



Universiteit Utrecht

 MONASH University

April 2010

PREDICTING THE PURCHASE OF INNOVATIONS

Forecast model based on the relation between purchase intention and actual purchase taking into account the influence of product diffusion on a population level

Science & Innovation Management
Master Thesis | GEO4-2239 | 30 ECTS

Author

I.J.W. (Inge) Lebbink BSc
Utrecht University
Student number: 0429341
I.J.W.Lebbink@students.uu.nl
Potgieterstraat 37
3532 VP Utrecht

Supervisors

Dr. F.J. (Frank) van Rijnsoever
Utrecht University, Utrecht
Prof. H. (Harmen) Oppewal
Monash University, Melbourne
Dr. J. (Jan) Faber
Utrecht University, Utrecht

EXECUTIVE SUMMARY

The main objective of this research is to examine how purchase intention can improve the prediction of actual purchase on an aggregated level. On macro level the adoption of products result in a product diffusion curve that can influence the relationship between purchase intention and actual purchase. According to former research on micro level, attitude, subjective norm and perceived behavioural control are expected to influence purchase intention. Using an Australian database provided by Roy Morgan Research, this research formulated three hypotheses:

H₁: Purchase intention of a population at t-1 is positively related to actual purchase at t.

H₂: Product diffusion positively moderates the relation between a consumer's purchase intention at t-1 and the actual purchase at t.

H₃: Purchase intention of a population is positively influenced by the consumer's attitude, subjective norm and perceived behavioural control.

A sample that contains 22 entertainment products and purchase behaviour data of Australian households is used to test the expected relationships. The hypotheses are tested along the lines of the diffusion theory and the theory of planned behaviour.

When a product enters the market, consumers adopt the product and the diffusion of the product starts. According to the widely used Bass model, the adoption of products occurs based on the imitation of precursor adopters. In other words, social pressure results in purchase of products. The Bass model is a S-shaped curve that displays the product adoption by consumers over time until a certain saturation point is reached. In this research, a difference is made between the first, A, and second, B part of this diffusion curve. This is tested by comparing results of the data in these two product diffusion parts. Furthermore, the theory of planned behaviour is used to approach purchase intention. This theory originates in the theory of reasoned action assuming that attitude and subjective norm influence the consumers' intention. Later, research shows the added value of perceived behavioural control in understanding purchase intention. Therefore, all three variables are included in this research.

The database of Roy Morgan Research contains factors that directly measure purchase intention, actual purchase and product diffusion. Attitude is measured by four statements regarding interest in technology that are derived from the dataset. Moreover, since product diffusion and subjective norm are both mainly based on social pressure, product diffusion is used to measure the influence of subjective norm on purchase intention. In addition, perceived behavioural control is measured by income and the ownership of complementary goods. All used data is a percentage of the total population that are transferred from the database to SPSS. Subsequently, ANCOVA models are used, because this test is able to include continuous variables, it enables to correct for the differences between the included entertainment products and it tests the relation between variables.

All models that compare data in diffusion part A and B when compared to models analyzing all data, better explain the dependent variable based on the included independent variables. The result of interpreting the output of ANCOVA models is a confirmation of the first hypothesis regarding the main relation. Purchase intention positively affects actual purchase, as expected. The second hypothesis is not confirmed. With regard to the third hypothesis a significant positive relation was

found between subjective norm and purchase intention. No significant relation was found between attitude or perceived behavioural control and purchase intention. Therefore, the third hypothesis concerning this relationship, except for the part concerning subjective norm, was rejected. In conclusion, subjective norm positively influences purchase intention and purchase intention is positively related to actual purchase.

Firms can use this model to make predictions for innovations and more diffused products. First, when firms have developed several innovations and aim to determine which of these products will perform best on the market, the management team can use purchase intention to predict the future sales. Second, when a firm, for instance, lacks in having a precise sales history, purchase intention can be used to determine actual purchase of existing products as well. At least one year upfront a firm needs to survey consumers on the market about their purchase intention. Furthermore, the social network of consumers will influence the purchase intention and should be taken into account while measuring the purchase intention. In diffusion part A the actual purchase will be approximately the same population fraction as stated to have a purchase intention, while in part B the actual purchase will be approximately three times the measured purchase intention. To conclude, firms can base their future sales predictions on the purchase intention.

After conducting this research, some recommendations regarding further research are formulated. First, more research on aggregated level can focus on the theory of planned behaviour, because in this research only subjective norm is significantly related to purchase intention, while also a relation was expected between both attitude and perceived behavioural control and purchase intention. Second, the hypotheses were tested with trend data, whereas panel data can provide more insights into the individual decisions. Third, further research can be done with other product categories and data obtained from more than one country to make it easier to generalize the results. Finally, future research can focus on the reason of purchase. Not enough data was available concerning replacement purchases, which can give a more complete view of the nature of the purchase intention and the reason for actual purchase.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
1 INTRODUCTION	6
2 THEORETICAL BACKGROUND	8
2.1 Conceptual model	8
2.2 Definitions of the main variables	8
2.3 Theoretical attributes Diffusion of products	9
2.4 Theoretical attributes Purchase intention	11
3 METHODOLOGY	12
3.1 Roy Morgan Research ASTEROID	12
3.2 Research design	12
3.3 Measurement of the variables	13
3.3.1 <i>Actual purchase</i>	14
3.3.2 <i>Purchase intention</i>	15
3.3.3 <i>Product diffusion</i>	16
3.3.4 <i>Attitude</i>	17
3.3.5 <i>Perceived behavioural control</i>	18
3.4 Data analysis	19
3.4.1 <i>Hypothesis 1 & 2</i>	20
3.4.2 <i>Hypothesis 3</i>	20
3.4.3 <i>Diffusion part A and B</i>	20

4	RESULTS	21
4.1	Hypothesis 1 & 2	21
4.1.1	<i>Hypothesis 1</i>	22
4.1.2	<i>Hypothesis 2</i>	22
4.1.3	<i>Diffusion part A and B Hypothesis 1 & 2</i>	23
4.1.4	<i>Comparison with former sales as predictor</i>	23
4.2	Hypothesis 3	25
4.2.1	<i>Diffusion part A and B Hypothesis 3</i>	26
5	CONCLUSION	27
6	DISCUSSION	29
6.1	Limitations	29
6.2	Theoretical implications	29
6.3	Managerial implications	30
6.4	Further research	30
7	ACKNOWLEDGEMENTS	32
	REFERENCES	33
	APPENDIX A CORRELATION MATRIX	36

1 INTRODUCTION

Every company monitors its sales to evaluate the commercial performance, to plan production, and to predict future sales (Butters, 1977; Haining et al., 1997; Morwitz et al., 2007; Parker, 1994). For existing products, the previous sales form a good base for predicting sales in the succeeding year (Fisher et al., 2000; Holt, 2004; Morwitz et al., 2007; Winters, 1960). However, when an innovation enters the market no sales history is available to base predictions on. Therefore, additional predictors are necessary for firms to be able to correctly estimate the number of products that consumers will purchase. One important predictor mentioned in literature is the consumers' purchase intention (Ajzen, 2001; Bemmaor, 1995; Morwitz et al., 2007).

Three purposes are formulated in this study. First, this study aims to explore the usability of purchase intention as predictor for actual purchased products. Second, we look at the influence of product diffusion on the relation between purchase intention and actual purchase. Third, the predictability of purchase intention is studied. The outcome of this study enables firms to more accurately predict their sales, in particular with regard to innovations.

Despite the fact that purchase intention is a widely used predictor to estimate purchases of innovation, it has been used with varying degrees of success. Currently, it is still difficult to predict actual purchases from intentions. On the macro level, adoption of products results in a product diffusion curve, which can be analysed to approach the total amount of purchased products over time (Bass, 1969, 2004; Norton & Bass, 1987; Parker, 1993, 1994). There are several different models to approach diffusion, of which the Bass model is the most often used (Bass, 2004). The Bass model "assumes that the adoption of a new innovation by an individual is influenced by factors external to product experience, as captured in the coefficient of innovation, and factors based on interpersonal influences and cumulative learning, reflected in the coefficient of imitation" (Parker, 1993:82). This model has the form of a S-shaped curve that displays the adoption of the product by consumers over time (Bass, 1980, 2004; Norton & Bass, 1987; Parker, 1994).

According to the Bass model the diffusion curve starts when a product enters the market, and consumers have the opportunity to purchase it. Morwitz et al. (2007) study the effect of purchase intention on actual purchase for existing and new products. In contrast to the approach of Morwitz et al. (2007) we consider the diffusion curve of one group of products instead of two categories of products (existing and new), which are compared. Therefore this study is different and increases the scientific value tremendously by elaborating on diffusion curves in relation to intention data. One reason to expect effect of product diffusion on the relation between the purchase intention and actual purchase on macro level is because Morwitz et al. (2007) notice a difference between existing and new products. As a result the model, which is developed in this research, can be more accurate compared to models excluding diffusion. During product diffusion an increasing amount of information becomes available about the product. Consumers consider the purchase of a product mainly based on the available information about the product, thus their purchase is well considered when the product is further diffused (Alba & Hutchinson, 1987; Johnson & Russo, 1984; Ozer, 2009). As a result, the predictive value of intention for actual purchase increases with the diffusion of the product as well. As a result, the theoretical added value of this study is the aim to propose an extended Bass model by adding intention data to this model.

Many studies tested the predictability of purchase intention for actual purchase on the individual/micro level (e.g. Ajzen, 2001; Sheppard et al., 1988; Taylor & Todd, 1995). Most of this

research uses the theory of reasoned action of Fishbein & Ajzen (Ajzen, 2001, 2005; Ajzen & Madden, 1986; Morwitz et al., 2007; Sheppard et al., 1988; Taylor & Todd, 1995). The main idea of this theory is that attitude and subjective norms influence the consumers' intention to display certain behaviour. According to Ajzen & Madden (1986), Chang (1998) and Godin et al. (1993), perceived behavioural control – the degree of access to resources and the level of self-confidence to perform the behaviour – increases the understanding of intentions. The theory of reasoned action is extended with perceived behavioural control, which is called the theory of planned behaviour. In this study all three variables are included to determine the consumers' purchase intention on the population/macro level. This study may also have theoretical implications regarding the theory of planned behaviour, because the assumed relations of this theory are tested on a higher aggregation level than most former research. This can result in more insight in the relations as described in the theory.

