lack of insight into consumers adoption potential, their needs, and their wants beforehand. Reactions such as ‘*If we would have known that our introduction price was too high …*’ or ‘*… that consumers were not willing to pay for application X …*’ or ‘*… application Y only appealed to those two*

[1] An incremental innovation is an innovation that is based on (an) existing product(s), or improvements to existing products (Rothwell and Gardiner, 1988).

specific segments ...' are often heard and imply that introduction and marketing strategies would have been different, and could have been more effective if such knowledge would have been available beforehand. At the presentation of the zdf-platform for digital television (2001) for example, Stuart Thompson (2001: 2) stated that '*Over much of Europe, digital pay-tv growth remains characterized by poor take up* ...' and that this is due to '... *badly judged marketing decisions*' (Thompson, 2001: 2). This explanation for failure has also been mentioned by other authors as Danaher et al. (2001: 501), Crawford and Di Benedetto (2000: 225), Schneider et al. (1991: 190) and Choi et al. (2003: 162–163).

A possible explanation for such 'badly judged marketing decisions' are the evolutions on the demand-side. Consumers have become far more exacting, more fragmented, and less predictable as they used to be. In the beginning of 'the information society' period, adopter segments as innovators, early adopters, ... appeared to have a constant homogeneous socio-demographic, socio-economic, media(technology) usage and ownership, and lifestyle profiles for different ICT-innovations. Innovators for example were supposed to be typically male, higher educated, younger, more self-employed, having a typical media usage and ownership profile, ... (Wei, 2001: 705; Jeffres and Atkin, 1996: 320). In today's ICT-environment however, these segmentation criteria do not seem to be that reliable and homogeneous anymore (Bergman et al., 1995: 299; Neuendorf et al., 1998: 83; Lin, 1998: 104; LaRose and Atkin, 1992; Wright and Chariett, 1995: 34; McMeekin and Tomlinson, 1998: 873). Also the assumptions of innovators and early adopters owning significantly more other ICT-innovations, or being significantly heavier users of ICT-innovations, can be questioned (Dupagne, 1999: 39). Due to the increased offer of ICT-innovations people are overwhelmed with, it has simply become impossible to own all, or most of the technologies. This also makes the ownership of the number of ICT-innovations less reliable as a segmentation criterion. However, suppliers still rely too much on these 'traditional profiles' as a basis for an introduction strategy, resulting in 'badly judged marketing decisions', or having targeted the wrong people with the wrong message or product offer.

The reliance on these traditional but unreliable segmentation criteria is however only one of the reasons for the increasing number of failures. In other cases innovations fail, simply because they are too much introduced in a 'pushy way'. Many ICT-innovation introductions are still managed from a wrong point-of-view. In love with the own product and its capabilities, people on the supply-side are often too much convinced of the fact that 'if we build it, they (the adopters) will come' (Lennstrand, 1998: 3). For years this was an effective approach, but in the current environment of more exacting customers confronted with an exponentially increased offer, it is naive to stick to this 'field-of-dreams approach' (Baldwin et al., 1996: 190), or to this approach of 'supply-side concept reasoning' (Jankowski and Fuchs, 1995). As more and more authors emphasize, in today's environment it is important that introduction strategies are based on a 'demand-side reasoning', instead of the often too optimistic supply-side reasoning; and a pull-strategy instead of a push-strategy should be chosen. Picard (2002) for example, or Servaes and Heinderyckx (2002: 100) emphasize that the current 'corporate-driven policy' of short-term vision and technology push, and only having attention for the technology itself, should no longer be preferred. To introduce ICT-innovations, a 'user-driven policy' should be preferred: a policy, offering user-driven solutions, based on thorough insight in the users' needs and expectations.

2. Does the traditional theoretical view become obsolete?

Studying successful or failing innovations, inevitably brings us to the theory of 'diffusion of innovations' and its founding father Everett M. Rogers (1962). Despite the many adjustments, criticisms and remarks that have been made since, the basics of it still remain valid: instead of looking at the market as one big entity, it can be split up into five segments under a bell-shaped curve, according to their degree of innovativeness along an axis of risk aversion and following a 2.5/13.5/34/34/16%-ratio (Fig. 1A). Adoption is perceived as a linear process driven by a 'copy-behaviour-' or 'imitation' principle (Carter, 1998; Mahajan et al., 1995; Rogers, 1995; Crawford and Di Benedetto, 2000: 228): initially, an innovation is adopted by a small group of innovators, soon followed by the early adopters, which are copied by the less innovative early majority etc. ...

Probably one of the most criticized points of this theory is its deterministic linear-mechanical presentation (Boullier, 1989; Chambat, 1994; Flichy, 1995; Lennstrand, 1998: 6), giving the impression that the different stages or adopter segments in the diffusion process almost automatically succeed each other. Related to another point of criticism, the 'ex post approach' of diffusionism, it may not be that surprising to come up with such smooth linear models, since diffusion-theory is mainly based on 'ex post' studying of mostly successful innovations (Boullier, 1989: 33; Pinch and Bijker, 1987: 22). Also the assumption of fixed segment sizes can be questioned (Mahajan et al., 1995: 82; Boullier, 1989; Carter, 1998; Vedel, 1994). Many follow(ed) Rogers (1995) with his 2.5/13.5/34/34/16-ratio, but also more flexible interval-approaches as the one from Mahajan et al. (1995: 82), where the size of the

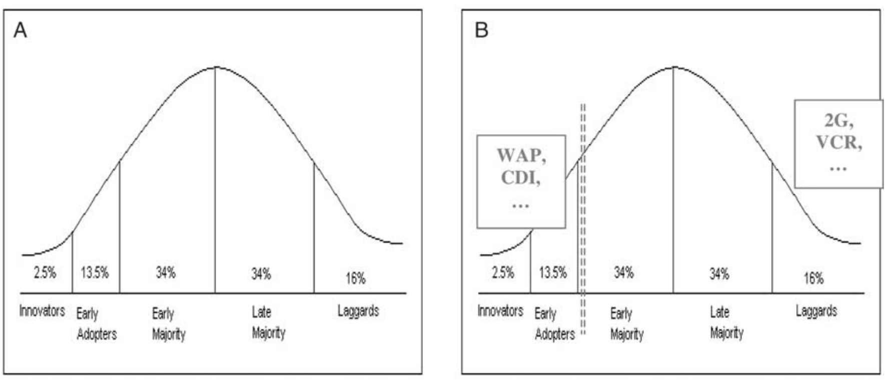

Fig. 1. (A) Adoption-curve in theory (Rogers, 1995: 262), (B) adoption-curve in practice.

innovator segment for example is variable between 0.5% and 2.8%, are still too 'fixed'. Innovators or early adopters for a certain product, may be 0.5% as well as 25%. Not taking this into account may result in a wrong targeting and communication strategy, in which the wrong people are targeted, or a lot of people that should be targeted on a certain moment, are not. Related to the criticism on this partition in percent of the adopter segments, is the criticism on the assumption of 100% of the market being under or included in the adoption curve. It seems only logical that, besides the traditional five adopter segments, there must always be a sixth segment of what we can call 'innovation dislikers (ID)'; people showing not the slightest interest and of which we know in advance that every effort towards these people will be a wasted one. For this reason, it may be useful such a segment of 'innovation dislikers' is taken into account.

