Predicting the market demand for an innovation based on the concept of social contagion

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6 General Discussion

6.1 Introduction

The way that consumers influence each other to adopt a new product, the process known as social contagion, plays an important role in that product’s market success (Manchanda, Xie and Youn, 2008; Van den Bulte and Stremersch, 2004). When firms develop new products they base many of their decisions to some extent on their estimations of consumer demand, such as which of a range of new product concepts to fund, which product design will be most successful and which market segments to aim the communication at. There is a lack of methods for aiding with such decisions for situations, early in product development, where the new product is innovative and thus dissimilar to existing products (Kahn, 2005; Urban, Weinberg and Hauser, 1996). The research described in this thesis focuses on two issues: one is developing a new approach for estimating the level of consumer demand for an innovative new product which can be applied when that product is still at the concept stage; the other focus of this thesis is identifying what it is about a new product, or the consumers who may use it, that drives the process of social contagion and, in turn, affects consumer demand. In this chapter we summarize the main findings, discuss some relevant issues arising from this research and describe the managerial implications. We also reflect on a number of limitations of the research described in this dissertation and set out some ideas for future research.

6.2 Main Findings

6.2.1 Methods for the pre-introduction estimation of consumer demand

By estimating the future consumer demand for a new product, market research methods are applied so as to reduce the inherent risk of product commercialization. However, the validity of market research results is often low when applied to innovations, such as when breakthrough technologies enter the market, as well as when the estimates of consumer demand are carried out prior to a product’s market introduction (Taschner, 1999). Nevertheless, firms make financial, organisational and strategic decisions based on these estimates and so when market research is needed most, valid results are most difficult to obtain. Our first research question addresses the extent to which traditionally applied methods of market research are applicable in such situations where new product innovations are being developed. In chapter 2 we find that in these situations two dominant market research approaches, concept testing and needs assessment, are not readily applicable. We find that many of the assumptions that these methods make are invalid during the development of innovative new products. Our conclusion from these findings is that alternative approaches for estimating
the likely future consumer demand for a new product are needed. Four alternative approaches for estimating the likely future adoption of new products are proposed: (1) adapting existing methods; (2) combining consumer research with market structure analysis or futures research; (3) using theoretic models; and (4) using trial and error methods. Each of these requires successively fewer assumptions and can therefore be applied to successively innovative situations.

As a basis for a new theoretic approach, the idea of social contagion is introduced in Chapter 2. We show that an important advantage of this new approach is that it allows us, in principle, to assess consumer demand for a new product without relying on potential consumers to evaluate the product. It makes no assumptions about potential consumers’ knowledge of the product or its possible impact on their daily lives and it does not assume that consumers can adequately articulate their future needs. As such, there is an additional research question we are able to answer, even though we did not initially specify it: when is it appropriate to apply our new social contagion approach? Based on our analysis of assumptions in Chapter 2, it would appear that such a theoretic approach to model the consumer demand for a new product will be relevant in situations where innovative products are being developed and where demand-side issues are the limiting factor in the new product decision making process. This means that our approach can fruitfully be applied when the main uncertainties about the future of the new innovation are related to whether consumers will buy it as opposed to supply-side issues such as whether it is technologically feasible or which partnerships a firm should engage in.

6.2.2 A social contagion based approach for pre-introduction estimation of consumer demand

Predicting the consumer response to the market introduction of an innovative product continues to be a major scientific challenge in business research (Hauser, Tellis and Griffin, 2006; Rogers, 2003). The idea of social contagion has been applied to new product diffusion through a market but this has been in a descriptive manner, not predictive, and it has been done after the product has been introduced, not before (Van den Bulte and Stremersch, 2004). Our second research question is: How can the concept of social contagion be used to make predictions about the consumer demand for a new product? In chapter 3 we show how a new instrument which uses the concept of social contagion to make pre-introduction estimations of consumer demand has been developed. We describe the theory of social contagion on which the instrument is based, known as memetics, and propose that the instrument be a combination of information regarding the product’s characteristics and the consumers’ personality traits. By decomposing innovative product concepts into a number of behavioural elements we are able to estimate the probability that a person with certain personality traits will imitate these behavioural elements and, as a consequence, will adopt the new product. The instrument then works as an expert model by assessing the effect that a certain product characteristic has on the chance
that a type of person possessing certain traits will copy the behaviour associated with the product. For example, given a type of person who score high on the ‘openness to experiences’ dimension of personality, and a product which scores high on the ‘distinctiveness’ dimension, the combination of these two will result in a high likelihood that social contagion will occur. That is, that the behaviour associated with this product (buying it, using it, etc.) will be copied by this type of person. In chapter 4 we specify in more detail how the instrument works and list the product and consumer characteristics used.

Our third research question relates to the types of product development question that our new approach can answer in practice: (i) Which market segments show the highest potential for the new product? (ii) To what extent can we determine the focus for marketing communication in order to stimulate social contagion? (iii) Which elements of the basic design of the concept need to be improved, so as to optimise social contagion? (iv) What will the consumer demand be for the new product? In chapter 4 we describe two cases in which our approach was applied, prior to the market introduction of a new product, showing how all four of these questions were answered. As these are very practical questions, we provide a summary in the Managerial implications section (6.3) below.

Our next research question is whether our theory-based approach of measuring the likely social contagion of a new product is able to provide valid estimations of consumer demand for that product. Indeed, the scientific contribution of our new approach is that it produces valid estimates in two challenging situations:
1. When the new product is unlike existing products; i.e. the new product represents a marketing discontinuity and/or a technological discontinuity.
2. When the estimations of consumer demand are made prior to the product’s market introduction.
In the study presented in chapter 5 we analyze data from 124 product-segment combinations of information and communication technology products from the telecom and financial sectors. Using Partial Least Squares Path Modeling, a technique suitable for prediction oriented research, we find that our measurement of social contagion has a strong, positive relationship with consumer demand, with the variance in actual consumer demand explained by social contagion being 33% in the telecom sector and 32% in the financial sector. As a comparison, the time the products have been on the market accounts for only about 2% of the variance in actual consumer demand. And so we can conclude that our approach is able to provide valid estimations of consumer demand for these products.