The formulated considerations above result in three research questions:

1. To what extent is purchase intention an accurate predictor to estimate actual purchase?
2. To what extent does product diffusion moderate the relation between the populations' purchase intention and actual purchase?
3. To what extent is the populations' purchase intention influenced by attitude, subjective norm and perceived behavioural control?

This study answers these research questions for the home entertainment industry. This industry is developing fast. For example, the Video Cassette Recorder (VCR) was almost entirely replaced by the Digital Versatile Disc (DVD) player in 2003. Next, DVD players with a recorder function began to increase in popularity, and the High Definition (HD) quality video format entered the market in 2006 (Waller et al., 2007; 2008). All included products in this study are consumer electronics. All data concerning Australian households used in this study have been provided by the Roy Morgan Research company.

In section 2, the expected relations are visually represented in one conceptual model, and all hypotheses are formulated based on two theoretical streams, i.e. the theoretical attributes of purchase intention on micro level, and the diffusion theory on macro level. In section 3 the background of Roy Morgan Research, its database, and the methods they use to gather data are described in more detail. Furthermore, section 3 discusses the research design and the methods used in this study to analyse the data. The results of the tested hypotheses are presented in section 4. In section 5 the research questions are answered and the final conclusions are given. Finally, in the discussion the limitation of this research, theoretical and managerial implications and options for further research are described.

2 THEORETICAL BACKGROUND

Section 2.1 introduces the entire conceptual model that visualizes the relations of this research, which will be further explained in the following sections. The most important relation and the theoretical background of purchase behaviour are discussed in section 2.2. Section 2.3 describes the background of diffusion curves and adoption processes along with their influence on the described variables. Last, the influential factors on purchase intention are discussed in section 2.4.

2.1 Conceptual model

Three hypotheses are formulated in this theory section. First, purchase intention predicts the actual purchase (Bemmar, 1995; Morwitz et al., 2007). Second, product diffusion moderates the relation between intention and actual purchase (Morwitz et al., 2007). Third, purchase intention is determined by attitude, subjective norm and perceived behavioural control (Ajzen, 2001; Godin et al., 1993; Lu et al., 2009). In total these assumed relations are visualized in one conceptual model as depicted in figure 2.1.

The most important relation (bold) is the causal relation between purchase intention at t-1 and actual purchase at t. In this model actual purchase is the dependent variable at t, all other variables are measured at t-1.

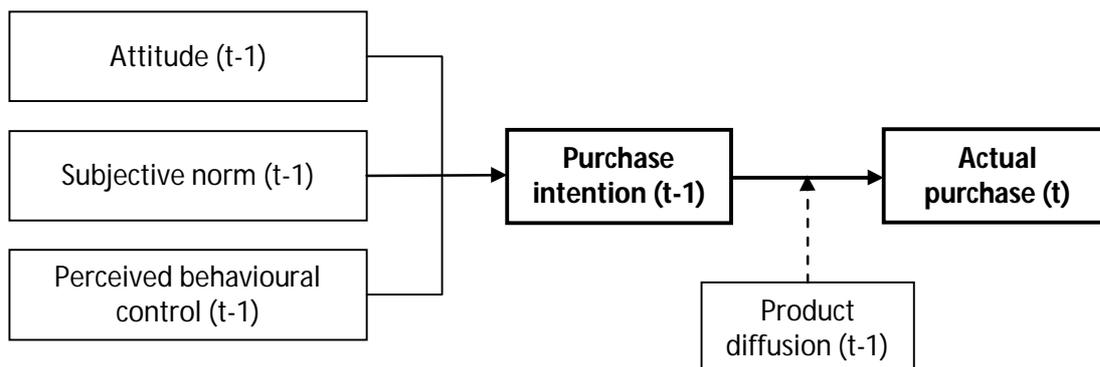


Figure 2.1: Conceptual model depicting all variables and assumed relations

2.2 Definitions of the main variables

Actual purchase

Actual purchase is the dependent variable in the conceptual model and is defined as the total amount of products bought by consumers on the market. Nevertheless, consumers can also replace products instead of buying new ones. In this study, the difference in ownership between t-1 and t is considered to give insight in the replace purchases. However, on an aggregated level it is impossible to conclude from these figures whether it was a replacement purchase or not, it is only likely to be a replacement purchase when the growth in the amount of bought products is higher than the growth in ownership.

Purchase intention

The main independent variable in this research is purchase intention. In this study it is defined on the macro level as the fraction of the population that states to have the intention at t-1 to purchase product x before t.

Figure 2.2 shows the possible paths a consumer can follow from (not) having intentions to (not) actually purchasing a product. Bemmaor (1995) distinguishes between intenders and non-intenders at the time of the survey and both types of individuals can switch between those two. When more (less) intenders than non-intenders change their purchase decision after the survey took place, the predicted amount of buyers is usually overestimated (underestimated) (Bemmanor, 1995). With regard to intenders, less surveyed intenders than non-surveyed intenders will change their decision to actual purchase the product (Chandon et al., 2005). The surveyed intenders experience that they have made a commitment by writing down to have a purchase intention. Obviously, a short duration between the survey and the measured time of purchase results in less time for the consumer to consider a switch between categories (Ajzen, 2005). In this research these paths are studied on aggregated level and include the purchase intention for only one year later in order to decrease this switch chance.

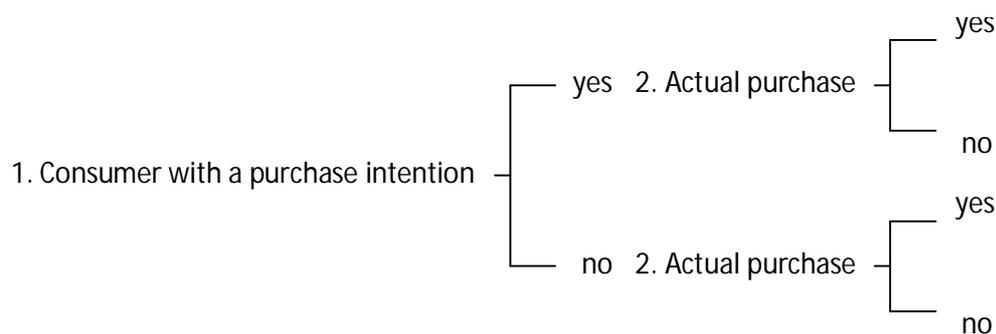


Figure 2.2: Choices of consumers after having a/no purchase intention concerning actual purchase

According to the theory of reasoned action, actual behaviour depends on intentions (Ajzen & Madden, 1986). Obviously, the accuracy of the prediction of the actual behaviour depends on the time interval between the time at which the intention was assessed and the time at which the behaviour was observed (Ajzen & Madden, 1986). Recent research results also show a high positive correlation between intention and actual purchase (Ajzen, 2005; Bemmanor, 1995; Morwitz et al., 2007). Consequently, a high level of predictability is expected of a populations' intention for the actual purchase. Furthermore, the relation is expected to be positive, because when the populations' purchase intention increases it is likely that the actual amount of purchased products also increases.

H₁: Purchase intention of a population at t-1 is positively related to actual purchase at t.

2.3 Theoretical attributes | Diffusion of products

Innovations are approached as new technologies that mostly replace older technologies (Norton & Bass, 1987). Consumers have the opportunity to adopt a product when an innovation enters the market – this marks the start of the diffusion curve. According to the Bass model, the adoption of products occurs logistically, as depicted in figure 2.3 (Bass, 2004; Norton & Bass, 1987). The rationale behind the Bass model is based on the adopter groups as defined by Rogers in 1962 (Bass, 1969). According to Rogers (2003), consumers can be divided into five groups of adopters based on their time of adoption after the product enters the market; innovators, early adopters, early majority, late majority and laggards. An important feature fulfilled by innovators and early adaptors is the spreading of their opinions about the new adopted products towards the three following adopter groups. The late majority and laggards are driven by these opinions. Social pressure of their network and being

economic restricted are important characteristics of these adopter groups as well (Rogers, 2003). All in all, the social pressure becomes more important over the years. More and more consumers own the product and motivate others to purchase the product. Consequently, more consumers purchase the product as a result of social pressure, thus, social pressure determines the consumers' actual purchase over time (Rogers, 2003).

Bass (1969; 2004) translates the social pressure as an influence that creates imitators. Thus, consumers imitate consumers that have adopted a product earlier. This also explains the logistic growth (starts in part A, figure 2.3) of sales until a certain saturation point (part B, figure 2.3) is reached (Bass, 2004). The growth of the diffusion curve is presented in figure 2.3 with a dotted line, which also confirms the two parts of diffusion. In sum, the rate of product diffusion is determined by the purchases of consumers. Obviously, marketing of firms can enhance this process, but at a certain moment a substantial amount of households owns at least one product resulting in a decline of product adoptions (end of part B, figure 2.3). In other words, it is expected that the purchase intention and actual purchase decrease in part B.