In the light of the linear and deterministic criticism, authors as Punie (2000), Silverstone and Haddon (1996), Bijker et al. (1987), Mackenzie and Wajcman (1985) also criticized diffusionism for not having included the conception of an innovation as 'social construction'. Since the focus of this social constructivistic tradition of authors is more on the domestication-aspect, and taking into account the way the innovation gets its place in the household, we would like to emphasize that our attention goes exclusively to the actual decision to adopt or reject, and not to the further course of the innovations life. For that reason, we do not account for this criticism within our beaconed scope.

Our main criticism is that the traditional adoption pattern, mapping these adoption decisions over time, is not that self-evident anymore in today's practice. In the current ICT-environment, the bell-shaped adoption pattern cannot taken for granted anymore. For technologies as 2G mobile telephony or the VCR, innovations smoothly passed this theoretically described curve, having no trouble reaching the 'less innovative segments'. But these are—unfortunately—becoming more and more exceptional cases. WAP (Wireless Application Protocol) for example, hardly got further then the early adopters (Fig. 1B). And who does not remember the RCA video disc, the 3DO-gamecomputer, IBM's PC Junior or Philips Cdi, ...: one by one examples of technologies or '*hyped up universal solutions to the home of the future*' (Samuelsson, 1996: 23) that failed, despite the promising prophecies. More recently, also for UMTS or the third generation mobile telephony (Van Der Lugt, 2001) and for digital television, that future seems to be uncertain, or not as bright as initially expected. For most innovations, there mostly appears to be a segment of innovators and some early adopters, but for more and more innovations adoption suddenly stops somewhere at those early adopters. Suddenly, for some reason the copy-behaviour stops, and adoption does not seem to follow the smooth bell-shaped pattern anymore. To cover this phenomenon, Geoffrey Moore (1999a,b: 13) introduced 'The Chasm', a critical stage somewhere between early adopters and the majority (Fig. 1B, double dotted line), making clear that reaching the majority cannot be seen as an evidence anymore. To reach that majority, some kind of gap, called 'chasm' (Moore, 1999a,b) or 'ravine' (Lennstrand, 1998: 2) needs to be crossed. In the Gartner Group Hype Cycle we find confirmation for all this.

This 'Hype Cycle-curve' represents the life cycle of an innovation along an axis of product-maturity on which five stages are distinguished, and which carries the same logic as Rogers' curve: the farther on the curve, the further in time and the deeper the penetration into the market. In this 'Hype Cycle' the product knows a short period of 'high visibility' and fast adoption, almost automatically followed by a backsliding, after which adoption can climb slowly towards a level of productivity and large-scale-diffusion-advantages.

Fig. 2 shows the 'Hype Cycle' for ICT-innovations in 2000, illustrating the great offer of innovations nowadays. In the beginning ('Technology Trigger'), almost every ICT-innovation experiences fast increasing adoption rates, confirming our earlier statement that for almost any kind of innovation, there will always be some innovators and early adopters. For these people, the promising prophecies and forecasts, traditionally going hand in hand with the introductions of these products, were compelling enough to create high expectations about them, and to make them act according to those expectations by moving them towards adoption. In a lot of cases, this rapid increase of adoption or 'hype-stage' soon comes to an end. Reason for this: the product cannot come up to the high expectations of the exacting user. To move the doubting majority of the market towards adoption nowadays, the product has to prove it is able to come up to the created expectations. As a consequence of this doubt, or this state of disillusionment, in which the market finds itself, adoption increases very slowly or even decreases. In other words, adoption rates fall into a ravine, without any guarantee of ever coming out of it. We meanwhile know for example that Wap/Wireless Web, in 2000 still on top of inflated expectations, never climbed out of that ravine. Wap did not proceed on that curve, it stayed behind in the stage of disillusionment. As we came to say that far from all products succeed in crossing the 'chasm' or 'ravine', this Hype Cycle confirms that only a few technologies pass through all five life-cycle stages. Most of the increasing number of ICT-innovations experience a fast, but short peak of initial market-enthusiasm, but only a

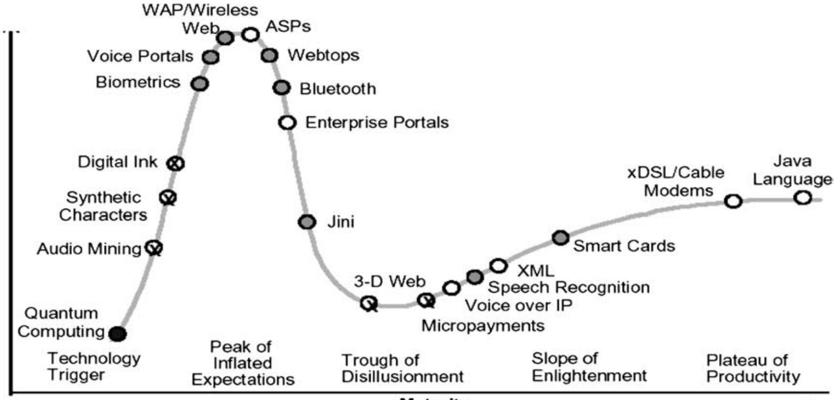

Fig. 2. The Gartner Group Hype Cycle 2000 (Fenn and Linden, 2000: 1).

few of them can recover from a backsliding we are quite sure of, following that enthusiasm-peak.

3. Adoption curve: double peaked instead of bell-shaped

If we interpret this recovery (from the backsliding) as a second peak in the adoption curve (after the first enthusiasm-peak), we can revise the traditional perception of the adoption curve. Instead of sticking to the traditional one-peaked and bell-shaped curve, this rather results into a double-peaked curve.

In this adjusted theoretical pattern it immediately strikes that the shape is not one-peaked anymore. With a first peak of market enthusiasm, and a second peak of mass market adoption, separated by a backsliding, we take into account the chasm- or ravine-concept (double vertical line, Fig. 3). As the dotted lines between both peaks illustrate, the depth of this backsliding or chasm is variable. Sometimes, as it was the case for 2G, there nearly was no backsliding, which resulted in an adoption curve resembling the traditional single-peaked one. In other cases (e.g. WAP) the backsliding was very deep, only leaving a small funnel (F) to crawl through towards the mass market. With the inclusion of a sixth segment of 'innovation dislikers', the partition of segments becomes more logical, in a sense that the potential market is not considered to be the full 100% of the market anymore, and can be separated from a segment of people that is not interested at all, and is not worth any targeting effort. In that potential market we still distinguish the classical five adopter segments innovators up to laggards, but we do not stick to the classical segment sizes. We make this distinction along an axis of product maturity and risk aversion, whereby earlier adopters are segments prepared to take the risk adopting something new, while laggards are risk-allergic consumers, only considering adoption when a product becomes mature and domesticated (Punie, 2000). This axis can also be

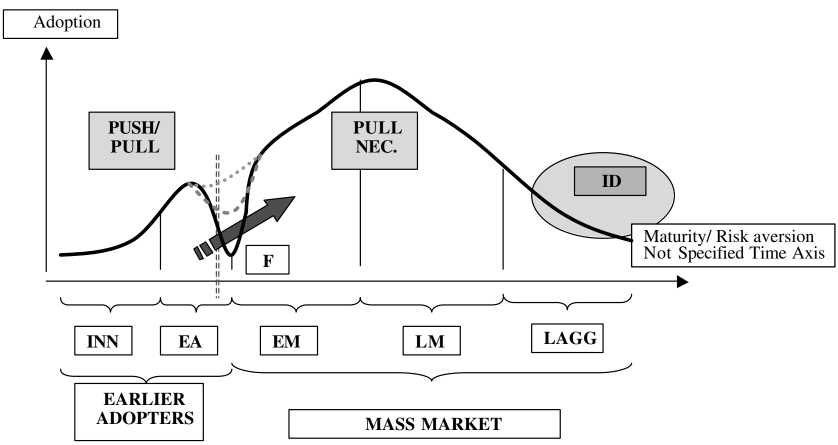

Fig. 3. Adoption curve 'adjusted'.