A related research question which we did not specify in advance is how accurate the estimations made by our approach are compared to other, generally applied approaches. We can assess the validity of existing methods by reviewing the literature
and we can then compare the validity of our new method with this benchmark. The literature distinguishes three categories of approaches for estimating consumer demand for a new product (Kahn, 2005; Taschner, 1999): (1) consumer analysis methods, including measuring consumers’ behavioural intentions, (2) expert analysis methods which are based on judgment and (3) data analysis methods such as data extrapolation and analogies with other data sets. We briefly described the published evidence on the validity of their estimations.

Beginning with consumer analysis methods, one of the most broadly studied approaches is to measure consumers’ intentions to buy and use a new product as a means of predicting their actual behaviour (Jamieson and Bass, 1989; Morwitz, Steckel and Gupta, 2007; Tobin, 1959). This research shows that the link between intentions and behaviour varies considerably, with correlations between what people say they want and what they subsequently actually choose ranging from almost zero to almost 1.0. It appears that in some situations consumers are better able to accurately state what they will do. It depends on a number of factors, including whether they are asked what they intend to do or what they expect they will do (Warshaw and Davis, 1985), the extent to which they have control over the situation, the way the question is asked (e.g. select from a number of choices versus open question) (Sheppard et al., 1988), the experience the consumer has in the relevant product category (Morwitz and Schmittlein, 1992) and, crucially for this dissertation, whether they are asked about an existing product or a new product (Bemmaor, 1995). In a meta-analysis of 87 studies on the link between intentions and behaviour, Sheppard, Hartwick and Warshaw (1988) report an average correlation between intention and behaviour to be 0.53, which means that on average consumers’ answers to questions about their intentions account for only 28% of their actual behaviour.

A second approach widely used in consumer research is based on analysing perceived innovation attributes which represent the consumers’ perceptions of an innovation. The main categorization of an innovation’s attributes proposes: relative advantage, compatibility, complexity, trialability, communicability and perceived risk (Ostlund, 1974; Rogers, 2003). A study on the link between these six perceived innovation attributes and purchase intention (Holak and Lehmann, 1990) showed correlations between 1% (complexity) and 56% (compatibility). In a meta-analysis of 51 empirical studies, these relationships have been shown to be different when the dependent variable is consumer intentions or consumer behaviour (Arts et al., 2007), with complexity inhibiting intention less than it inhibits behaviour with the reverse being true for ‘uncertainty’, which the authors link to risk. That study reports weighted average correlations between the perceived innovation attributes and intentions of 4 – 46%, and between the perceived innovation attributes and behaviour of 0 – 29% (i.e. 0 – 8% explained variance). In another study of telecommunications innovations, Ortt (1998) shows that the perceived innovation attributes explain 49% of the purchase
intentions for a major innovation and 62 – 65% for minor innovations. As mentioned in the previous paragraph, in order to compare these results with our data we need to take into account the extent to which the purchase intentions can explain actual adoption behaviour (Sheppard et al., 1988) and then these figures become much lower. Accordingly, the perceived innovation attributes only explain around 15% of actual adoption behaviour.

Another widely applied consumer research approach is conjoint analysis (Green and Srinivasan, 1978; Green and Srinivasan, 1990). However, this approach is intended for application with minor innovations: “The reason conjoint is applicable to continuous innovations is that respondents can easily imagine their liking for possible product configurations. By contrast, for discontinuous innovations the analyst should use more elaborate data-collection procedures.” (Wittink and Bergestuen, 2001). As such, we do not include this approach in our comparison.

We now look at the literature on the predictive validity of other approaches to estimate consumer demand for a new product, based on expert analysis or data analysis. In an exploration of new product forecasting practices, including both expert and data analysis techniques, an average forecast accuracy of 58% is reported, with an accuracy for major innovations of 40% (Kahn, 2002). It is unclear from the description of this overview exactly which statistic is used to measure forecast accuracy (Armstrong, 2002). We assume that the correlation between forecast and actual market performance is reported, bringing these findings in line with other authors. Many forecasting techniques are intended for use after the product has been launched and they use the first months of data as a basis for forecasting subsequent months. In these time-series analyses, explained variance should not be used to compare predictive accuracy (Armstrong, 2001b). However, for the pre-introduction estimation of consumer demand we do use explained variance particularly because this is the statistic most often reported. Unfortunately, for methods to assess the market potential of products prior to their introduction, there is no published benchmark such as the forecasting M3 competition for methods of time-series data analysis (Makridakis and Hibon, 2000). Evidence from cases where experience from analogous products was used to predict the success of a new product shows that for innovative new products this approach “serves more to mislead than to guide the way forward” (Schnaars, 2009).