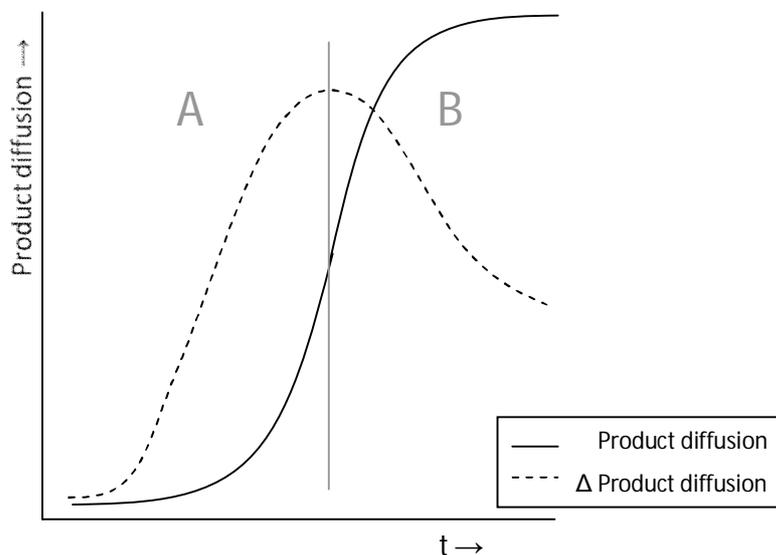


Figure 2.3: S-shaped product diffusion curve according to the Bass model

Not only saturation occurs in part B of the diffusion curve. As a result of the duration a product has been present on the market and of the increasing amount of users, also more information about the product becomes available. Besides the classification of Rogers' (2003), adoption behaviour is influenced by consumer characteristics, such as knowledge (Park et al., 1994; Van Rijnsoever & Castaldi, 2009; Schmidt & Spreng, 1996; Vishwanath, 2005). During the product diffusion consumers get to know the product better by buying it themselves and as a result of consumers in their social network who own and discuss the product. Therefore, consumers are more likely to fulfil their intention in part B of the diffusion curve than in part A. So, it is expected that the purchase intention realization is higher in part B compared to part A of the diffusion curve (Morwitz et al., 2007). This can be explained by the strengthening effect of diffusion on the relation between intention and actual purchase.

H₂: Product diffusion positively moderates the relation between a consumer's purchase intention at t-1 and the actual purchase at t.

2.4 Theoretical attributes | Purchase intention

Much research concerning purchasing behaviour uses the theory of reasoned action by Fishbein & Ajzen to conceptualize consumer behaviour (Ajzen, 2001, 2005; Ajzen & Madden, 1986; Morwitz et al., 2007; Sheppard et al., 1988; Taylor & Todd, 1995). The theory of reasoned action explains the prediction of behaviour by attitude, subjective norm and intention. Later, a third variable, perceived behavioural control was added to the model (Ajzen & Madden, 1986). Research results show that perceived behavioural control contributes to the understanding of intentions (Ajzen & Madden, 1986; Chang, 1998; Godin et al., 1993; Lu et al., 2009). Accordingly, this variable is included in this study as well.

Attitude denotes the individuals' evaluation of the potential behaviour whereas subjective norm refers to the social pressure an individual experiences to perform the behaviour (Ajzen, 2001). In this study the focus is on intentions, which is determined by attitude, subjective norm and perceived behavioural control. These aspects are related as follows: "*Attitudes* are said to follow reasonably from the *beliefs* people hold about the object of the attitude, just as *intentions* and actions follow reasonably from attitudes" (Ajzen, 2005:29). Two types of beliefs are defined; behavioural beliefs and normative beliefs. The former affects attitude, the latter results in subjective norm. The model extended with perceived behavioural control, which is called the theory of planned behaviour, "addresses the possibility of incomplete volitional control by incorporating the additional construct of perceived behavioural control" (Ajzen, 2005:117). Perceived behavioural control incorporates on the one hand access to resources, on the other hand the degree of self-confidence to perform the behaviour (Ajzen, 2001; Taylor & Todd, 1995). In this research, this last aspect is excluded since it is not measured. Therefore, the focus is on access to resources by including income and ownership of complementary goods.

All three variables are likely to positively influence purchase intention (Ajzen, 2001; Godin et al., 1993; Lu et al., 2009). First, when a population's attitude toward technology is positive, it is likely the population intends to purchase an entertainment product. Second, the subjective norm is determined to a large extent by the opinion of others, namely social pressure. When social pressure increases it may be expected that purchase intention also increases. Since, product diffusion also depends to great extent on social pressure, product diffusion is used as an indicator to measure subjective norm. Third, a population with a high income and ownership of complementary goods is more likely to have a high purchase intention than a population with a low income and no complementary goods. To conclude, when all three variables are positive, it is expected to have a positive effect on purchase intention.

H₃: Purchase intention of a population is positively influenced by the consumer's attitude, subjective norm and perceived behavioural control.

3 METHODOLOGY

The conceptual model is tested in an analysis using data retrieved from a database that contains an extensive amount of information concerning purchase behaviour. This database is provided by an Australian company, Roy Morgan Research. Section 3.1 elaborates on the background of Roy Morgan Research and explains how the company collected the data. The focus of section 3.2 is on the research design. Next, section 3.3 describes the measurement and methods for analysis. Finally, the processing of ASTEROID data into useful SPSS data is discussed in section 3.4.

3.1 Roy Morgan Research | ASTEROID

The research questions are answered by using a rich database from a market research company, called Roy Morgan Research¹. It is the largest and oldest established Australian market research company, founded in 1941. The firm originally focussed on public opinion, later their activities expanded to cover all aspects concerning market research information gathering. Moreover, their research was extended from Australia to include New Zealand, the USA, and UK. Consequently, the research results from Roy Morgan Research of these countries are valuable information for a large number of firms that wish to know more about consumers. From all available country-specific data, the Australian sample represents the highest number of interviews per capita: 3,03 interviews per 1000 inhabitants (respondents are older than 18 years old) in May 2009. The database is very unique because of its qualitative and extensive information content. For that reason, the Australian data will be used in this study.

The data cover the period 1999-2008, and are gathered through surveys on a weekly basis by going door to door throughout Australia. No panel data are created since different households are surveyed every time. The data used in this research consist of over 50.000 surveys. Next, the data were cleaned and processed to be incorporated in the databases for ASTEROID, which is a PC-based survey analysis system. In this study ASTEROID is used to select all relevant data and to produce the first results.

3.2 Research design

Roy Morgan Research collects data once only per individual, using surveys. Chandon et al. (2005) notice a substantial difference between purchase intention and actual purchase, when comparing surveyed and non-surveyed consumers. They state that surveyed consumers are more aware of the product, thus, are more likely to consider purchasing a product. Consequently, the likelihood of realizing intention of surveyed consumers is higher than of non-surveyed consumers. The bias regarding the different switch chance between surveyed and non-surveyed consumers is eliminated in this research, because Roy Morgan Research surveyed a different sample about their intentions compared to the sample regarding actual purchase. However, because of the lack of panel data, it is only possible to analyse on an aggregated level. The data can be broken down to fractions of the total Australian population (depicted in table 3.1) by selecting certain characteristics of a respondent. For each variable, percentages of this population are calculated that, for instance, have the intention to purchase product *x* in the next 12 months. These percentages are a fraction of the population. No

¹ Roy Morgan Research Pty. Ltd., Melbourne, Australia. URL: <http://www.roymorgan.com>

additional data are gathered since this database is sufficient to answer the formulated research questions. The 22 entertainment products used to test the hypotheses are depicted in figure 3.1.

Table 3.1: Australian population

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Population x1000 (N)	-	15.435	15.637	15.853	16.124	16.353	16.568	16.798	17.082	17.392

<ul style="list-style-type: none"> ◆ Video Cassette Recorder ◆ Laser Video Disk Player (until Sep03) ◆ DVD Player (from Apr00) ◆ DVD Recorder (from Oct04) ◆ Plasma or LCD Screen Television (from Oct03) ◆ Other Widescreen Television (from Oct03) ◆ Other Colour Television ◆ Digital Set Top Box (not a Pay TV Box) (from Apr01) ◆ Personal CD/Cassette/Radio (eg. Walkman) ◆ Minidisc Player (from Apr00) ◆ MP3 Player (from Apr01) 	<ul style="list-style-type: none"> ◆ iPod (from Jul04) ◆ Portable combined CD/Cassette/Radio ◆ Audio System with Detachable Speakers (until Sep03) ◆ Separate Components Audio System (until Sep03) ◆ Surround Sound System (from Oct03) ◆ Other Audio/Stereo System (eg. CD, Turntable) (from Oct03) ◆ Electrical Musical Instrument (eg. Guitar, Keyboard) ◆ Video Tape Camera ◆ Digital Video Camera ◆ Film Camera valued over \$150 ◆ Digital Camera valued over \$150
---	---

Figure 3.1: Overview of entertainment products used in this study (derived from ASTEROID)

3.3 Measurement of the variables

The conceptual model consists of five variables that are all measured with the data of Roy Morgan Research on aggregated level. All variables are measured in percentage of the total population that fulfil the requirements of the indicator. Table 3.2 depicts the measurements of all variables, and the correlation matrix with all indicators is presented in appendix A.

Table 3.2: Measurement of every variable of the conceptual model

Variable	Indicator (derived from ASTEROID)		Indicator SPSS (in percentages)
Attitude	Statement 1: Computers/technologies give me more control over my life		Interest (percentage of the population that agreed on statement 1 and 2, and disagreed on statement 3 and 4)
	Statement 2: I go out of my way to learn everything I can about new technologies		
	Statement 3: I don't buy luxuries anymore		
	Statement 4: I find technology is changing so fast, it's difficult to keep up with		
Perceived behavioural control	Total household income (annual)		Low income vs. high income
	Ownership of complementary goods		Ownership of the PC (yes/no) Ownership of the TV (yes/no)
Purchase intention	Entertainment products intent to purchase in next 12 months		Purchase intention t (yes/no) Purchase intention t-1 (yes/no)
	New to the household	Bought in last 12 months	Bought in last 12 months (yes/no)
Actual purchase	Not new to the household (familiar)	Difference of current ownership (Δ Current ownership)	Difference of current ownership (yes/no)
	Entertainment products owned		Current ownership t-1 (yes/no) Current ownership t-1*Purchase intention (moderator)

3.3.1 Actual purchase

Actual purchase is measured by two different indicators, i.e. bought in the last 12 months and difference of current ownership. Despite the definition of actual purchase (section 2.2) the second indicator enables to determine the actual owned products instead of only the amount of bought products. If a product is bought, but the ownership remains the same, it is likely to be a replacement purchase. Roy Morgan Research asked the respondents whether they have bought product *x* in the last 12 months and whether they currently own product *x*. This is measured for the 22 entertainment products in ASTEROID. The tabulations present percentages of the total population, resulting in different fractions of the population that bought or own the product. Hence, the percentage of ownership at *t* is deducted by the percentage at *t-1* to calculate the second indicator. The population fractions of both indicators are depicted in table 3.3 and 3.4.