interpreted as a rough timeline, without any concrete specifications in terms of months or years. As a basis for an introduction strategy, decisions are better based on the market penetration percentages, than on a concrete time schedule. If it would be forecasted for example to take 5 months to move from innovators to early adopters, changes in the communication strategy can be made/planned after 5 months to appeal to those early adopters. In reality however, adoption rates seldom follow forecasted timelines exactly. In practice, the move towards early adopters can go faster (e.g. 3 months) which makes the communication switch after 5 months desperately late and totally ineffective. If evolutions take longer than forecasted, there is the risk of overwhelming and frightening people and creating a 'too much too soon'-situation (Sutherland, 1999: 41) because people are targeted, that are not really ready for it yet. Therefore, making decisions based on percentages seems more reliable: once x% of the market adopted, a switch in communications can be made, ... Of course, this approach will only be possible with a tool available to give preliminary insight into those percentages.

Besides the ravine between the two peaks, the course of the adoption curve in the figure above, very much resembles the traditional course. We would like to emphasize however, that this course is very variable. Innovators and early adopters may be 30% of the market as well, resulting in a larger initial peak.

The challenge is to offer the innovation in such a way that it is still appealing enough for the majority: that it is 'copy-worthy' [2] for them. For innovators and a part of the early adopters, it does not really matter how the product is introduced, they will adopt anyway; simply because they want to be among the first ones to have it. For that reason, the choice for a push strategy, or for a more pulling strategy, will not really affect the adoption of the innovators and first early adopters. From the majority onwards, a 'pulling' strategy becomes a necessity. To crawl the funnel successfully or to bend the decreasing adoption curve into an increasing one again, and to reduce the risk of getting stuck into the chasm, it will be necessary to have an insight in what that majority expects from the innovation, what they are willing to pay for it, and what may be the drivers or the thresholds to adopt, ... Without such insights adoption runs the risk of getting stopped at the chasm. Since it is very difficult to change the chosen introduction path somewhere at the early adopters, introduction strategy and product offer need to be on the right track from the beginning. If a product is offered for example with an emphasis on six applications, of which only two appeal to the majority, innovators and early adopters will adopt, but it will be very difficult to convince the majority. For this reason, it seems only obvious there is a necessity for preliminary (before launch) insights, to provide communication and marketing departments with the necessary information to develop an effective strategy (cf. arrow, Fig. 3) to cross the chasm. Dodgson (2000: 188) implicitly states that such consumer insight is necessary to temper the inclination of offering too much too soon, or offering too many sophisticated applications at once. Because of '*the need to effectively communicate with consumers in order to reduce*

[2] cf. copy behavior principle.

uncertainty and increase adoption rates' also Ziamou (2002: 365) and others (Burgelman, 2000: 236; McBurney et al., 2002: 232–234; Sandberg, 2002: 189) consider such insight as an absolute necessity.

4. Preliminary insight: how to obtain?

Above, we made clear that preliminary insight in consumers' needs, wants and adoption potential is necessary to develop an effective introduction strategy. Also, we stated that lots of failing innovations are due to a lack of such insights. In some cases this lack can be explained by a wrong mentality of 'pushy' field-of-dreams thinking (Baldwin et al., 1996: 190) or 'supply-side-reasoning' (Jankowski and Fuchs, 1995) and technological determinism, in which consumer insight and research are not considered as a requirement for successful innovation adoption. In other cases, people do realize the importance of such preliminary insights, but innovations fail because they use the wrong information and segmentation criteria (cf. supra (1.), traditional 'ever valid and generic profiles are not that reliable anymore), or they fail because they simply did not had any research tools available to obtain those necessary insights, as Carter (1998) illustrated by saying '*... we still need to know who they (the adoption segments) are, we still need a way to single them out*'.

On first sight, the latter may be surprising, since there are piles of information and publications available on segmentation criteria, adoption determinants and forecasting methods within the context of innovation adoption. Summing the requirements we need to take into account, in the light of the current ICT-environment and the adjusted adoption pattern, will clarify a lot. To be useful for our purposes, being "gaining preliminary insight in the adoption curve for a specific innovation, and the different adopter segments for that product", the research tool has to meet the following conditions:

1. it must be implementable in advance (before launch) in large-scaled research.
2. its usage has to result in a reliable and accurate forecast of the adoption curve, and the adoption potential of every segment within that curve, for product X.
3. it has to take into account flexible segment sizes and an ID-segment (not sticking to the traditional fixed percentages).
4. the forecast must be product-specific (cf. infra (4.)).

If we consider the available segmentation- and forecasting methods, a large gathering of methods and tools seem to be available. Qualitative methods as Scenario analysis (McBurney et al., 2002: 235) or Delphi methods (Carey and Elton, 1996: 39), hybrid methods as conjoint analysis (Lilien and Rangaswamy, 1999: 65), as well as purely quantitative scaling (Bearden et al., 1993) or modeling techniques passed in review in trying to obtain an accurate forecast. Dividing them into four broad categories (qualitative methods, analogies/bibliometrics, modeling/econometrics, and scaling) we notice that not one of these four really satisfies or meets the above mentioned conditions.

Because some qualitative methods (as Delphi) do not focus on consumer insight, but rather on expert-opinions, and others have a too small basis, these techniques are inadequate to make reliable generalizations on the consumer level. They still may be very useful for additional research, but they certainly do not suffice as single research method. Since we need a method, resulting in an accurate insight in adoption curve and segment profiles, usable prior to launch; also the second and the third tradition can be labeled as 'not suitable for our purposes'. Bibliometrics (Watts and Porter, 1997) is a tradition in which forecasting research is done on a non-statistical bibliographic/literature base, or on experiences or data times series of analogue products. Based on previous research, patents, expert-opinions, introductions in other countries, ... conclusions are drawn in order to launch a new product. A recent study on the NTT Docomo-case (3G) for example, showed that because of the specific Japanese societal and business context, it would be naive to export the successful Docomo-strategy to Western Europe (Heres et al., 2003: 77). In contrast to the two previous traditions that seldom result in a concrete forecast of adoption curve and segments, econometrics/modeling and scaling do result in such forecasts, but—for different reasons—they also do not suit our purposes. For econometrics/modeling that reason is they cannot be used prior to launch, because these methods (e.g. the generalized Bass Model (Lilien and Rangaswamy, 1999: 133) need an input of data for some variables, over a period of at least a couple of months since the introduction of the innovation. The tradition that suits our needs the best is the tradition of scaling: a gathering of scales (Goldsmith and Hofacker, 1991; Leavitt and Walton, 1988; Price and Ridgeway, 1983; in Bearden et al., 1993), usable in advance and easy to implement in several research settings. Because Rogers (1995) et al. considered 'innovativeness' as the main determinant for adoption, lots of scales have been developed to measure this innovativeness by a set of items or statements. One of the most frequently used scales within this tradition is the Domain Specific Innovativeness (DSI)-scale of Goldsmith and Hofacker (1991, in Bearden et al., 1993: 59) (Fig. 4).