In the period between July 2002 and July 2006, we have applied our instrument to estimate the consumer demand for 618 product-market combinations. To compare the validity of our new method with the other approaches we take our estimates for the products which were subsequently launched and for which the actual market performance could be assessed (Langley et al., 2009b) In total we include 160 product-market combinations, comprising 33 products each for an average of five consumer segments. These products came from five sectors, namely telecommunications,
dentistry, banking services, internet applications and consumer electronics. This data-set contains the estimations of the likely social contagion effect, which were made prior to the products’ introduction, as well as data on the actual market performance, as assessed post-introduction. Due to the broad range of products and sectors included in this analysis it is a challenge to collect relevant and comparable data on the actual market performance of the products. What one firm considers to be successful is for another firm a disaster. Purchase data is not always readily available and for some products it is not relevant as consumers may pay for usage rather than purchase the product, or not pay at all. We could ask the relevant product manager if our pre-introduction estimations were useful, but that is less usable for validation purposes. Eventually, we found that a reasonable source of data on actual market performance which can easily be used to compare disparate products from a range of sectors is the prevalence of information on each product from the relevant firm which can be found on the internet. As well as this, we collected data from the internet on the prevalence of sales outlets for each product from the relevant firm. We limited the information to that which was from the relevant country and that which was produced in the twelve months to March 2009. We combine these two sources to produce an index of actual market performance which we adjust to allow for time since the pre-introduction analysis was carried out and we assess the performance of the new approach for innovative products, based on two dimensions of innovation: marketing discontinuity and technological discontinuity (Garcia and Calantone, 2002). The results of this analysis are shown in Table 6.1. The average explained variance in actual market performance is 36%, which is highly comparable with the results presented in chapter 5 of 33% for telecom products and 32% for financial products. Surprisingly, we see an improvement in the accuracy of the social contagion estimations for major innovations compared to the average. On both the marketing and the technology discontinuity dimensions we see that for the new products which, at the time of their introduction, were similar to existing products our estimations are less accurate than for products which, at the time of their introduction, were dissimilar to existing products. This result may have come about because our method makes an estimate of the likely uptake of a product with specific characteristics, which for an innovation is that one product alone. After a product innovation has been successful many firms launch their own versions which incorporate the same characteristics. In this case our estimates are likely to reflect the total product uptake for the original and the copied products, thus making the estimations less accurate for less innovative products.

The published evidence on the validity of estimations made by the various approaches is summarized in Table 6.1 below. We conclude that our approach has a relatively high predictive validity. The implications of this comparison are of importance for those involved in the new product development process. For example, in practice it is often deemed necessary to measure the behavioural intentions of potential consumers as a means for estimating likely product uptake (Morwitz, Steckel and Gupta, 2007). These
results show that, particularly for major innovations, this notion may be incorrect. It is undoubtedly useful to involve potential consumers in the new product development process, to see if they understand a new product concept, to investigate the usability of the new product, etc. However, it appears that there may be better ways to predict their adoption behaviour than by measuring their purchase intentions.

Table 6.1.
Comparison of predictive validity of our social contagion approach with other consumer research and forecasting approaches

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>EXPLAINED VARIANCE IN ACTUAL CONSUMER DEMAND</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer research approaches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– behavioural intention surveys</td>
<td>0.28</td>
<td>(Sheppard, Hartwick and Warshaw, 1988)</td>
</tr>
<tr>
<td>– perceived innovation attributes</td>
<td>0.15</td>
<td>(Ortt, 1998)</td>
</tr>
<tr>
<td></td>
<td>0 – 0.08</td>
<td>(Arts, Frambach and Bijmolt, 2007)</td>
</tr>
<tr>
<td>Forecasting approaches, including expert (judgmental) analysis and data analysis</td>
<td>0.24</td>
<td>(Armstrong, 2002; Kahn, 2002)</td>
</tr>
<tr>
<td>The social contagion approach described in this dissertation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– telecom products</td>
<td>0.33</td>
<td>(Langley et al., 2009a)</td>
</tr>
<tr>
<td>– financial products</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>– wide range of products</td>
<td>0.36</td>
<td>(Langley, Ortt and Pals, 2009b)</td>
</tr>
<tr>
<td>– for major innovations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>marketing discontinuity</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>technology discontinuity</td>
<td>0.46</td>
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</table>

6.2.3 Determinants of social contagion

In the last few years there has been increasing interest in the role of the process of social contagion in the consumer adoption of new products. However, quite surprisingly, there is as yet a lack of studies identifying determinants of social contagion. The literature which does look at the role of social contagion places it as antecedent to consumer demand. For example, many different and sophisticated versions of the Bass Diffusion Model make estimations of the internal market influence, analogous to social contagion between consumers, without investigating how the process of social contagion comes about or the ways in which one new product may be more socially contagious than another. However, if we are to improve our understanding of social contagion it is insufficient to consider it a black-box which somehow drives consumer demand. This issue is of prime importance in the scientific debate surrounding this issue at the moment and forms our fifth research question: What are the determinants
of social contagion? During the study we report in chapter 3, we carry out a literature search looking for product characteristics that can be related to copying behaviour and also for personality traits that might influence the copying behaviour of an individual, resulting in two long lists of characteristics. We then narrow these long lists down by expert judgment during a process of discussions in which consensus was reached to produce the lists reported in Tables 4.1 and 4.2. In chapter 5 we create a structural equation model to link these product and consumer characteristics via the concept of social contagion to consumer demand. We use behavioural data regarding the sales and usage for 124 product-segment combinations of information and communication technology related products from the telecoms and financial sectors to test the effects relating to social contagion. We identify the main determinants of social contagion. Specifically, we find that consumer characteristics have only a weak effect on the probability that social contagion occurs. We find the strongest effect from product attributes which stimulate people to begin using that product as opposed to other product attributes such as those encouraging people to carry out the product-related behaviour accurately or to keep on using the product over an extended period of time. This is the first time that determinants of social contagion have been identified as well as the first time that their relative importance in driving consumer demand has been assessed.

Our final research question, also addressed in chapter 5, is: what is the strength of the effect of social contagion on the actual adoption of new products? This has been investigated for certain types of products, such as contagion effects between medical doctors prescribing new medicines (e.g. Burt, 1987b; Manchanda, Xie and Youn, 2008) and for consumer durables (Van den Bulte and Stremersch, 2004) but as yet not for innovative information and communication technology products. We show that the effect size of social contagion on actual consumer demand is around 0.57 in both the telecom and the financial sectors (see Table 5.2), which, as can be seen in 6.2.2 above, compares very favourably with similar studies using other factors as independent variables.