Table 3.3: Descriptive statistics of products bought in last 12 months

Year	VCR	Laser Video Disk Player	DVD player	DVD recorder	Plasma or LCD screen TV	Other widescreen TV	Other colour TV	Digital Set Top Box	Walkman	Minidisc player	MP3 player
1999	-	-	-	-	-	-	-	-	-	-	-
2000	5,9%	0,3%	1,8%	-	-	-	5,4%	-	2,7%	1,1%	-
2001	12,1%	0,4%	6,5%	-	-	-	12,3%	0,4%	5,2%	1,7%	0,8%
2002	11,9%	0,4%	14,0%	-	-	-	14,0%	0,6%	5,5%	1,9%	1,1%
2003	10,5%	0,6%	22,9%	-	0,8%	4,9%	14,7%	0,9%	5,9%	2,3%	1,6%
2004	10,2%	-	29,0%	3,3%	2,7%	6,0%	12,0%	2,9%	5,8%	1,5%	3,3%
2005	7,7%	-	24,8%	4,6%	4,1%	6,3%	11,1%	6,1%	4,5%	1,3%	7,0%
2006	5,7%	-	18,8%	6,4%	7,5%	4,1%	8,2%	8,2%	3,0%	0,7%	9,2%
2007	4,1%	-	15,1%	6,9%	12,1%	3,2%	6,3%	8,9%	2,4%	0,5%	8,7%
2008	2,7%	-	12,8%	7,2%	17,2%	2,1%	4,4%	7,7%	2,0%	0,4%	7,0%

Year	iPod	Portable combined CD/Cassette/Radio	Audio system	Separate Components Audio System	Surround Sound System	Other Audio/Stereo System	Electrical Musical Instrument	Video Tape Camera	Digital Video Camera	Film Camera over \$150	Digital Camera over \$150
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	2,6%	2,1%	1,1%	-	-	1,0%	1,0%	0,6%	2,9%	0,6%
2001	-	4,9%	4,0%	1,7%	-	-	1,5%	1,8%	1,4%	4,4%	1,9%
2002	-	5,2%	3,7%	2,0%	-	-	1,5%	1,3%	2,1%	5,2%	3,8%
2003	-	5,2%	3,9%	1,9%	5,3%	3,5%	1,8%	1,0%	3,1%	4,1%	7,3%
2004	1,3%	4,8%	-	-	5,5%	3,1%	2,0%	1,4%	4,5%	2,7%	14,7%
2005	4,6%	4,4%	-	-	5,3%	2,8%	2,5%	1,3%	4,8%	1,5%	18,4%
2006	8,2%	3,5%	-	-	4,0%	2,5%	2,7%	1,3%	4,9%	1,0%	17,6%
2007	9,3%	2,9%	-	-	3,9%	2,8%	2,5%	0,9%	4,6%	0,7%	16,4%
2008	11,2%	2,2%	-	-	3,5%	2,4%	2,5%	1,1%	5,0%	0,6%	16,0%

Table 3.4: Descriptive statistics of the difference of current ownership

Year	VCR	Laser Video Disk Player	DVD player	DVD recorder	Plasma or LCD screen TV	Other widescreen TV	Other colour TV	Digital Set Top Box	Walkman	Minidisc player	MP3 player
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-
2001	-1,4%	-0,9%	6,2%	-	-	-	-4,1%	-	2,5%	2,1%	-
2002	-1,4%	-0,6%	12,9%	-	-	-	-3,2%	0,4%	1,2%	0,9%	0,7%
2003	-2,2%	0,6%	19,8%	-	-	-	-1,6%	0,5%	-0,5%	0,4%	1,9%
2004	-2,9%	-	20,3%	-	5,5%	2,3%	-15,6%	2,6%	-0,1%	-1,8%	2,8%
2005	-5,9%	-	9,5%	3,3%	0,6%	2,6%	-0,9%	5,7%	-2,9%	-0,4%	6,9%
2006	-5,1%	-	3,9%	5,1%	5,6%	-0,2%	-3,0%	6,2%	-5,1%	-0,9%	7,6%
2007	-5,8%	-	1,2%	5,1%	8,2%	-0,5%	-3,8%	5,9%	-5,5%	-1,1%	5,0%
2008	-5,4%	-	-0,3%	4,1%	10,5%	-1,2%	-5,8%	2,5%	-2,9%	-0,7%	0,3%

Year	iPod	Portable combined CD/Cassette/Radio	Audio system	Separate Components Audio System	Surround Sound System	Other Audio/Stereo System	Electrical Musical Instrument	Video Tape Camera	Digital Video Camera	Film Camera over \$150	Digital Camera over \$150
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-
2001	-	-0,7%	-2,4%	-7,5%	-	-	-0,6%	0,8%	1,4%	4,4%	2,3%
2002	-	2,0%	-1,9%	-1,1%	-	-	-0,5%	-0,7%	2,1%	-0,4%	4,3%
2003	-	-1,5%	-0,6%	-1,6%	-	-	-0,3%	-0,8%	2,5%	-2,9%	6,7%
2004	-	-2,7%	-	-	1,9%	-0,3%	0,6%	0,7%	4,1%	-5,6%	14,8%
2005	5,7%	-0,1%	-	-	2,0%	-2,3%	1,1%	-0,7%	3,1%	-8,5%	14,5%
2006	8,7%	-2,0%	-	-	0,5%	-3,1%	-0,1%	-0,4%	2,1%	-6,5%	9,6%
2007	6,9%	-2,9%	-	-	0,8%	-2,1%	-0,2%	-1,1%	2,6%	-6,5%	6,9%
2008	7,2%	-2,0%	-	-	0,1%	-1,4%	1,5%	0,6%	1,8%	-3,9%	2,6%

3.3.2 Purchase intention

Similar to the processing of actual purchase data, the values of purchase intention are directly derived from the tabulations in ASTEROID. Roy Morgan Research asked the respondents whether they have an intention to purchase product *x* in the next 12 months. The tabulations present percentages of the total population, resulting in different fractions of the population (table 3.5) that have a purchase intention.

Table 3.5: Descriptive statistics of the intention to purchase a product in the next 12 months (continued on the next page)

Year	VCR	Laser Video Disk Player	DVD player	DVD recorder	Plasma or LCD screen TV	Other widescreen TV	Other colour TV	Digital Set Top Box	Walkman	Minidisc player	MP3 player
1999	-	-	-	-	-	-	-	-	-	-	-
2000	2,2%	0,3%	4,2%	-	-	-	2,0%	-	0,7%	0,7%	-
2001	5,5%	0,5%	8,1%	-	-	-	6,4%	1,0%	1,5%	1,0%	1,1%
2002	5,3%	0,4%	10,0%	-	-	-	6,5%	1,1%	1,7%	1,2%	1,1%
2003	4,7%	0,4%	9,2%	-	1,7%	3,1%	6,8%	1,4%	1,9%	0,9%	1,3%
2004	3,6%	-	6,9%	5,8%	3,7%	3,5%	5,0%	2,8%	1,5%	0,5%	1,9%
2005	2,8%	-	4,4%	6,2%	4,9%	2,9%	4,7%	3,4%	1,1%	0,4%	2,5%
2006	2,1%	-	4,2%	5,8%	7,0%	2,1%	4,4%	3,5%	0,8%	0,2%	2,3%
2007	1,6%	-	3,6%	5,0%	8,0%	1,7%	3,7%	3,1%	0,7%	0,2%	2,1%
2008	1,3%	-	3,7%	4,5%	8,9%	1,5%	3,8%	3,4%	0,5%	0,1%	1,2%

Table 3.5 (continued): Descriptive statistics of the intention to purchase a product in the next 12 months

Year	iPod	Portable combined CD/Cassette/Radio	Audio system	Separate Components Audio System	Surround Sound System	Other Audio/Stereo System	Electrical Musical Instrument	Video Tape Camera	Digital Video Camera	Film Camera over \$150	Digital Camera over \$150
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	1,0%	0,9%	1,0%	-	-	0,5%	1,4%	1,6%	1,1%	1,5%
2001	-	1,8%	2,1%	1,7%	-	-	1,0%	2,2%	2,8%	2,4%	3,0%
2002	-	1,7%	2,3%	2,0%	-	-	0,9%	1,7%	3,3%	2,2%	4,5%
2003	-	1,7%	2,1%	1,7%	2,4%	2,4%	0,9%	1,8%	4,2%	1,9%	6,5%
2004	2,2%	1,5%	-	-	3,4%	2,3%	1,0%	1,2%	4,3%	1,4%	7,6%
2005	3,4%	1,4%	-	-	3,1%	2,3%	1,2%	1,2%	4,8%	0,9%	7,3%
2006	3,2%	1,2%	-	-	2,9%	1,8%	1,0%	1,0%	4,6%	0,8%	6,4%
2007	2,7%	1,0%	-	-	2,6%	1,7%	1,0%	0,9%	4,4%	0,5%	5,7%
2008	3,2%	0,7%	-	-	2,6%	1,8%	1,1%	0,8%	4,2%	0,5%	5,5%

3.3.3 Product diffusion

Product diffusion is the product adoption by consumers in the market resulting in the ownership of a product. Consequently, product diffusion is measured by the current ownership of product x. As mentioned in section 3.3.1 ASTEROID provides the ownership data directly, so the percentages from the tabulations are used to test the effect of product diffusion.