As the name of the scale suggests, the dots need to be filled in with the name of a domain or broad product-category, e.g. ICT, with regard to which one wishes to reveal the degree of innovativeness of the respondents. Having judged these six Likert statements on a five-point-scale (1: I completely agree, ... 5: I certainly don't agree), every respondent ends up with an innovativeness-score for the domain ICT

1. In general, I am among the first (last) in my circle of friends to buy a new ………….when in it appears.
2. If I heard that a new ……………. was available in the store, I would (not) be interested enough to buy it.
3.Compared to my friends I own a few of (a lot of) …………
4.In general, I am the last (first) in my circle of friends to know the titles/brands of the latest ………….. .
5.I will not buy a new ……….. if I haven't heard/tried it yet. (I will buy a new …….. if I haven't heard/tried it yet.)
6.I (do not) like to buy ……….. before other people do.

Fig. 4. DSI-scale Goldsmith and Hofacker (1991, in Bearden et al., 1993: 59), six items.

between 6 (6×1) and 30 (6×5) (after scaling in one direction). Also other scales result in similarly interpretable innovativeness-scores that can be used to make an innovation segmentation. One way to do this is making a percentile-based split-up of all these scores. Sticking to Rogers' percentages, the respondents with the highest 2.5% of the scores are assumed to be innovators, the following 13.5% are early adopters, ..., ending with the laggards, having the lowest 16% of the scores. By segmenting our market this way, we automatically end up with an adoption curve, similar to the theoretical one of Rogers. Since this way of segmenting does not solve the linear-mechanical criticism (Boullier, 1989; Chambat, 1994; Flichy, 1995) or the criticism of fixed percentages (Carter, 1998; Mahajan et al., 1995), we cannot be satisfied with it. For this reason, some use 'arbitrary cutoffs' to distinguish between the different adopter segments. In the DSI-scale-example, this could be done by considering those having a score between 26 and 30 (or between 1 and 5, depending on direction of scaling) as innovators, those scoring 21–25 on the innovativeness-scale as early adopters, etc. ...

Although these innovation-scales make possible a segmentation in advance with variable segment sizes, this tradition of innovation forecasting still does not satisfy us. Besides critics on reliability and validity of these scales—Flynn and Goldsmith (1993) for example specifically criticized this DSI-scale—our main argument for not using them is they are not specific or accurate enough. These scales do come up with clearly differentiated segments, but they still are innovation-segments and profiles for a domain or broad category, and not for a specific product. Based on our DSI-scale we obtain a segment of innovators for the domain ICT, which is actually too vague to serve as a basis for a good introduction strategy. A naive way of interpreting, could make us conclude that an innovator for the domain, can automatically be considered as an innovator for every product within that domain. Following this reasoning, targeting campaigns for digital television and 3G, would be addressed to exactly the same people. This is not very logically in our view. In general, an ICT-domain-innovator will indeed be more or less innovative for most products within that domain, but the prediction remains too vague to draw conclusions for specific products within that domain. Because such lack of accurateness causes dissatisfaction (Kahn, 2002: 137), we need a more accurate product specific innovativeness-scale, instead of the vague domain innovativeness scales. By summing the requirements for a segmentation and forecasting tool, we also pointed at product specificness. By this, we mean more specific than the traditional DSI-segmentation: a part of the innovators that the DSI-scale would give, will indeed be innovators for the specific product of interest. Obviously, these people must also be detected by the new segmentation tool. The precision of this tool must appear from its ability to separate them from the domain-innovators that are not amongst the most innovative ones for the specific product.

In a first reaction to this specificness-problem there could be suggested to use the specific product (instead of the domain), to fill in on the dots of the scale-items. Trying to do this for a specific innovation as digital television however, soon learns a product-specific application of the scale is not feasible. Item 3 of the DSI-scale for example, gives '*Compared to my friends I own a lot of digital television*.' Knowing this question is asked on a moment the product is not on the market yet, and most of the respondents do not even know it yet, this kind of statement is pretty absurd.

5. The PSAP-scale

In order to meet the above-mentioned conditions, we developed the PSAP or 'Product Specific Adoption Potential'-scale, consisting out of a core of three questions. 'Product Specific' refers to the ability of the scale to come up with a forecast and a segmentation that is specific for that single innovation, and cannot be generalized to other products. With 'Adoption Potential' we emphasize that the scale measures a broader concept than only 'innovativeness' as a predictor for adoption. As mentioned above, the one-dimensional criticism on the traditional perception of diffusion and adoption, can also make us question the power of innovativeness as the main or only predictor for adoption. Because more and more authors emphasize the importance of other factors or determinants as 'social influences' (Punie, 2000; Woolgar, 1996), 'willingness to pay' (Lennstrand, 1998: 8), 'complexity' (Fidler, 1997: 13; Brouwer-Jansse, 1996: 149), 'compatibility' (Mundorf and Westin, 1996: 158), 'image' (Choi et al., 2003; Lee and Baek, 2001: 4) 'optimism' and 'sensitiveness for tangibles' (Parasuraman and Colby, 2001), . . . the scale is optionally extendable with a battery of items, measuring the potential impact of these determinants. An addition that is not necessary however, because in several cases, we already found that the three PSAP-questions accurately cover for the impact of these factors (cf. infra (7.)). With 'adoption potential' we also refer to the fact that it is not our ambition to make forecasts of actual sales for one specific supplier/provider (but only of adoption potential). Since competitive (re)actions (and their impact) of suppliers/providers of the same product are practically impossible to assess beforehand, the adoption or diffusion patterns can turn out quite differently in practice. What we do aim to do, is making a forecast of the adoption potential of the total product, without saying which provider/supplier will take what share of that total adoption potential. In this forecast we use Rogers' labeling of adopter categories (innovators, . . .), but we do want to emphasize that there is some difference between Rogers' categorization and ours. While Rogers' categories traditionally arise from an 'ex post' establishment of the number of adopters at different points in time we use the same labeling, but for a categorization beforehand of the number of potential adopters (and not actual adopters).

A first obstacle in our attempt to make a forecast, is we want to question users about an innovation, before it is on the market. To make sure that every respondent has an equal, objective and clear picture in mind about the innovation, we opted for a survey that is taken by a personal interview. This method has been successful in similar research before (e.g. Taylor and Todd, 1995). In this interview the respondent needs to be familiarized as much as possible with the innovation. The respondent receives a document that explains what the new product is and what can be expected from it, and which is discussed with the interviewer afterwards. These interviewers are trained to make sure that all respondents have a correct picture in mind before continuing the questionnaire. As a guidance for this, every interviewer has a 'checklist' at his/her disposal with aspects that need to be covered (e.g. pointing the respondents to the switching costs, ...). If possible, the innovation must be made more 'tangible' for the respondent. In our DTV-case this was done by a folder of illustrations of interfaces for applications as EPG, choosing camera angles, etc. ... In the 3G-case we had the cooperation of a Belgian mobile phone operator who placed some 3G phones at our disposal, and who activated the test network during our data collection. Although not all the 3G-applications were available yet, it gave respondents the opportunity of 'experiencing' applications as gaming, e-mail, MMS, video streaming, ... Once the interviewer is sure of this, the first PSAP-question can be answered:

> "*Suppose ... would be available to you now. As you have it in mind right now, up to which degree would you be interested to adopt/purchase this ?*"

To answer this question the respondent has five possibilities: 1. '*I subscribe/adopt immediately*', 2. '*Big chance I subscribe/adopt*', 3. '*Let's wait and see, maybe later*', 4. '*I don't think I will subscribe/adopt*', 5. '*I certainly won't subscribe/adopt*'. The answer to this question gives an impression of the global interest/attitude at first sight. The second and the third PSAP-question are used to refine this impression.