6.3 Managerial implications

From the outset, an objective of this research has been to develop a well-founded and workable instrument for firms which develop new products. A large part of this dissertation describes an instrument which offers such firms a new approach to assess the market potential for innovations early on in the development process. This instrument is complementary to traditional methods and the results provide recommendations for improving their products to increase the market potential.
6.3.1 Relevance for product development

When managers develop new innovative products they make many decisions based on what they expect will happen once that product is made available to consumers. These decisions include: Which new product idea has the highest market potential and should be developed? Which of the many possible variants of the new product has the highest market potential and should be developed? Which (functional, aesthetic, user interface, etc.) design choices will optimise the market potential? The method presented in this dissertation goes some way to providing valid and useful answers to these questions. It can help product developers by providing advice as to how to stimulate the social contagion process of new products. This can benefit firms, particularly prior to market launch, by helping them to choose between various products in the development pipe-line as well as by focusing product development activities to improve a new product’s social contagion properties. In chapter 4 we propose a simple procedure for applying the new instrument which can easily be carried out during the new product development process and we applied this process in a number of case study settings.

The first case study, described in chapter 3, was in an assignment for a European mobile telecommunications operator, which was considering the introduction of five new mobile services in one country for the so called SOHO market; SOHO stands for ‘Small office, home office’ and is used to refer to self-employed entrepreneurs working from a small office, often based at their own home. In a short space of time we applied our new instrument and calculated estimates of the social contagion effect. We also analysed five existing mobile services to use as a benchmark. All ten of these services had already been launched in a neighbouring country. By comparing our estimates with the market penetration of the services in the neighbouring country, including the benchmark services, we found a high correlation. Thus for the five new services we were able to advise on which would be the most successful if launched into the target market.

In chapter 4 we describe the relevance of the new instrument for product development in two more case studies. The first of these was carried out during the development of the innovative new product, mobile TV, whereby broadcast TV can be watched on a mobile phone, intended for the Dutch consumer market. Prior to market introduction, the firm developing the new product needed to understand which market segments were likely to show the highest potential for the new product. Our new instrument was applied by assessing the mobile TV product characteristics and the characteristics of a segmentation of the Netherlands (Dekker et al., 2003) whereby consumer segments are plotted on two axes: socio-economic status (low – high) and categories of values (traditional – modern – postmodern). From the resulting six consumer segments we were able to calculate the likely social contagion effect for each group and provide a relative score for their potential for adopting the new product.
We identified one (high socio-economic status/modern values) as having the highest potential for social contagion to occur, thus answering the first practical question: which market segments show the highest potential for the new product?

In the second case study described in chapter 4, a friend network service, also for use on mobile phones, was analysed using the new instrument whilst this new service was at the concept stage, very early in the development process. This new service would allow users to upload information to their personal profile from their mobile phones thus helping their friends to keep constantly updated as to where they are, what they are doing, etc. The key product development question which needed addressing in this case was: which elements of the basic design of the concept need to be improved, so as to optimise social contagion? Our new instrument can identify the product characteristics which show the most room for improvement with respect to a market segment, by determining the difference between the calculated social contagion effect brought about by each product characteristic and the highest possible effect that product characteristic can have for the market segment in question (see Figure 4.1). In this way, we identified that for the friend network concept the largest increase in the social contagion effect would be achieved by increasing the non-social benefit for the individual. This concept service is focused on stimulating rich communication between users – more often, better quality, any place. However, according to the analysis, in order to maintain market interest in the longer term, people will need added benefit besides these social aspects, such as being able to use the service as a new source of information (e.g. via blogs), as an image database, etc.

Besides these specific product development questions, the main decisions made during new product development are based to a large extent on the overall estimate of consumer demand for the new product in question. In all of the cases described above these estimates were made and presented to the development teams. Our findings relating to the validity of these estimates are described above (6.2.2).

6.3.2 Relevance for marketing communication

Working alongside the product developers, the marketing function is responsible for communicating with the consumers about the new product. They too base many of their decisions on what they expect will happen once that product is made available. Their questions include: Which market segments or consumer types are most likely to buy and use the product? What are the strengths of the product which we should highlight? Which aspects of the proposition may limit the uptake of the product and is it possible to alleviate the problem via marketing communication? Again, the method presented in this dissertation helps answer these questions.

For example, in the mobile TV case from chapter 4 referred to above (6.3.1), one of the main questions which our new instrument was used to answer was: are there features
of the service that can have a positive effect on the target group that can be emphasised in the marketing campaign? From the detailed results (see Figure 4.2) for the highest scoring market segment it is possible to see which product characteristics contribute the most to their high chances of copying the new behaviour. For example we identified that the distinctiveness of watching TV on a mobile phone, compared to other behaviours using a mobile phone such as text messaging, etc., has a strong positive effect on the chance that social contagion will occur. The behaviour is eye-catching, especially the fact that most devices have to be turned by 90 degrees to meet the standard screen size ratio of the TV image. Since this analysis, the firm in question launched the mobile TV service in the Netherlands and adopted our advice in the accompanying TV advertising campaign by emphasising exactly this 90 degree turn.

Although the results of an analysis of the social contagion of a new product are primarily of use for product developers and marketers, on a strategic level they can help firms with a wide range of decisions, including, the allocation of resources, competitive strategy leading to a unique market position, portfolio management and focus in product lines, cannibalization choices and decisions relating to a growth strategy driven by innovation.

The approach presented in this dissertation has some differences compared to standard approaches making it an interesting addition. Importantly, it can be applied prior to the market launch of the product, when there is no direct market data available. Most standard methods require real market data or at least a working prototype which can be costly to produce whereas our approach can be applied at the concept stage thus saving time and money. Also, our approach can be applied to innovative new products which are dissimilar to existing products. For example, it allows us to assess consumer demand for a new product without relying on potential consumers to evaluate the product. It makes no assumptions about potential consumers' knowledge of the product or its possible impact on their daily lives and it does not assume that consumers can adequately articulate their future needs.