Table 3.6: Descriptive statistics regarding product diffusion (continued on the next page)

Year	VCR	Laser Video Disk Player	DVD player	DVD recorder	Plasma or LCD screen TV	Other wide-screen TV	Other colour TV	Digital Set Top Box	Walkman	Minidisc player	MP3 player
1999	-	-	-	-	-	-	-	-	-	-	-
2000	87,9%	3,8%	4,7%	-	-	-	93,5%	-	45,1%	7,4%	-
2001	86,5%	2,9%	10,9%	-	-	-	89,4%	1,6%	47,6%	9,5%	2,3%
2002	85,1%	2,3%	23,8%	-	-	-	86,2%	2,0%	48,8%	10,4%	3,0%
2003	82,9%	2,9%	43,6%	-	1,9%	11,8%	84,6%	2,5%	48,3%	10,8%	4,9%
2004	80,0%	-	63,9%	6,8%	7,4%	14,1%	69,0%	5,1%	48,2%	9,0%	7,7%
2005	74,1%	-	73,4%	10,1%	8,0%	16,7%	68,1%	10,8%	45,3%	8,6%	14,6%
2006	69,0%	-	77,3%	15,2%	13,6%	16,5%	65,1%	17,0%	40,2%	7,7%	22,2%
2007	63,2%	-	78,5%	20,3%	21,8%	16,0%	61,3%	22,9%	34,7%	6,6%	27,2%
2008	57,8%	-	78,2%	24,4%	32,3%	14,8%	55,5%	25,4%	31,8%	5,9%	27,5%

Table 3.6 (continued): Descriptive statistics regarding product diffusion

Year	iPod	Portable combined CD/Cassette/Radio	Audio system	Separate Components Audio System	Surround Sound System	Other Audio/Stereo System	Electrical Musical Instrument	Video Tape Camera	Digital Video Camera	Film Camera over \$150	Digital Camera over \$150
1999	-	-	-	-	-	-	-	-	-	-	-
2000	-	45,1%	45,0%	32,2%	-	-	19,2%	19,8%	2,2%	47,4%	2,6%
2001	-	44,4%	42,6%	24,7%	-	-	18,6%	20,6%	3,6%	51,8%	4,9%
2002	-	46,4%	40,7%	23,6%	-	-	18,1%	19,9%	5,7%	51,4%	9,2%
2003	-	44,9%	40,1%	22,0%	21,9%	46,1%	17,8%	19,1%	8,2%	48,5%	15,9%
2004	1,9%	42,2%	-	-	23,8%	45,8%	18,4%	19,8%	12,3%	42,9%	30,7%
2005	7,6%	42,1%	-	-	25,8%	43,5%	19,5%	19,1%	15,4%	34,4%	45,2%
2006	16,3%	40,1%	-	-	26,3%	40,4%	19,4%	18,7%	17,5%	27,9%	54,8%
2007	23,2%	37,2%	-	-	27,1%	38,3%	19,2%	17,6%	20,1%	21,4%	61,7%
2008	30,4%	35,2%	-	-	27,2%	36,9%	20,7%	18,2%	21,9%	17,5%	64,3%

3.3.4 Attitude

The most important component of attitude concerning the home entertainment industry is a positive attitude toward technology, thus, interest (Godin et al., 1993) in technology. Therefore, in this study *interest* in technology is used as an indicator for attitude and is tested by four statements (figure 3.2) retrieved from ASTEROID on a dichotomous scale (agree/disagree). The percentage of the Australian population that agreed on statement 1 and 2, and disagreed on statement 3 and 4 are the fraction of the population with interest in technology. All other combinations are not included in the test since these combinations represent less interested fractions of the population. Table 3.7 depicts the Australian population whereof the percentage is the population fraction with interest in technology.

Statement 1:	Computers/technologies give me more control over my <u>life</u>
Statement 2:	I go out of my way to learn everything I can about new technologies
Statement 3:	I don't buy luxuries anymore
Statement 4:	I find technology is changing so fast, it's difficult to keep up with

Figure 3.2: Statements retrieved from ASTEROID measuring interest

Table 3.7: Descriptive statistics regarding attitude

Year	Interest
1999	-
2000	4,3%
2001	4,3%
2002	5,0%
2003	4,8%
2004	4,8%
2005	4,8%
2006	4,8%
2007	5,6%
2008	4,9%

3.3.5 Perceived behavioural control

Perceived behavioural control is divided in access to resources and the confidence of a consumer to purchase and use a product. This study concentrates on the resources due to the lack of data regarding the confidence of a consumer. The indicator of the third variable is called *current resources*. The availability of current resources is measured with two categories of ASTEROID, i.e. total household income and complementary goods.

First, the average percentage of respondents not answering the income question is 28% during 1999-2008, these are not included in the statistical tests. Therefore, these missing values are not taking into account in the calculation of the median of income. Using this calculation, the income border between low and high income is determined for each year, as depicted in table 3.8. Third, the fraction of the population with a low and high income are calculated, based on the calculated border between low and high income for each year. Last, these fractions are converted until a total of 100% and these percentages are used in the statistical tests and presented in table 3.8 as well.

Table 3.8: Descriptive statistics regarding perceived behavioural control

Year	Border low/ high income	Low income	High income	Own a PC	Own a TV
1999	\$40.000	58,7%	41,3%	55,4%	-
2000	\$40.000	57,1%	42,9%	61,3%	93,8%
2001	\$50.000	59,1%	40,9%	68,3%	91,5%
2002	\$50.000	55,6%	44,4%	73,2%	90,2%
2003	\$50.000	55,0%	45,0%	75,5%	90,3%
2004	\$60.000	53,7%	46,3%	78,0%	83,4%
2005	\$60.000	51,7%	48,3%	80,4%	83,8%
2006	\$60.000	52,8%	47,2%	81,3%	83,8%
2007	\$70.000	55,8%	44,2%	82,9%	84,4%
2008	\$70.000	53,3%	46,7%	85,2%	84,5%

Another aspect that measures current resources is the ownership of complementary goods. Two types of possible complementary goods are selected from the available entertainment products in ASTEROID, i.e. personal computer (PC) and television (TV). ASTEROID provides two types of PCs and three types of TVs that are all included in the calculations. In ASTEROID two combined variables are created by measuring the figures of respondents that own PC type 1 or PC type 2, and a similar calculation is done for the TV types. In ASTEROID the tabulations present the percentages that are transported to the SPSS file (depicted in table 3.8).

Subsequently, both possible complementary goods are considered in combination with the 22 products resulting in the combinations as depicted in table 3.9. Product 1-4, 8, 14-19, and 21 are used in the statistical tests that include the TV as complementary good, and 11, 12, and 20-22 are used in the tests considering the PC as complementary good.

Table 3.9: Complementary good(s) of a product

	Product description	Complementary good		Product description	Complementary good
1	VCR	TV	12	iPod	PC
2	Laser Video Disc Player	TV	13	Portable combined CD/Cassette/Radio	-
3	DVD player	TV	14	Audio system with detachable speakers	TV
4	DVD recorder	TV	15	Separate components audio system	TV
5	Plasma or LCD screen television	-	16	Surround sound system	TV
6	Other widescreen television	-	17	Other audio	TV
7	Other colour television	-	18	Electrical musical instrument	TV
8	Digital Set Top Box	TV	19	Tape camera	TV
9	Walkman	-	20	Digital camera	PC
10	Minidisc	-	21	Film camera valued over \$150	PC/TV
11	MP3	PC	22	Digital camera valued over \$150	PC

3.4 Data analysis

Because of the absence of panel data and the embedding in ASTEROID, the first results are provided by cross tabulation to create the fractions of the population in percentages for each variable. Along with the tabulations, ASTEROID has the ability to draw basic graphs that are useful to visualize the outcomes. Due to the limited analytical options of ASTEROID, spreadsheets are transferred to SPSS to conduct more detailed statistical analyses.

SPSS version 17.0 is used to test the hypotheses, although transferring data from the ASTEROID database to SPSS requires multiple steps. First, in ASTEROID factors are selected that present the indicator of the formulated variables in the hypotheses. Second, tabulations over a period of time (1999-2008) are made with the selected ASTEROID variables. Third, the figures that follow from the tabulations are exported to an Excel file, and further adapted to useful data points in SPSS. Finally, the SPSS file contains 22 entertainment products, derived from ASTEROID. All data are arranged by product in order to visualize differences between products regarding tested relations in the SPSS file. The data used in the statistical test are continuous variables, because the fraction of the population is presented as a percentage of the total population in the database. Moreover, all hypotheses describe a causal relation between variables. In this research the Analysis of Covariance (ANCOVA) is used to test all hypotheses, because it is applicable to examine a causal relation and to continuous variables. In addition, it enables to rectify the differences between the mean values of a certain variable per product (as fixed factor in the ANCOVA model). Obviously, the figures followed from the ASTEROID tabulations result in a different mean value for each product. Therefore, two models are run, one without a fixed factor and one with 'products' as fixed factor. Moreover, the output of ANCOVA shows whether the relation is positive or negative, and presents the R Square that visualizes the explained variance of the model. The hypotheses are confirmed if the relation is significant ($p < 0,05$) with a 95% confidence interval or higher ($p < 0,01$ with CI = 99%).

3.4.1 Hypothesis 1 & 2

The central relation in the conceptual model is the effect of purchase intention on actual purchase, and is tested in hypothesis 1. As both variables are related to the same products, purchase intention is measured at t-1 and actual purchase at t to measure the causality over a period of time. Hypothesis 2 tests the moderating effect of product diffusion on the relation as tested in hypothesis 1. Similar to purchase intention, product diffusion is tested at t-1 to test the causal relation regarding the same products over a period from 1999-2008.

In order to quantify the moderating effect of product diffusion, an interaction variable is required (Baron & Kenny, 1986). Hence, hypothesis 1 and 2 are tested with one ANCOVA model in which an interaction variable (purchase intention*product diffusion) is added to test the moderating effect of product diffusion. In the ANCOVA model the independent variables are purchase intention, product diffusion and the interaction variable, the dependent variable is actual purchase. If the interaction variable is significantly related to actual purchase, the moderating effect is confirmed.

3.4.2 Hypothesis 3

All variables of hypothesis 3 are tested at the same moment in time, because purchase intention formulation depends on the attitude, subjective norm and perceived behavioural control at that moment. Purchase intention is used as dependent variable and the independent variables are tested as covariates in the ANCOVA test.