After the respondent answered this first question, the interviewer starts discussing the innovation again with the respondent. This is done in depth this time, paying attention to all the possible applications and features, the willingness and ability to pay for these applications, but also possible adoption determinants and thresholds as price, usability, design, complexity, sensitivity to social environment ... For the respondent this gives a concrete impression of the innovation, and it indirectly forces him to think (and evaluate) about the innovation in all its facets. It also gives the interviewer an idea of what may appeal to the respondent, and what may be possible drivers or thresholds. After this, the respondent receives the second and third more specific PSAP-questions, which are formulated by the interviewer based on the price level the respondent indicated as still acceptable, and the interest of the respondent in the different applications of the innovation.

> "*Suppose ... would be available to you now, in its most optimal conditions for you: only the applications/features/services you are interested in (...), and at a price that isn't exceeding the price you are willing to pay for it (...). Up to which degree would you be interested to adopt it or to subscribe on it?*"

> "*Suppose ... would be available to you now, in only suboptimal conditions for you: a bit too expensive (...), or an offer that also contains applications you are not interested in, (...). Up to which degree would you be interested to adopt it or to subscribe on it?*"

Both questions can be answered in the same way as the first one. Depending on the product, being subject of research, and the discussion preceding these questions, the questions can be specified. In a survey on digital television for example, where the discussion could have learned the interviewer that €15 a month is a maximum for the respondent, who is only interested in EPG (electronic programming guide), home-banking, more channels and being able to start and stop programmes (time shifting) when it suits him, the questions could have been formulated this way:

> "*Suppose dtv is available to you today. The package offered includes home-banking, time-shifting, more channels and epg; at a price of €14.5/month. Up to which degree would you be interested to subscribe?*"

> "*Suppose dtv is available to you today for €18/month. This offer would include epg, more channels, time shifting, sms-functions and VOD. Up to which degree would you be interested to subscribe?*"

For respondents that appear to find it important what their social environment thinks of them (and their consumption patterns), additional questions can be asked. The 'optimal question' can be extended for example with the sentence: '*..., but your friends are very negative about the product.*' Or for people that appear to be complexity-sensitive, sentences as '*... very easy to work with (one button) ...*' or '*... you need a manual to work with it ...*' can be added to gauge for the impact of the determinant 'perceived complexity'. Dependent on the number of determinants or thresholds (out of an exhaustive list with between 30 and 50 items) that appear to be important for a respondent, additional questions (besides the core three) are added.

With the usage of the three core questions in this example the respondent is confronted with an optimal and a suboptimal offer (more expensive, not having the home-banking-application and he also has to pay for VOD and sms; applications he is not very interested in). Based on the answers on these three cumulative questions, we are able to assign the respondents to five segments (innovators up to laggards) in a logical and gradually caving way. If the respondent does not answer positively on the first global PSAP-question, we can already be quite sure he will be situated at the back of the adoption curve. If someone answers this first question positively on the contrary, and he stays quite sure of his intention to adopt the optimal and suboptimal offer, he will be situated in front of that curve. People that still intend to adopt immediately the suboptimal offer, can be considered as innovators, while people answering positively on the global question and the optimal question, but not outspoken on the suboptimal offer, will be situated somewhere between early adopters and early majority, because they do not seem that convinced. By combining all answers of every respondent on these three questions, every respondent is ranked in a gradual caving way, according to their 'adoption potential', or their intention to adopt. Through programming of this heuristic (e.g. if the answers on the three PSAP-questions are 3×'1', then one is forecasted is as 1 (= innovators), if the answering pattern on the three questions is '2', '2', '4', one is forecasted as '3' early majority) and performing the necessary consistency checks, one is able to yield the PSAP-segmentation. Several studies during the past years proved this scale (three questions) to give constant, reliable and valid results in making a forecast of total adoption potential and the course of the adoption curve that also cover for the whole gathering of adoption determinants. The three questions in other words, certainly meet the need for an accurate tool that is easy to implement in large scale research settings. If the research design (personal interviews, CAPI, CATI, web-based ...) allows for some more questions, more additional variants on question two and three (optimal and suboptimal offer) can be integrated to obtain even more accurate assessments of the impact of several determinants. Based on the answers on these additional questions, some shifts may appear between forecasted adopter segments. Someone that was forecasted as an early adopter by the PSAP-scale for example, but appeared to be very complexity-sensitive (based on questions on adoption determinants, e.g. '*If I first have to read a manual to find out how things work, I don't buy new products*' (cf. Fig. 7)), could be shifted to the early majority if they find the innovation complex (which becomes clear in the discussion with the interviewer after the 'familiarization stage').

6. Cases

During the past years, the PSAP-scale has been implemented in several studies (digital television, X-Box, internet broadband, UMTS (three studies), ...) with the purpose to make a forecast of the adoption potential for ICT-innovations that still had to be introduced in Flanders (Belgium). For third generation mobile telephony and broadband the scale already proved its usefulness in practice, since a leading Belgian mobile phone operator, and a Belgian broadband player are currently using the PSAP-scale as a segmentation instrument, which serves as a basis for their communication strategies. Generally, each questionnaire in these cases started with a battery of general questions on adoption determinants (complexity, social pressure, ...). This allows to map the adoption drivers and thresholds for every adopter segment, which is very valuable for communication purposes. Then, the respondent is familiarized (cf. supra) with the innovation, after which he indicates a price level that is still acceptable for him/her for the innovation, and in which he evaluates the different applications and/or features of the innovation. In the DTV-case 17 applications were taken into consideration, in the 3G-case 34 (cf. notes). For each of these applications, the interest is indicated on a five-point-scale (1: 'not interested at all' up to 5: 'very interested'), and 'willingness to pay extra' for them is measured as dummy variable (0–1). On top of that, the respondent is also asked to make an 'ideal package' of five applications. Together with the questions on pricing, willingness to pay and interest, this latter allows the interviewer to formulate the second and third PSAP-question. Besides that, these questions are also very valuable as an input for strategical decisions concerning 'packaging of applications' or 'gradual offering of applications'. In some cases, this was followed by a second battery of questions on adoption determinants, but specifically formulated for the innovation this time (e.g. '*The DTV-interface seems complicated to me*'). In the cases in which this is done, the combination with the first battery of more general formulated items on adoption determinants, allowed to make some refinement to the segmentation. Finally, each questionnaire ended with a battery of lifestyle-items, a battery of demographic questions, and some media usage questions, enabling detailed profiling for more effective targeting.

All cases showed consistent, reliable and valid results. The Fig. 5 shows the forecasted curve for (A) digital television and (B) UMTS or 3G, third generation mobile telephony in Flanders. For the digital television survey, 624 households were interviewed in 2001. Both surveys were conducted by personal interviews, in the digital television case 10 interviewers, and for the 3G case 20 interviewers were trained to guide the survey, to make sure the respondent had a good notion of the new product ((s)he wasn't familiar with yet), and to make a good formulation of the second and third PSAP-question. For what concerns the sampling, quota for sex and age were respected, to be representative for Flanders. For the 3G-case, we had 1006 personal interviews. The full lines are the forecasted curves, the dotted lines are the theoretical curve with the 2.5/13.5/34/34/16 ratio. For digital television there did not appear to be a segment of 'innovation dislikers'. For 3G there was a clear segment of 15.3% that was not interested at all.