6.4 Limitations and Future research possibilities

As with any new approach, there are a number of limitations and shortcomings in the research presented in this dissertation which we will attempt to summarize here. Some authors have complained that many methods proposed to predict the market potential of new products do not state when they are or are not applicable (Kahn, 2002; Lynn et al., 1999) and so we include such issues in our list of limitations. In the following sub-sections we identify assumptions that we have made in this research, state what the related limitations are and then propose a number of research avenues for the future.
6.4.1 Expert judgment

The approach we have adopted in this research, in particular in chapters 3, 4 and 5, is one whereby experts make judgments regarding the new products and regarding the relevant market segments. For each of the products included in the study the experts were provided with information on related and competing products and then asked to complete a questionnaire. The experts gave their opinion of the product’s characteristics, such as, “Intrinsic sociability: The extent to which the behaviour is itself social, or forms part of a social situation.” They rated the product on a 7-point Likert-type scale (1 = “Very much less than the average of the other products” to 7 = “Very much more than the average of the other products”). So, for example, if an expert considered a product to have the same level of “intrinsic sociability” as the related and competing products, they would give it a score of 4. A similar process was carried out for collecting experts’ opinions of the market segment characteristics. We adhered to Stewart’s principles for reliable judgments, by organising and presenting information in a form that clearly emphasizes relevant information, by limiting the amount of information used, by using computation to process the judgments and by combining the judgments of several experts (Stewart, 2001). We make two assumptions: that the experts are able to make consistent judgments in this way and that the judgments are unbiased, i.e. that they are a valid reflection of the actual characteristics of the products and market segments. Inconsistency and bias are the two ways that expert judgments can be suboptimal (Harvey, 2001). We have taken a number of steps to ensure that our assumptions hold. Firstly, others have found that better results are achieved when the judgment task is decomposed into smaller tasks (MacGregor, 2001) and this is what we did by asking the experts about individual product characteristics one at a time. We did not ask the experts to make any judgment about a product as a whole and we did not ask for any form of prediction. A second step we took to reduce bias was to only include experts who had no stake in the outcome of the analysis, as evidence shows that the person responsible for developing and implementing a plan of action should not be involved in estimating its chances of success (Brenner et al., 1996; Harvey, 2001; Taleb, 2007). Another step to ensure that the experts used in our studies could make valid judgments was to measure the inter-judgmental agreement (see 5.2.1). As our experts agreed with each other we know that their judgments were reliable and this is a prerequisite for validity.

There are important practical advantages for making use of experts as we have, as opposed to other methods making use of potential new users of a product or methods based on data analysis. The main advantage is that our method can be applied very early in the development process, before any market data is available and, crucially, before important financial decisions are made. This allows firms to boost profits by optimizing the chances of their best ideas, and reduce costs by changing the course of less promising developments. Nevertheless, despite taking steps to ensure that our assumptions regarding the reliability and validity of the judgments hold, our
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approach’s heavy reliance on experts remains a limitation. In relation to this limitation, future research could focus on two areas: reducing the reliance on experts or further reducing the inconsistency and bias of the experts’ judgments. Taking the first of these areas, new studies could investigate whether by combining our approach with different approaches into a single analysis more valid results could be obtained, in line with evidence to this effect from combining other methods (Armstrong, 2001a). The literature identifies two alternatives to expert judgment, namely consumer analysis and data analysis (Armstrong, 2001c; Kahn, 2005; Taschner, 1999), and as previously stated in the introduction (1.3) we add two categories, namely practical, trial-and-error approaches and theoretical approaches. We argue against relying on consumer analysis and data analysis for cases where the new product is innovative and therefore different to existing products (see 3.2). These two categories of methods rely heavily on the assumption that past experience or past data is the best predictor of the future, which for innovative new products is likely not to be the case (Morwitz, Steckel and Gupta, 2007; Schnaars, 2009; Taschner, 1999). We would like to investigate how to adapt practical, trial-and-error approaches to allow them to be applied very early in the development process and this could provide us with timely information on the products and market segments without recourse to experts. The second area for future research mentioned above is to improve the quality of the experts’ judgments. Various authors suggest ways of improving judgments and further research could, for example, assess the effect of making the experts explain their judgments (c.f. Arkes et al., 1987; Stewart, 2001) or of selecting the experts to ensure that they are heterogeneous with respect to their domain knowledge (Rowe and Wright, 2001). New studies could further investigate various selection criteria which could be applied to obtain the most valid judgments or show the effect of including more experts on the quality of the judgments or the effect of removing any outlying judgments.

6.4.2 Supply-side of the market

Our approach for estimating the consumer demand for a new product only addresses part of the total picture of new product success. Besides the demand-side of the equation there are many supply-side issues which we purposefully exclude from our model. These include the technological choices, partnering between businesses, supplier-relationships, market introduction strategies, governmental regulation, the value-chain, distribution and so forth (Baumol and Blinder, 2008). An assumption we make is that our estimations of the demand side of the market provide sufficient insight into the likely consumer demand. This is a limitation because when a firm sets about deciding which new product ideas to develop, the decision makers need to take account of issues on both sides of the equation. Sometimes, however, one side proves to be the limiting factor, by being both highly important for the success of the new product as well as being difficult to estimate. For example, for a new telecommunications product such as mobile TV where the new technology is fully developed (DVB-H) and the regulatory situation determining broadcasting rights is clear (such as in the
Netherlands at the time that mobile TV was launched) then the limiting factor in a firm being able to make well-founded decisions regarding new product development is the estimation of consumer demand. In other situations the supply-side issues may be the limiting factor and in many situations both sides will prove to be equally important and equally difficult to predict. The method presented in this dissertation is a partial answer for those seeking to develop new products and an avenue for future research is to link this approach and others like it which focus on the demand-side of the market with complementary approaches for modelling the supply-side thus updating earlier work on combining both sides of the market (see e.g. Bon, 1986).