3.4.3 Diffusion part A and B

Finally, a difference is made between data regarding diffusion part A and B to test whether the output differs significantly between the test with the whole database and these two diffusion parts. The difference between diffusion part A and B is made by considering a change (in rise or decrease) in the difference of current ownership. This difference shows the change of an increasing curve into a decreasing curve. The point of change between those two is the border between part A and B (figure 2.3). 73 cases are included in part A, and 66 cases in part B. New ANCOVA models are run for all hypotheses in which diffusion part A and B are taken into account to test to what extent the output differs from the output with all data.

4 RESULTS

This section presents the results and discusses the estimates for each hypothesis.

4.1 Hypothesis 1 & 2

The main relation tested in this research is the relationship between purchase intention and actual purchase. First, a model with only purchase intention and actual purchase is tested. Second, product diffusion is added to this model. Third, the main relation is tested including products as fixed factor. Last, the model including product diffusion is tested with products as fixed factor. All output is depicted in table 4.1. Two different indicators are used to measure actual purchase as explained in section 3.3.1. In the following sections 'bought' is used as abbreviation of 'bought in last 12 months' and with 'ownership' is meant 'difference in current ownership'.

Table 4.1: Output of the ANCOVA test to quantify H₁ and H₂

	Dependent variable:	Actual purchase					
	Indicator:	Bought in last 12 months	Difference of current ownership	Bought in last 12 months		Difference of current ownership	
				A	B	A	B
No fixed factor	Constant	-0,001	-0,027***	-0,001	-0,002	-0,022**	-0,034***
	Purchase intention t-1	2,140***	1,362***	2,085***	2,191***	1,480***	1,288***
	R ²	0,703	0,322	0,706	0,699	0,362	0,314
	Constant	-0,008	-0,011	-0,011	-0,004	-0,009	-0,016
	Purchase intention t-1	1,765***	2,004***	1,888***	1,552***	2,038***	2,010***
	Purchase intention t-1*	0,696	-1,075*	0,186	1,393*	-0,972	-1,236
	Product diffusion t-1	0,034*	-0,076***	0,048**	0,015	-0,072***	-0,073*
	R ²	0,774	0,615	0,782	0,771	0,657	0,574
Products as fixed factor	Constant	0,008	-0,004	-0,008	-0,004	0,009	0,014
	Purchase intention t-1	2,103***	1,530***	2,001***	2,599***	1,571***	1,037*
	F-value of products	6,816***	10,297***	3,087***	28,737***	6,889***	5,746***
	R ²	0,867	0,763	0,872	0,977	0,836	0,800
	Constant	-0,020**	-0,010	-0,012	0,004	-0,001	0,049
	Purchase intention t-1	2,000***	2,264***	1,214***	2,912***	1,408***	3,198***
	Purchase intention t-1*	-0,422	-1,830***	-0,487	0,846	-0,894	-4,168***
	Product diffusion t-1	0,146***	-0,001	0,440***	-0,016	0,253***	-0,103
	F-value of products	12,211***	5,280***	16,547***	21,680***	3,792***	9,300***
	R ²	0,930	0,805	0,974	0,978	0,871	0,917

*** p < 0,01; ** p < 0,05; * p < 0,10

N_{total} = 139; N_A = 73; N_B = 66

4.1.1 Hypothesis 1

First, the direct relation between purchase intention and actual purchase is tested in one ANCOVA model without including a fixed factor. The output of both models that measure actual purchase with a different indicator, presents a significant positive relation between purchase intention and actual purchase. Moreover, the B-value of purchase intention and the explained variance is lower when actual purchase is measured by ownership. The difference of the explained variance indicates that actual purchase is almost 40% better explained by purchase intention when using bought compared to using ownership.

Second, a next model step is made with products as fixed factor, to correct for the different values of products. The significant F-value of products shows that the model in total is significant. In this output the relationship between purchase intention and actual purchase is still significantly positive, thus, hypothesis 1 is confirmed. Both the model using bought and ownership show a higher explained variance than the output of the first step without including a fixed factor. The explained variance of second output using ownership is more than double compared to first output of the model without including a fixed factor. Thus, determining actual purchase is more precise when considering the different values of different products.

A possible explanation for the extremely increased explained variance in the ownership model is that the ownership of a product depends also on the duration a product is on the market. For instance, the VCR has already been on the market for a long time, while the iPod was introduced in the period that Roy Morgan Research surveyed households. As a result, the 'starting' current ownership of VCRs by the population is much higher than the 'starting' current ownership of the iPod. The second model step corrects for these large difference, resulting in the higher explained variance.

4.1.2 Hypothesis 2

The moderating effect of product diffusion on the relation between purchase intention and actual purchase is tested in new ANVOVA models by the interaction variable purchase intention t-1*product diffusion t-1 (explained in section 3.4.1). Again two model step are made from not including a fixed factor to including products as fixed factor. When product diffusion is added to the model testing hypothesis 1, the effect of purchase intention of actual purchase remains positively significant in both models using different indicators for actual purchase. When these models are compared to the models discussed in the former section, the B-values of models using ownership are higher than the ones using bought. This is the other way around in the models only testing hypothesis 1.

The moderating effect of product diffusion is only significant in the model correcting for products and measuring actual purchase with ownership. This is a negative moderating effect, thus, the effect of purchase intention on actual purchase is decreased by product diffusion. Furthermore, the average explained variance of the ANCOVA models taking differences between products into account is substantially higher than the not correcting models. Consequently, actual purchase is best explained with the included independent variables by the models including products as fixed factor. Additionally, from these models the R Square value of the model that measured actual purchase with bought is 12,5% higher than the model using ownership. However, the indicator 'bought' also includes replacement purchases, which leads to more uncertainty about the relation between the independent variables and new-to-the-household purchases. With ownership only the difference in ownership of the population is measured, thus, if a household replaced a product the ownership remains the same while they actually purchased a second product. Therefore, both indicators include

an error and the model with the highest explained variance is considered as most precise. From the explained variance the model using bought and correcting for differences between products is most precise, which presents a significant positive relation between purchase intention and actual purchase, but no significant moderating effect of product diffusion on this relationship. Consequently, hypothesis 1 remains confirmed with a confidence interval of 99%, while hypothesis 2 is rejected.

4.1.3 Diffusion part A and B | Hypothesis 1 & 2

Additionally, hypotheses 1 and 2 are tested considering diffusion part A and B. Again both indicators of actual purchase are used in the ANCOVA test. The relation between purchase intention and actual purchase is still positively significant in all models, except for diffusion part B in the model correcting for differences between products, measuring actual purchase with ownership and not including product diffusion. The moderating effect of product diffusion on this relationship is only significant in diffusion part B of the model using ownership to measure actual purchase and correcting for differences between products.

Similar to the models considering all data instead of making a difference between diffusion part A and B, the R Square value of the second model step taking the differences between products into account are higher than without making this correction. In addition, the highest R Square values are from the models measuring actual purchase with bought and considering diffusion part A and B. Furthermore, the difference in explained variance between the model step without fixed factor and the second step taking the differences of the products into account is higher when actual purchase is measured by ownership compared to bought. All in all, the highest explained variance is close to 100% of the model correcting for differences between products, taking diffusion part A and B into account and measuring actual purchase with bought. From the output of this model hypothesis 1 is confirmed, but hypothesis 2 is rejected when taking diffusion part A and B into account.

4.1.4 Comparison with former sales as predictor

According to previous research, former sales are the best predictor for future sales (Fisher et al., 2000; Holt, 2004; Kluyver, 1980; Morwitz et al., 2007; Proctor, 1989; Wentworth et al., 1961; Winters, 1960). However, in case of innovations this sales history is unavailable. As a result, this research tests whether purchase intention is a better predictor than bought at t-1 for actual purchase. The output of the tests with bought at t-1 is depicted in table 4.2.

In all models not taking diffusion part A and B into account, the relation is significantly positive between bought at t-1 as well as purchase intention (at t-1) and actual purchase when measured with bought. When actual purchase is measured by ownership, bought at t-1 is significant in less model steps than purchase intention (at t-1), which is in all steps significant positively related to actual purchase. This implicates that purchase intention is a better predictor for actual purchase in the model steps without considering diffusion part A and B. Additionally, product diffusion has in all these models a negative moderating effect on the relation between bought at t-1 and actual purchase. Obviously, the explained variance of the models measuring actual purchase with bought is higher than when measured with ownership since the independent variable is a lag-variable of the dependent variable. From these models, the highest R Square value is presented in the output of the model using all data and correcting for the differences between products. From the output of this model, actual purchase at t can be predicted by bought at t-1 and this relationship is negatively

influenced by product diffusion. Moreover, the relation between purchase intention and actual purchase is significant, thus, purchase intention influences actual purchase.