With 4% innovators, 15% early adopters, a great 'doubting majority' (45.9% early majority and 28.2% late majority) and a relatively small segment of 6.9% laggards in the case of digital television (A, 2001), the forecasted diffusion pattern approaches the theoretical one (dotted), and is even a bit more optimistic, which promises a bright future for digital television in Flanders. A future however, that cannot be supposed to arise automatically. Only if digital television is offered at a price between 7.5 and 10 Euros and includes applications as time-shifting (starting/stopping programmes when you want), an electronic programming guide, more channels, the ability to consult more information with current affairs and news programmes, it will appeal to the majority and even the laggards. A higher price or more applications will frighten or overwhelm a big part of the market. Only when they are used to this 'basic offer', the offer can be 'gradually' augmented (and the price can be increased). Up to the majority for example an sms-application and video-on-demand can be added, as long as the monthly subscription price is not higher than 12.5/15 Euros. Despite the high interest for applications as e-mail and surfing through their television, people did not appear to be willing to pay for it. Those without internet-experience certainly were not interested in internet through their television, those

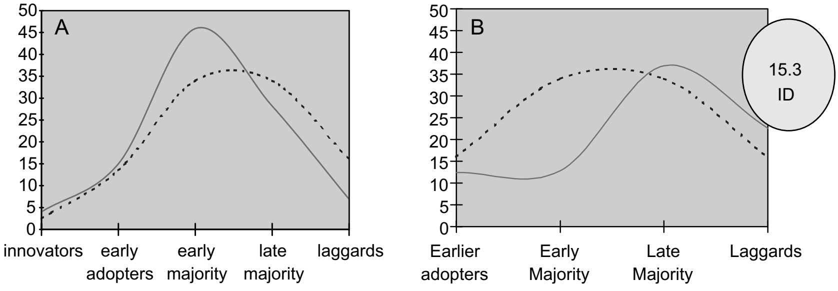

Fig. 5. Forecasts Flanders: (A) digital television (2002, $N = 624$), (B) 3G (2003, $N = 1006$).

with internet experience preferred to keep computer and television as separated worlds. For applications as gaming, home-shopping and e-banking, there appeared to be a high willingness to pay, but only for two specific segments. The latter proves it to be valuable to distinguish between 'interest in applications' and 'willingness to pay for the application' in the questionnaire.

The forecast for UMTS or 3G in Flanders (B, 2003) was far less optimistic, and significantly deviating from the theoretical pattern. Since the size of the innovators was nearly neglectable in this case (B), we considered innovators and early adopters—analogous to Rogers and Schoemaker (in Watkins, 1985)—as one segment of earlier adopters. With 12.4% earlier adopters, 12.8% early majority, 36.9% late majority, and 22.6% laggards, the future seems less bright in Flanders for 3G, than for DTV. In contrast to the DTV-case, we do detected a segment of 'innovation dislikers' in this case, having not the slightest interest, and coping with huge adoption thresholds (complexity, price, compatibility, negative influence from social environment). Reflecting to our adjusted diffusion curve, the forecasted 3G-curve clearly illustrates the funnel towards the mass market. Offering 'too much too soon', will certainly result in a bunch of earlier adopters adopting, but will probably frighten and overwhelm the rest of the market. Applications as 'gaming' and 'surfing', of which the supply-side is considering them as so-called 'killer applications' do not seem to have the potential to force the breakthrough towards the mass market, and to crawl the funnel successfully. Even for the earlier adopters, being a segment of 'young gamers', a huge communications-effort will be needed to convince them about the usability of a mobile phone for 'advanced gaming', or to convince them of the fact that the screen is big enough, and there is no loss of image quality when compared to 'conventional gaming'. Factor analysis (R^2: 0.65) allowed us to summarize the 34 3G-applications included in the survey into four factors. One of them, 'safety' (Alpha: 0.87) appeared to appeal to the whole market. Late majority and laggards were even more interested and willing to pay for these 'safety applications' (alarming in case of theft (home, car), assistance in case of criminality, …) than the 'earlier adopter segments'. Only with an offer based on this safety-applications and at a price that is not higher than €15 a month, 3G will have a chance to get adopted and 'copied' by the majority and even the laggards. Once they got used to the product, and their doubts on usability, reliability, and complexity (which are quite high from the early majority onwards) decrease, they might be prepared to use their 3G-phone for other applications. In the meanwhile, the earlier adopters can be offered (by specific targeting) more applications, in which they are interested. Once the later segments get prepared to adopt other applications, these earlier adopters will already use them, making them able to serve as opinion leaders or gatekeepers, and initiating the necessary word-of-mouth promotion.

7. Psychometric quality

To evaluate the psychometric quality (reliability and validity) of our PSAP-scale, we used Mokken-analysis for cumulative scales and LISREL. Based on Mokken-analysis, MSP5 showed a RHO-value of 0.85 for the DTV-case, and 0.87 for the

3G-case, implying a high reliability of the cumulative scale, consisting out of three questions. Assuming the following cumulative arrangement: an optimal offer is preferred before a global adoption-intention-question is answered positively, and the suboptimal offer is considered as the least interesting offer in a cumulative perspective; the H-index of cumulativity amounts 0.73 and 0.74. To evaluate the concurrent validity of our PSAP-scale we used a LISREL-measurement-model (Bollen, 1987), in which we compared our PSAP-segmentation (five adopter categories 'innovators' up to 'laggards) with the result of the above-mentioned DSI-scale of Goldsmith and Hofacker (five adopter categories 'innovators' up to 'laggards', percentile-based), in order to compare up to which degree the PSAP-segmentation matched the DSI-segmentation.

Without questioning the already proven reliability and validity of this DSI-scale on the broad domain-level, we considered greater precision, or product specificness as a requisite for the new segmentation tool. Translating this concretely to both segmentation methods we used in our cases, we expect a significant correlation between the DSI- and the PSAP-segmentation, because it is only logical that a substantial amount of the domain-innovators is also innovator for digital television (or 3G), a product of that domain. But we do not expect this correlation to be perfect however, because it would be naive to assume that all domain-innovators are DTV (or 3G)-product-innovators as well. There can be a group of domain-innovators for example, very innovative for mobile phones, computers, dvd and game computers, but not interested in digital television. The 0.33-correlation in DTV-case, and the 0.38-correlation in the 3G-case between the DSI and the PSAP segmentation in the lisrel-model, of which the goodness-of-fit measures (above 0.90) ensure the model fits the data, confirm the assumption that both segmentations (categorizations in innovators up to laggards) match significantly up to a certain degree, and that there still remains a difference between them (correlation of 0.33 and 0.38, instead of 1). But we still do not know which of the two segmentations is the most precise one. Only if we consider the evaluations of the innovations in both case studies, we learn that the PSAP-scale makes a more precise segmentation, and gives a more accurate insight in the adopter segments and their profiles. As well in the DTV-case, as in the 3G-case, in which the respondents had to evaluate respectively 17 and 34 different applications and features of both technologies [3] (on five-point-scales), we used both scales (PSAP and DSI) to make an innovation segmentation. In Fig. 6 the vertical

[3] In the figures in the text we numbered the applications, because describing them in full text, would not be very well-organised anymore. As described the evaluation was done on a five-point scale (Very interesting, More or less Interesting, Neutral, Not Quite Interesting, Not Interesting at all), and the numbers correspond with the following applications or features: in the *DTV-case 17 applications* were evaluated: better image, better sound, more channels, more thematic channels, subtitling, background information, own taste, time shifting (start and stop programmes when it suits you), EPG (electronic programming guide), homeshopping, homebanking, downloading, proton, courses, surfing, e-mail and sms. In the *3G-case 24 applications* were evaluated: ums (unified message service), browsing, Mobile Video Telephony, Shopping, AOD, VOD, Gaming, Navigation (GPS), AlarmLocation, Ecash (proton), yellow pages, e-banking, Printed media consultation, reservation application, gambling, instant public services, in home automation, online library, local information, alarming in case of theft valuable possessions, assistance in case of criminality, home-alarm, electronic traffic information, Electronic public services.