6.4.3 Generalizing to other product categories

The research we describe has been focussed on information and communication technology products, both in the telecommunications and the financial sectors, and the instrument we describe was initially developed for this product category. However, as described in 6.2.2, we have since applied it in other sectors such as dentistry, banking and consumer durables and we therefore assume that it is more broadly applicable. The validation research includes some product categories from these sectors but we would advise those applying the method to take care when applying it to other product categories as the interpretation of the results as well as the reliability of the findings has been less well researched. This is clearly a valuable area for future research and we would welcome the opportunity to validate this approach more widely with other product categories including various fast moving consumer goods, commodities like water, gas and electricity, as well as mortgages, health-care insurance, electric cars, etc. In a number of these areas the pace of innovation is accelerating and many wholly new products are being developed and released into the market. At the time of writing electric cars show potential to burst onto the market and in the electricity sector the arrival of smart meters combined with local energy production provides many opportunities for a wide range of new consumer services. Nevertheless, the information and communication technology sector has proven to be a good place to start as it has allowed us to include a number of radical product innovations in our studies. As noted by other authors, “In high technology businesses such as computers and telecommunications, for example, change is rapid and the rate of new product introduction is fast and frequent, meaning data series are often short or nonexistent. In addition, the innovations themselves are often more radically new, making their adoption by consumers more consequential. This suggests that a different set of new product forecasting models may be more appropriate than when forecasting sales of low-technology products, such as new bars of soap or breakfast cereals.” (Lynn, Schnaars and Skov, 1999, p.566).

6.4.4 Business-to-business market

When the adopters and users of a product are businesses rather than individual consumers then the method as presented in chapters 3, 4 and 5 is not applicable, as the
assumption we make is that groups of consumers can be described on the basis of their personality traits. Thus, a limitation is that we can only apply our model to products intended for the consumer market. Future research can focus on social contagion in the business market and indeed we have made a start in this direction. We believe that if we look at the basic concept of social contagion then there is no reason in principle that it cannot be applied to organisations. Businesses are comprised of people at various levels of the organisation and these people talk to each other, to others from other organisations and they view the same media. Because of this, we can propose that not only do individuals copy each other, also companies copy each other in terms of the products they use or even the strategies they adopt. Take the rapid spread of certain business products or processes, such as computer software (e.g. Microsoft Office), Total Quality Management, Enterprise Resource Planning and many others. Could the adoption of these have been driven to some extent by social contagion between businesses? Based on a belief that this is the case, we have developed a business-to-business version of our method. The product characteristics of this version are very similar to the business-to-consumer version described in this dissertation. The customer segment characteristics are replaced with elements of the organizational culture. The validation of this business-to-business version is ongoing.

6.4.5 Models for use by consumer groups

The instrument described in this dissertation has been applied to provide advice for firms which develop new products. The implicit assumption is that it is predominantly these firms which are interested in the estimates of likely consumer demand. However, there may well be others who could benefit from a better understanding of the mechanisms which drive the spread of new products. For example, we may be able to provide advice for the consumers at whom these firms aim their products, perhaps by providing consumer groups with support and direction to allow them to better understand how they are influenced in the process of social contagion. This could help consumer groups to take more control over the process of innovation, by helping them to learn how they can convince their members to join in activities aimed at putting pressure on the firms to provide the products and services they demand. An interesting example of this process of a consumer association taking the lead in an innovation process was the recent case in the Netherlands of a consumer association, Windvogel, which operates four wind turbines and delivers electricity to the Dutch network. The association sought cooperation from the major energy retailers to allow the individual consumers in the association to deduct their portion of the generated electricity from their monthly bill and recently agreed just this with Eneco, one of the Netherlands’ leading energy retailers.

There is huge potential for many consumer groups to get their members acting together to influence firms. This could be aimed at influencing a specific firm to change its practices or to offer a specific new product, such as the internet-based consumer
group Dell Hell (www.dellhell.net), which focuses on communicating with the computer manufacturer Dell to improve its products, or it could be aimed at a sector of firms to put forward the consumers’ perspective, such as the Windvogel example above. Either way, if the consumers are aware of the process of social contagion and can coordinate their activities such that their requirements are communicated in an effective way, then the whole process of innovation which has generally been a one-way communication from firm to consumer can change into a two-way communication bringing the consumers onto an equal footing with the firms. One stream of research in this area has focused on the so-called lead-users (Hippel, 1986) who are ahead of the mainstream consumers and generate new ideas. Another relevant stream of research looks at brand communities (McAlexander et al., 2002; Thompson and Sinha, 2008), but there has been little attention paid to how the process of social contagion can help the mainstream consumers to become more active and to combine together, e.g. via the internet, to become a force in the innovation process.

6.4.6 Quantified sales forecasts

During the application of our method we have noticed that the firm concerned is very often interested in two levels of results. Firstly, they are interested in results on the level of choosing between various possible new product developments or understanding how a new product is likely to perform compared to competing products. On this level our method provides sufficiently detailed results. However, on a more detailed level, they would also ideally like a quantification of the data in terms of turnover or market share. The results of our method provide an estimation of the likely social contagion effect but do not calculate how this translates to a specific number of future adopters or forecast sales figures. As stated in 6.4.1 above, these detailed figures depend on more than just the likely consumer demand. In order to generate such predictions we would need to take many issues into account besides the product characteristics and the consumer characteristics, such as the size of segments, the general rate of new product diffusion for a specific product category, and a range of supply-side issues. This would be a major extension to our model which could combine a validated business model with the results of our method to produce hard predictions of actual sales and would be a valuable but challenging area for future research. “Forecasting sales of radically-new technological products is an important but treacherous task.” (Lynn, Schnaars and Skov, 1999).