Table 4.2: Output of the ANCOVA test with former sales as predictor for future sales

	Dependent variable:	Actual purchase					
	Indicator:	Bought in last 12 months	Difference of current ownership	Bought in last 12 months		Difference of current ownership	
				A	B	A	B
No fixed factor	Constant	0,008***	-0,007	0,006*	0,003	-0,001	-0,020**
	Bought t-1	0,941***	0,321***	1,164***	0,891***	0,430***	0,350***
	R ²	0,835	0,109	0,831	0,915	0,115	0,183
	Constant	-0,003	-0,027***	-0,002	-0,006**	-0,022***	-0,034***
	Bought t-1	0,666***	-0,176*	-0,835***	0,694***	-0,411**	0,028
	Purchase intention t-1	0,933***	1,682***	0,823***	0,753***	2,101***	1,231***
	R ²	0,897	0,337	0,875	0,953	0,403	0,314
	Constant	-0,009**	-0,012*	-0,010*	-0,007	-0,008	-0,019**
	Bought t-1	0,753***	0,658***	1,079***	0,846***	1,080***	0,861***
	Purchase intention t-1	1,086***	1,411***	0,922***	0,854***	1,071***	1,301***
	Bought t-1*Product diffusion t-1	-0,893***	-2,464***	-1,434***	-0,946***	-2,592***	-3,617***
	Product diffusion t-1	0,018	-0,090***	0,026*	-0,004	-0,094***	-0,092***
R ²	0,903	0,727	0,892	0,966	0,770	0,837	
Products as fixed factor	Constant	0,045***	0,062***	0,037	0,025**	0,048***	0,040
	Bought t-1	0,745***	0,146*	0,959***	0,868***	0,664***	0,260
	F-value of products	2,609***	8,749***	3,298***	10,525***	11,018***	6,991***
	R ²	0,888	0,655	0,929	0,984	0,843	0,793
	Constant	0,003	-0,002*	0,028**	-0,005	0,027	0,014
	Bought t-1	0,505***	-0,219***	0,858***	0,563***	0,419**	-0,005
	Purchase intention t-1	1,247***	1,901***	0,307	1,207***	0,745	1,049
	F-value of products	3,133***	10,840***	1,873**	9,679***	6,964***	5,612***
	R ²	0,934	0,778	0,931	0,991	0,850	0,800
	Constant	-0,015*	-0,007	-0,007	-0,008	0,002	0,034
	Bought t-1	0,416***	0,266*	0,339**	0,626***	0,261	0,834***
	Purchase intention t-1	1,679***	2,059***	1,046***	1,329***	1,279**	2,049***
	Bought t-1*Product diffusion t-1	-1,084***	-2,254***	-1,127**	-0,566	-1,387	-6,047***
	Product diffusion t-1	0,083**	-0,041	0,354***	0,004	0,187	-0,076
	F-value of products	3,721***	2,384***	7,656***	6,629***	1,798**	4,591***
R ²	0,943	0,811	0,976	0,992	0,872	0,947	

*** p < 0,01; ** p < 0,05; * p < 0,10

N_{total} = 139; N_A = 73; N_B = 66

The models that take product diffusion part A and B into account also present a significant positive relation between bought at t-1 and actual purchase measured by bought. In all these models, purchase intention is significantly positive related to actual purchase, except in diffusion part A in the model step in which both bought at t-1 and purchase intention are included this effect is not significant. The moderating effect of product diffusion on the relation between bought at t-1 and

actual purchase is in all models significant and negatively related, except for diffusion part B of the last model step correcting for differences between products.

Similar to the former discussed models, the relation between bought at t-1 and actual purchase is in less model steps significant than purchase intention (at t-1). Furthermore, the moderating effect of product diffusion is significantly negative in the models distinguishing diffusion part A and B, except for diffusion part A in the model correcting for differences between products. The explained variance of all these models is extremely high, which implicates that actual purchase well explained by the included independent variables. Additionally, the highest R Square value is reached when a difference is made between part A and B of the diffusion curve and when actual purchase is measured by bought. From the output of this model bought at t-1 influences actual purchase at t while product diffusion decreases this effect in part A.

In conclusion, the highest explained variance of the models regarding bought at t-1 only differ minimally from the explained variance when predicting actual purchase with purchase intention. Moreover, in the models using ownership, purchase intention is a better predictor than bought at t-1. From these results, bought at t-1 is not a better than purchase intention for predicting actual purchase.

4.2 Hypothesis 3

The influence of attitude, subjective norm and perceived behavioural control on purchase intention is tested in one ANCOVA model in which product diffusion measures subjective norm (as explained in section 2.4). The output is depicted in table 4.3.

Table 4.3: Output of the ANCOVA test quantify H₃

	Dependent variable:	Purchase intention	A	B
No fixed factor	Constant	0,055	0,069	-0,056
	Interest	-0,184	0,052	0,128
	Product diffusion	0,024***	0,031***	0,037***
	High income	0,011	-0,238	0,048
	Own PC	0,003	-0,137	-0,574*
	Own TV	0,076	0,165	0,247
	R ²	0,112	0,126	0,249
Products as fixed factor	Constant	0,080	0,075	0,028
	Interest	-0,171	-0,143	0,126
	Product diffusion	0,016*	0,035**	0,031**
	High income	0,000	0,128	0,101
	Own PC	0,072**	0,114*	-0,152**
	Own TV	0,136**	0,167**	0,050
	F-value of products	17,436***	24,914***	110,498***
	R ²	0,747	0,926	0,985

*** p < 0,01; ** p < 0,05; * p < 0,10

N_{total} = 139; N_A = 73; N_B = 66

In the output of all models not correcting for differences between products, a significantly relation is shown between product diffusion and purchase intention. This is a positive effect. Furthermore, the explained variance is acceptable, but this is relatively low compared to the all former discussed R

Square values. Moreover, two significant relations are shown in the models that take differences between products into account and not distinguish between the diffusion parts. Both complementary goods positively influence purchase intention as expected. Moreover, none of the remaining included independent variables show a significant relation with purchase intention. The explained variance of the model that takes differences between products into account, is much higher than the model not correcting for these differences. This implicates that the differences between products concerning these relations are large and that the correction is useful to create a model, which best explains purchase intention by the included independent variables.

In sum, interest and product diffusion are not significantly related to purchase intention, neither is the income indicator that measures perceived behavioural control. Only the complementary goods show a positive relation to purchase intention with a 95% confidence interval. As a result, hypothesis 3 is almost completely rejected, however, the effect of the ownership of complementary goods positively influences purchase intention.

4.2.1 Diffusion part A and B | Hypothesis 3

An extra ANCOVA model is run in which a distinction is made between diffusion part A and B. Again no significant relation is found between either interest or income and purchase intention. In both the model taking products into account and the model that not corrects for products, product diffusion is significantly positive related to purchase intention. The highest explained variance is reached when the model corrects for differences between products. From this model interest (measuring attitude) is not significantly related to purchase intention. Furthermore, perceived behavioural control was measured by both income and complementary goods. Income is not significantly related to purchase intention and the complementary goods show a significant relation with purchase intention with a 95% confidence interval in different parts of the diffusion curve. The ownership of the PC as complementary good is negatively related to purchase intention in diffusion part B whereas the ownership of the TV is positively related to purchase intention in diffusion part A of the model correcting for differences between products. However, because of the contradiction between these results within the indicator of complementary goods and the insignificant effect of income, it seems not consistent to confirm the relation between perceived behavioural control and purchase intention. Concluding, in this study hypothesis 3 is almost completely rejected, however, the effect of subjective norm positively influences purchase intention.

5 CONCLUSION

Currently, it is a challenge for firms to predict the purchases of an innovation. The actual purchase of products depends to great extent on the purchase intention of consumers on the market. In this research, the actual purchase is predicted based on the purchase intention. Moreover, the moderating influence of product diffusion was considered regarding the relation between purchase intention and actual purchase. Another research objective was to test the influences of attitude, subjective norm and perceived behavioural control on the populations' purchase intention. Different models were tested to study these relations on an aggregated level. The main objectives are summarized in the following questions:

1. To what extent is purchase intention an accurate predictor to estimate actual purchase?
2. To what extent does product diffusion moderate the relation between the populations' purchase intention and actual purchase?
3. To what extent is the populations' purchase intention influenced by attitude and perceived behavioural control?

To answer the first question, the output of an ANCOVA models was analysed. Purchase intention is positively related to actual purchase. Actual purchase is approximately two times the population fraction that states to have a purchase intention. Thus, when 25% of the population states to have a purchase intention, 50% will actually purchase the product. In case of more diffused products (diffusion part B) this effect is even stronger, namely approximately factor 2,5 should be used to predict actual purchase based on purchase intention..

The second question is answered by a model including both purchase intention and product diffusion as independent variables, and product diffusion as moderator affecting actual purchase. A significant positive relation was still found between purchase intention and actual purchase, while no significant moderating effect of product diffusion was measured. Moreover, the positive relation between purchase intention and actual purchase remains significant when a difference is made between data regarding diffusion part A and B. The effect of purchase intention on actual purchase is much higher in part B than part A. However, the relation in reality is expected to be less strong than presented, since these results depend on data of surveyed consumers. Surveyed consumers are more aware of the product and feel committed by writing down whether they have a purchase intention, which results in a higher chance to realize this than non-surveyed consumers on the market. Nevertheless, actual purchase can be most precisely predicted by the consumers' purchase intention when a difference is made between diffusion part A and B and when the model corrects for differences between products. Concluding, from this research actual purchase of less diffused products (part A) can be predicted by approximately the same population fraction as states to have a purchase intention, while more diffused products will be purchased approximately three times the population fraction that states to have a purchase intention.

Next, the third question can be answered. First, in this research subjective norm positively influences purchase intention. In other words, a positive opinion of others results in a higher purchase intention. This can be explained by a social network in which the products are already owned and discussed, resulting in recommendations. This social pressure about the product result in more enthusiasm with

consumers who not own the product, regarding a potential purchase of the product. Furthermore, attitude is not significantly related to purchase intention, neither is the income indicator of perceived behavioural control. Moreover, the ownership of a PC as complementary good is negatively related to purchase intention in diffusion part B and the ownership of the TV positively affects purchase intention in diffusion part A. Since both relations are found in a different part of the curve and have a different character (positive vs. negative) this part of perceived behavioural control is not fully confirmed. In sum, the populations' purchase intention is only positively influenced by subjective norm.

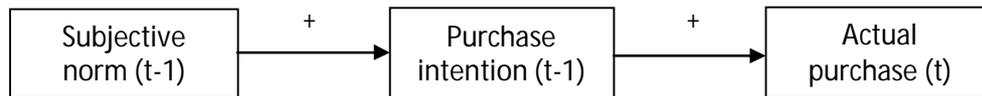


Figure 5.1: Concluding conceptual model

These conclusions result in a final conceptual model, as depicted in figure 5.1. Actual purchase is positively influenced by purchase intention, which is positively affected by subjective norm. Furthermore, figure 5.2 depicts the difference of the effect of purchase intention on actual purchase in diffusion part A and B.