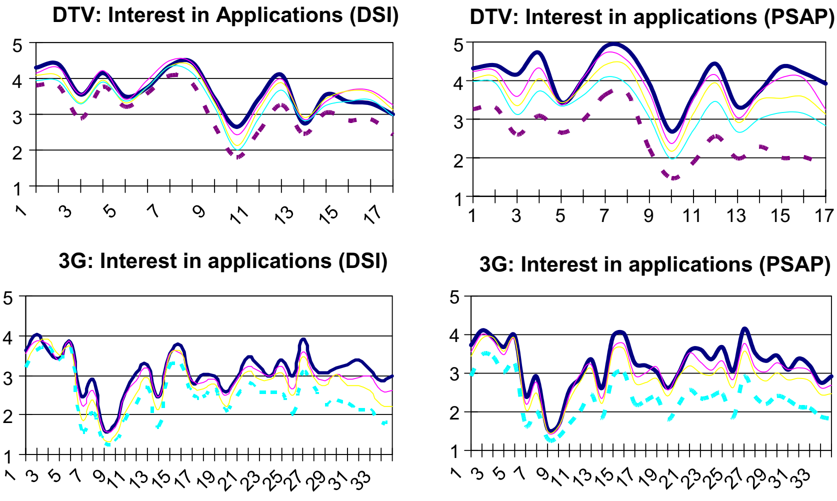

Fig. 6. DSI vs PSAP segmentation for interest in applications of DTV and 3G.

axis reflects the five-point-scale of interest, the horizontal axis contains the different applications (numbered from 1 to 17 in the DTV case, and from 1 to 34 in the 3G case (cf. notes)). The plotted lines represent the interest of the adopter segments (innovators up to laggards) in these applications. If we compare the evaluations of the applications/features for both ways of segmenting, it is clear the PSAP-scale makes a clearer, more precise distinction between the different segments. The upper two graphs reflect the interest in the DTV-applications, the lower two the interest in the 3G-applications. The two graphs on the left give this for the segmentation based on the DSI-scale. On the right side for the segmentations based on the PSAP-scale.

In all four graphs we see a logical global decrease in interest from innovators (dark full line) to laggards (dotted line), but it immediately strikes that the DSI-figures are more blurred, while the PSAP-distinction is clearer between the adopter segments. In the figures we see that the interest lines of the segments in the DSI-segmentations lie closer together than in the PSAP-segmentation. Also significance tests as Kruskal Wallis and Anova confirm this: they show more significant differences in interest between segments in the PSAP segmentation, than in the DSI-segmentation. For the PSAP-segmentation, as well as for DTV as for 3G, Kruskall Wallis and one-way anova indicate a significant difference in interest between the different segments for all 51 (17 + 34) applications (all significant at the 0.01 level, except for one DTV-application with p: 0.04). The DSI-segmentation on the other hand, is less differentiating. In the DTV-case, there was not any significant difference at all for seven applications ($p > 0.05$), four were significant at the 0.05 level, and on only six applications the differentiation was significant at the 0.01 level. Looking at the DSI-segmentation for DTV (upper left) we seldom notice the ‘innovators’ to be clearly more interested, or the laggards being significantly less interested. In the PSAP-segmentation on the contrary, innovators are really more interested than the rest of the market, while laggards are less interested for the specific product. In the 3G case this trend is less outspoken, but nevertheless we have 34 significant differences on the 0.01-level if we use the PSAP-scale to make the segmentation, leaving only 22 significant differences on that same level when using the DSI-scale (besides nine significances on the 0.05 level, and four non-significances). Since the purpose of segmentation is to strive for internal homogeneity, and external heterogeneity, we can conclude the PSAP-scale to be a better and more precise segmentation tool for a specific new product than the DSI-scale.

A second domain besides the interest in applications, on which we can illustrate that the PSAP-scale is able (and better than the DSI-scale) to make a precise and accurate distinction between the adopter segments, is the domain of adoption determinants. As mentioned above, several sources emphasize that being innovative is not enough to be likely to adopt an innovation, and that there should also be accounted for other determinants than the personality trait 'innovativeness'. By linking the segmentation to the battery of Likert statements that operationalize the main adoption determinants that appeared from literature and preliminary qualitative research (6 focus group discussions) (cf. Fig. 7), we can check up to which degree the segmentation is consistent with assumptions on this determinants. Doing this analysis for the PSAP, as well as for the DSI-segmentation enables to check which segmentation method is the more precise and accurate one.

Factor analysis (PCA, R^2: 0.59) already revealed that 18 of these items can be summarized in four reliable and internal consistent factors innovativeness (alpha 0.89, items 1, 2, 3, 4, 6, 8, 21, 22), complexity (alpha 0.75, items 23, 24, 25, 30), image-sensitivity (alpha 0.69, items 12, 14, 15, 28) and trialability (alpha 0.71, items 13 and 27). To discover up to which degree the PSAP-segmentation (based on three questions) covers for these four factors and the remaining 12 single items, we analysed how they correlated with the PSAP-scale and DSI-scale, and up to which degree this was consistent with earlier findings (Fig. 8).

Concerning the four factors, we found two logical [4] significant negative correlations for 'innovativeness' and 'image-sensitivity': the more people are in the forefront of the adoption curve of 3G, the higher they score on innovativeness (Rogers, 1995; Lee and Baek, 2001: 4; ...) and the more they are concerned about the looks and the feels of a mobile phone (Parasuraman and Colby, 2001), and the impression they make with their mobile phone (Choi et al., 2003; Lee and Baek, 2001: 4). Also corresponding with other theoretical and practical findings is the positive significant correlation of 0.281 with the factor 'complexity', indicating that people at the rear of the curve experience a higher complexity-threshold when it comes to adoption: when ICT become more complex or are perceive as more complex, they soon feel uncomfortable, which results in a delayed or a non-adoption decision. For the factor 'trialability' we did not find a significant correlation.

Besides the four factors mentioned above, we also accounted for two often mentioned determinants as 'social influences' (items 5, 10, 17, 18 and 19) and 'price

[4] With 'logical' we mean 'consistent with earlier findings'.