6.4.7 Modelling product diffusion

Once a product has been launched into a market, a rich quantity of data becomes available on the real consumer uptake of the product and this can be used as a basis to make forecasts of how the diffusion process will continue. Such post-introduction forecasting is an area which has generated an enormous amount of research and innumerable methods and techniques (Armstrong, 2001c; Leeflang, Wittink, Wedel and Naert, 2000; Makridakis, Wheelwright and Hyndman, 1997) which are generally aimed
at predicting how a diffusion curve will continue. Many variants of the generalized S-curve have been proposed (Bass, 1969; Goldenberg et al., 2002; Ortt and Schoormans, 2004; Rogers, 2003) and much work has been done to validate alternative methods. On the other hand, pre-introduction prediction of product adoption is relatively under-researched (Kahn, 2002; Taschner, 1999; Urban, Weinberg and Hauser, 1996). The approach we propose is intended for use prior to the market introduction of a product and it does not model product diffusion or produce a predicted diffusion curve. It is a model of market demand and can be seen as providing results in the form of gradations of ‘hit’ or ‘miss’, rather than a time-dependent curve. There is a need for better methods of predicting market demand at an early stage of new product development: to optimize the best ideas and to stop those doomed to failure before huge investments are made. One conceptualization of the new product development process extends the idea of the S-curve by adding two phases prior to the widespread uptake of the new product: the innovation phase between the initial invention and the first market introduction and the adaptation phase between the first market introduction and the onset of the standard S-curve (Ortt and Schoormans, 2004). Efforts to model the market potential of new products are almost exclusively intended for use after these two phases, once the smooth S-curve has begun. However, our approach is ideally suited to providing estimates of consumer demand during the adaptation phase, when there is instability in the market and when various forms of the new product are introduced, many of which fail and are replaced by adapted forms.

Any method which does produce a predicted diffusion curve at the beginning of the development of an innovative product will need rigorous validation to prevent a spurious accuracy effect. Nevertheless, there are a number of future research options related to our research. The first one is to link the theoretical basis of our method to the general S-curve diffusion pattern. The three theoretical concepts we used as a basis for our method are fecundity, i.e. the number of copies which are made of a product-related behaviour, the fidelity of those copies, i.e. whether consumers are able to carry out the product-related behaviour in the right way, and the longevity of the product-related behaviour, i.e. whether consumers keep on expressing the behaviour over a long period of time. In chapter 5 we show that fecundity has a stronger effect on market demand through social contagion than fidelity or longevity. The strength of the fecundity of a product-market combination could translate to the slope of the S-curve, or the speed of diffusion. The fidelity may reflect the reliability of the predicted curve and the longevity may say more about the duration of the curve. By linking fecundity and longevity, we may be able to calculate the expected maximum penetration. This idea is summarised in Figure 6.1. Further research could assess these relationships by determining the levels of the three social contagion constructs for product-market combinations for which the diffusion curve is known.
Chapter 6 | General Discussion

Figure 6.1. Possible links between three theoretical constructs of social contagion and the generalized S-curve of product diffusion.

Another option for linking our approach to the diffusion curve involves making use of future scenarios. Our approach does not require working prototypes and is based on assumptions regarding the product’s characteristics as well as assumptions regarding the competing products and alternative behaviours that the consumers could copy instead. By creating a number of future scenarios in which the competitive market situation gradually evolves, it could be possible to use our approach to predict a number of points along the expected diffusion curve. Even with only three or four points being predicted, a rudimentary diffusion curve can be estimated and this can be done in principle at the concept stage which no other method we are aware of can reliably do.

Yet another possibility to develop our social contagion approach so that we can generate predictions of the diffusion curve is to make use of models which can generate a time-related growth curve. One possibility is the modelling technique known as system dynamics (Sterman, 2000). System dynamics allows us to model two things: stocks (of consumers) and flows (e.g. from non-adopter to adopter). We have investigated the possibility of applying system dynamics to the process of social contagion during the adoption of new products (Mooy et al., 2004). The Bass adoption model can be depicted in the form of system dynamics, whereby there is a flow of consumers from the stock of the potential market to the stock of consumers who have adopted. This flow is influenced by both an innovation coefficient (P) and an imitation coefficient (Q). We elaborate on this basic model by proposing a social contagion model, shown in Figure 6.2. In this model, consumers can flow from the potential market to
being customers by adopting or to being non-customers by rejecting a new product. Consumers can also discard a product and therefore flow from being customers to being non-customers. Each of these three flows also has an innovation coefficient ($P_a$, $P_r$ and $P_d$) and an imitation coefficient ($Q_a$, $Q_r$ and $Q_d$). This model looks promising as the output depicts both the rise and the fall of a diffusion curve, shown in Figure 6.3. This research avenue can be explored further.

**Figure 6.2. A systems dynamics version of a social contagion model of product diffusion (taken from Mooy, Langley and Klok, 2004).**
An alternative possibility to generate predictions of the diffusion curve based on social contagion is to model individual consumers’ copying behaviour over time and this is described in the next paragraph.

6.4.8 Disaggregate level analysis

The approach we have proposed is an aggregate level model. We make assumptions regarding the homogeneity of the market segments, or at least that average values of the consumer characteristics are valid across a whole segment. Although our validation results suggest that this approach is effective in the situations we have applied it, that may not always be the case. In the field of macro economics, Lucas (1976) criticised macro-level models because of the assumption they make regarding the stability of the market structure which cannot account for changes in the environment, such as policy changes. As such, he rejects attempts to use aggregate level data to predict the effects of an economic policy change. This can serve as an analogy for aggregate level models of the consumer adoption of new products, particularly new product innovations which may cause disruption in the market. And this analogy applies to our model which works at an aggregate level and attempts to predict the effects of changes in the market brought about by innovative new products. Therefore, an improvement to our approach would be to model the adoption of a new product at the individual, behavioural level. There are a couple of strands of research which are making progress in this area. For example, Garcia (2005) proposes the use of agent-based modelling techniques in the area of new product adoption. Agent-based models are computer simulation models in which the actions of autonomous ‘agents’ are calculated by allowing each agent to ‘behave’ differently. By running the simulation model, the individual agents interact and the effects for the whole network can be calculated.
By modelling a connected network of consumers as the agents and programming them with varying degrees of innovativeness and propensity to copy their neighbours, these simulations can model the process of new product adoption at the disaggregate level. Some researchers have proposed just such models (Alkemade and Castaldi, 2005; Deffuant et al., 2005; Delre et al., 2007) which include agent parameters related to the extent to which agents are influenced by neighbouring agents in the network but as yet none of this research includes determinants of social contagion in the models. Combining the work presented in this dissertation with such agent-based models would be a fruitful path for new research.

A related strand of research which also models the individual level adoption of new products is based on the so-called cellular automata. These are computational models in which ‘cells’ can be in one of a small number of states and each cell ‘behaves’ by being activated or inhibited by the activity of its neighbour cells, each obeying a small set of a mathematical rules. The best known version of this model is Conway’s Game of Life (Gardner, 1970) which is a two-dimensional grid of cells, each of which is in one of two possible states, black or white. At each time step, the configuration of a cell’s neighbours determines whether that cell will change colour or stay the same. Despite the simplicity of the computational rules, this model can produce vast complexity, even simulating simple life forms (Dennett, 1995). This type of model has recently been used to simulate consumers’ adoption of products (Garber, Goldenberg, Libai and Muller, 2004; Goldenberg, Libai and Muller, 2002) whereby each cell in the model represents a consumer and each consumer can be in one of two states: non-adoption and adoption. There are simple computational rules that define the transition of a cell from being a potential adopter to adopting a product. Two types of rules are stipulated: external factors, whereby consumers are influence by external mechanisms, such as advertising; and internal factors, whereby consumers are influenced by an interaction with another consumer who has already adopted the product. Again this type of model appears to be a promising way of making early predictions of the consumer demand for a new product using an individual-level approach. Once again, however, none of this research includes determinants of social contagion in the models and future research could therefore combine the work presented in this dissertation with such models.

### 6.4.9 Social-psychological research into social contagion

Part of the scientific contribution of this dissertation is that for the first time the antecedents of social contagion have been investigated and we have been able to show why one product may stimulate the process of social contagion more than another. However, we have not focussed on the underlying inter-personal mechanisms which cause social contagion to come about. As stated in our definition of social contagion (1.2) there are various mechanisms which drive people to influence each other to adopt a new product, including direct behavioural imitation, word-of-mouth,
informational influence, persuasion and social norms. We have assumed that we can group these mechanisms together and that we can study the combined social contagion effect they produce. In order to tackle this limitation, social-psychological research would be needed to tease out the separate effects. Social psychologists have investigated mechanisms of social contagion, albeit in areas other than new product adoption. These include binge eating (Crandall, 1988), behaviour in crowds (Chapko and Revers, 1976) and emotional or mood contagion (Barsade, 2002; Hatfield et al., 1993; Neumann and Strack, 2000). Some have related these mechanisms to product or service related situations (Hennig-Thurau et al., 2006; Tanner, Ferraro, Chartrand, Bettman and Baaren, 2008) and this work could be continued, for example by implementing an experimental approach in which various mechanisms could be kept controlled and a single mechanism could be varied. This could attempt to see how social contagion between consumers comes about and could identify the dominant mechanisms. Such an approach could also investigate the social or contextual factors which stimulate or inhibit social contagion. For example, some social-psychological research has shown that social contagion can be inhibited by placing a mirror in front of the person involved in the experiment. By constantly being reminded of themselves in this way, they appear less likely to adapt their behaviour to be more like those around them (Dijksterhuis and Bargh, 2001). If such an effect were shown to play a role in inhibiting social contagion during product adoption, this could affect the recommendations regarding the placement of mirrors in shops. There are many such potential avenues for further research of consumer behaviour related to social contagion.

6.4.10 Other possible steps in researching social contagion

Besides the possible extensions to our method described above, there are a number of other relevant areas for future research. In the area of further improvements to the approach advocated in this dissertation, an obvious topic is to take the results from chapter 5 regarding the determinants of social contagion and feed them back into the instrument described in chapters 3 and 4. Using the structural equation model described in chapter 5, we could not only ascertain which determinants are the most important in driving the process of social contagion but also calculate the weights for each of the product characteristics and each of the consumer characteristics. These weights could serve as a fine-tuning of our instrument.

Another example of a refinement to our approach is to look at how different types of consumer may perceive the product characteristics. As this was the first time that researchers had looked at candidate characteristics which may increase the probability of copying we needed to take a simple step first before adding too much complexity to the model. In order to do this we assumed that we could measure the product characteristics as seen by an ‘average’ consumer. Future research could propose a modification to our approach so that these measurements can be split to reflect the
different perceptions. For example, consumers who are knowledgeable within a specific domain may have very different perceptions of product characteristics than consumers with no knowledge in the domain (e.g. related to ease of use). Another example is to include a broader range of product-market combinations in the data set for the model presented in chapter 5. As described in 6.2.2 above, we have carried out a large number of analyses using our model and more of these could be included in the model to identify the strength of the effects of the determinants, although finding accurate and comparable data on the actual market uptake of the products is challenging. With an increased dataset, we expect that we would then be able to investigate the relationships in more detail.

6.5 Concluding remarks

Right at the beginning of this dissertation we presented a quote from the 19th century proposing that innovations spread because of social contagion. More than a hundred years later we are still developing this idea. The research described in this dissertation has shown for the first time that it is possible to estimate the social contagion that a new product will bring about. It is possible to do this whilst that product is still in the process of being developed such that improvements can be implemented prior to market introduction. Additionally, we have shown that these estimations are valid predictions of the actual market demand for the new product and we have focussed on the practical application of the new approach for product developers and marketers. We have identified for the first time the most important determinants of social contagion from a set of product characteristics and consumer characteristics. We believe that we have shown that there is much benefit to be gained by firms if they make use of the social contagion approach we propose during their new product development process.

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