1. In general, I am among the first of my friends to buy new ict	16. I may be interested, but I rather wait till prices fall
2. If I heard a new ict was available, I would be interested enough to buy it	17. I have no problems with to ask friends/colleagues how my mobile phone works
3. I immediately adopt new ict, otherwise I fall behind	18. I feel annoyed if I can't join the conversation on new ict
4. In general, I am the first in my circle of friends to know the brands of the latest ict	19. Even if I am interested, I wouldn't buy if my environment would be negative on it
5. To buy new ict, I follow the advise of others	20. I wait to buy new things, until I know others have positive experiences with it
6. I like to buy new ict before other people do	21. Compared to my friends/colleagues, I know a lot about mobile phones
7. If I first have to read a manual to find out how things work, I don't buy new products	22. Compared to my friends I own a lot of ict
8. In general, I follow new trends	23. A mobile phone is an easy thing to work with
9. Usage of mobile telephones is too expensive	24. Calling and sms is still ok. More applications will make mobile phones too complicated
10. I regularly talk to friends about the newest things concerning mobile phones	25. The more applications on my mobile phone, the more I feel uncomfortable
11. I pay attention to the length of my (phone) conversations and the number of sms's	26. Usability and user-friendliness are very important to me, when I buy new things
12. Design of a mobile phone is very important to me	27. I prefer to have some experience with something before I buy something
13. I don't buy new ict before I have tried them out	28. It leaves a good impression to have a nice mobile phone with a lot of applications
14. I get influenced by ads and commercials on ict	29. I always choose the cheapest, if I have a choice
15. If my environment considers something as 'in', I'll consider buying it	30. More applications than those we have now on a mobile phone, are very interesting

Fig. 7. Operationalized adoption determinants in the 3G case (item 1–item 30).

Correlation with PSAP:			
Innovat (F): -.380**	Item 5: -.047	**Item 11: .098****	Item 19: -.029
Complex (F): .281**	Item 7: .013	Item 16: -.021	Item 20: .030
Image (F): -.252**	**Item 9: .115****	**Item 17: .088***	Item 26: .015
Trialab (F): .019	**Item 10: -.114****	**Item 18: -.221****	**Item 29: .164****

:sig. at 0.05 level** *: sig at 0.01 level** **(F): Factor**

Fig. 8. Correlations PSAP × item battery of adoption determinants.

sensitivity' (items 9, 11, 16 and 29), but these were not revealed by the factor analysis. Except for item 16 (not sig.) we found three positive correlations for the price sensitivity items. Which makes sense again, because this indicates that people in front of the adoption curve are less sensitive to price than people at the rear of the curve (Gatignon and Robertson, 1989). For 'social influence' we could already suspect a negative correlation with the PSAP-scale (...), since the items 1, 4, 22 and 21 of the innovativeness factor also partly covered for a social influence-component. We see this confirmed in the negative correlations on item 10 and 18. The positive correlation for item 17 (0.088) reveals that people in front of the curve have more problems to admit they do not know how to work with their mobile phone. The items 20 and 26 at last, did not appear to correlate significantly with the PSAP-scale.

Although we did not find significant correlations for all items or determinants, we did find three correlations with four factors and six correlations on twelve single items, by which we can conclude the PSAP-scale does cover well for adoption determinants, and for more than only innovativeness. Since the DSI-scale had only significant correlations with innovativeness (which is not that surprising, since the segmentation is based on an innovativeness-scale), we can also conclude the PSAP-scale is more precise on the level of adoption determinants.

Summarizing, we can say the PSAP-scale is a reliable and valid instrument. The assumed cumulativity and logic behind the three core questions proved to be reliable by the Mokken analysis, and the comparison between the traditional DSI-way of segmentation and the PSAP-segmentation not only learned the latter to be more specific, but illustrated also the concurrent validity of the PSAP-scale. Since DTV as well as 3G still are not yet on the market in Belgium, we are not capable yet of testing the predictive validity of the PSAP-scale. But as providers are upgrading their network capacity for 3G, GPRS is already possible, and applications as MMS are gradually introduced. As a first indicator for the predictive validity we contacted 120 of the original respondents from the 3G-case again in September 2003, to check whether they bought a new mobile phone with GPRS-, MMS-, i-mode-, digital internet- or digital camera-applications during the 5 months since the original data collection. Of each of the four categories (earlier adopters, early majority, late majority and laggards) 30 respondents were randomly contacted. Of the forecasted 3G-earlier adopters 40% did adopt such a new mobile meanwhile, while another 23.3% was planning to do so in the near future. For the other three categories the percentage of those who already adopted dropped to 16.7% for the early majority, 10% for the late majority and 0% for the laggards. The percentage of people that did not adopt, but were planning to do so in the near future was respectively 6.7%, 3.3% and 3.3%. A result that can be considered as a strong indicator for the predictive validity of the segmentation tool. For the hard proof of that predictive validity, we still have to wait until 3G is introduced in Belgium.

8. Conclusion

Starting from the finding that more and more ICT-innovations fail or do not manage to come up to the high expectations, we claimed that some adjustments could be made to the traditional assumed theoretical diffusion curve. Instead of the classical bell-shaped pattern, we assume diffusion patterns to be rather double peaked, most of the times having a backsliding between both peaks. To reach the second peak of mass market adoption, theory as well as practice emphasize the importance of preliminary consumer insight.

A review of the existing segmentation and forecasting tools however learned that none of the available methods really satisfies to obtain that preliminary insight. For that reason we developed a new tool, the PSAP or Product Specific Adoption Potential scale.

Since the scale comprises only three questions, it certainly meets the first requirement of being easily implementable in large-scaled research. In the two cases we used to illustrate this paper, we did this by personal interviews, in another case (broadband) it was done successfully by CATI, and currently we are working to integrate it in a web-based survey.

The second requirement was 'resulting in a reliable and accurate forecast of the adoption curve, and the adoption potential of every segment within that curve'. The consistent results over several cases, the Mokken test for cumulativity and the comparison with the existing DSI-scale proved the reliability, but the best test for this reliability and accuracy, is still verification of the prediction in reality. Since neither DTV, nor 3G are on the market yet in Flanders we were not able to do this predictive validity test. In the 3G case however, we have mobile phone numbers of 81% of the respondents, which enables us to contact them for forecast verification (as soon as 3G is on the market in Flanders). For the moment, only GPRS-applications are already available, and a validation test that compared the forecasted UMTS-behavior, with the actual GPRS-behavior, gave promising results (cf. supra).

In the brief description of the results of both cases, we made clear that the scale enables a researcher to obtain a clear insight into the adoption potential of every application for every segment. In that same description, the forecasted curves also make clear that the PSAP-scale accounts also for flexible segment sizes and a possible segment of 'Innovation Dislikers'. By comparing the ability to make a distinction in 'interest in applications' for every segment, and comparing the ability to cover for different adoption determinants, we also hope to have illustrated the PSAP-scale is a product specific tool.

With this paper we hope to have contributed to a movement that aims to obtain an accurate and updated grasp of the fast evolving adoption and diffusion dynamics within the domain of new communication technologies. With the adjustments to the traditional assumed theoretical curve, we hope to prevent future misleading interpretations or assumptions of the adoption process being a too linear-mechanical process. With the integration of the often very deep backsliding between the two peaks in the process we hope to have illustrated that a pull strategy is the only considerable option in the current ICT-environment, if mass market adoption is the ambition. Generally, with the PSAP-scale we hope to have reached an instrument that enables a good preparation for such a pull strategy: a preparation that decreases confusion about preliminary consumer insight, and increases the odds for an effective diffusion.

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