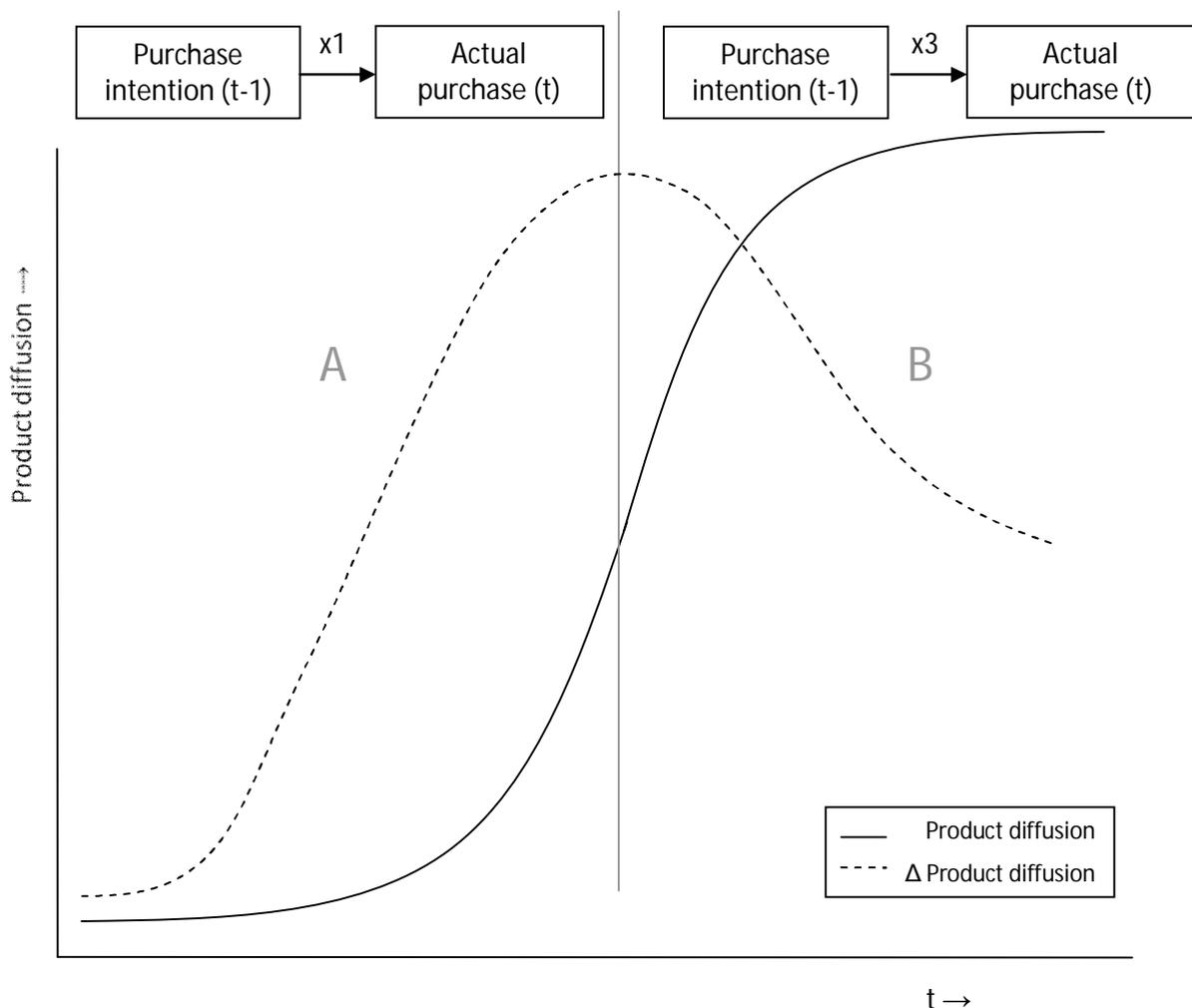


Figure 5.2: The effect of purchase intention on actual purchase in diffusion part A and B

6 DISCUSSION

This section describes the limitations, theoretical and managerial implications of this research.

6.1 Limitations

With respect to this study, all data are collected by Roy Morgan Research. Therefore, it was impossible to manipulate the way of gathering data of Australian household. The figures obtained from the database are combined to measure attitude and perceived behavioural control. Since all data comes from answers obtained from households, the data is subjective in a way because the respondent has to consider which situation as formulated in the possible answers is applicable to him/her. However, the database is a combination of many answers that are tested on reliability by Roy Morgan Research before they are included in the final database. Therefore, the final included data form a rich and unique database.

Another point of discussion is the development of the conceptual model. The main relationship is the causal relation between purchase intention and actual purchase. Testing this main relation as well as testing the moderating effect of product diffusion on this relationship, correcting for differences between products and considering diffusion part A and B resulted in models with a high explained variance. However, when predicting the actual purchase of a new product it is more useful to use the average, which results from the model not correcting for differences between products.

The value of this research also depends on whether it is possible to generalize the results beyond this paper. The case used to test the hypotheses of this research includes a broad sample of entertainment products that are released on the Australian market. Households are surveyed throughout all Australian states, hence, encompasses the complete Australian market. Despite the fact that every country is characterized by its own culture, market and inhabitants, the data used to test the hypotheses are not panel data. In other words, the database presents data regarding a population, not actions of an individual. Therefore, it is possible to use the models in firms in different countries.

6.2 Theoretical implications

In this study literature regarding consumer behaviour, product diffusion and purchase intention is used. The combination of the Bass model with intention data is not often made in earlier research. Though, the results of this study show no the moderating effect of product diffusion on the relation between purchase intention and actual purchase. Therefore, this research does not add to the Bass model. However, this research retains its scientific implications since the relation between three independent variables and purchase intention as well as the relationship between purchase intention and actual purchase, has not been measured on an aggregated level in earlier research. As a result, it adds to current models on the value of purchase intention to predict actual purchase.

In addition, the results give reason to make a difference between diffusion part A and B. It becomes clear that the effect of purchase intention on actual purchase is much higher in part B than in part A. When more parts of the diffusion curve are studied, the characteristics of this changing effect will become more clear.

6.3 Managerial implications

This study has succeeded in confirming the expectation that purchase intention can be used as predictor of future sales. Therefore, it is possible for management teams of firms to base predictions of purchases of products by using the outcomes of this study. Firms can use this model to make predictions for innovations and more diffused products. With regard to innovations, at least one year before a firm releases an innovation on the market, the management team can investigate the purchase intention of consumers on the market. Regarding innovation, a similar population fraction as stated to have a purchase intention will actually purchase the innovation. In the end, the management team can decide which of the potential innovations will perform best, thus, resulting in a decision to put one or more of these innovations on the market.

Regarding existing products, former sales are not significantly a better predictor for future sales than purchase intention is. In addition, when the firm not continuously monitored their sales or when the product diffusion is not clear, it is possible for firms to predict their sales based on the purchase intention. This strengthens the managerial implication of this research, because not only regarding innovations, but also for future sales of products that are more diffused on the market, purchase intention can be used as predictor for future sales. In this case, the actual purchase will be approximately three times the surveyed purchase intention. When predicting future sales with former sales the moderating effect of product diffusion should be taken into account while this is not the case with purchase intention as predictor.

Concluding, for firms that have several innovations ready to release on the market, the management team can predict the future sales of these potential innovations based on the (surveyed) purchase intention of consumers. Firms that predict actual purchase of an existing product, estimate this by three times the measured purchase intention.

6.4 Further research

Overall the models that corrected for the differences between products showed a higher explained variance. As a result, further research with a similar database should also correct for differences between products. However, this also depends on the aim of the research. When the aim is to predict the actual purchase of a new product, the average of several products is more useful to predict the actual purchase of a new product, than the corrected model.

Besides social pressure that is measured by subjective norm, it is still expected that the final purchase intention of a consumer strongly depends on the consumers' budget (based on income). Therefore, other variables can be investigated that influence purchase intention. Further research on aggregated level can be conducted on the theory behind the effect of attitude, subjective norm and perceived behavioural control on purchase intention.

Additionally, two formulated indicators can be discussed. On the one hand, the effect of attitude on purchase intention was tested with interest, on the other hand, perceived behavioural control was (partly) measured by complementary goods. The interest in technology can result in the purchase of more technological products, such as the tested complementary goods, PC and TV. As a result, interest as well as complementary goods measured the ownership of technological goods. In sum, these indicators of the two independent variables were interrelated, which decreases the validity of this study.

Besides that, this research only included trend data, while panel data can create insights into the decisions of individuals instead of populations. Especially characteristics of consumers that are expected to influence the purchase intention can be studied with panel data. Moreover, the hypotheses were tested with entertainment products, but to confirm to what extent this research can be generalized, research should be done with another product category. Similar to this recommendation, the test sample of further research should include data of other countries besides Australia. Last, in this research replacement purchases are not discussed, since not enough data was available concerning this type of purchase. Future research that includes data regarding replacement purchases can give a more complete view of the nature of the purchase intention and the reason for actual purchase.

7 ACKNOWLEDGEMENTS

I would like to thank Frank van Rijnsoever, who arranged everything for me in Australia with help of Harmen Oppewal. They made it possible to conduct most of my research at the Monash University in Melbourne (Australia), where I had a great time. Besides that, Frank was a great supervisor and during his time in Melbourne he was great company as well. Harmen gave me a warm welcome in Melbourne and guided me through the (for me sometimes hard) starting phase of this thesis. Furthermore, Peter Scholem, on behalf of Monash University, who arranged most of the communication with Roy Morgan Research and who introduced me to their main contact, Samantha Kelly. I would like to thank Samantha for her time to explain me how to work with their database in ASTEROID and for her help after I had left Melbourne. Moreover, I would like to express my gratitude to my reviewers for their criticisms and useful suggestions and to K.F. Hein Fonds and the UU Student Services that financially enabled conducting this project.

REFERENCES

- Ajzen, I. (2001). Nature and Operation of Attitudes. *Annual Review Psychology* 52, 27-58.
- Ajzen, I. (2005). Attitudes, personality and behavior. Open University Press, 2nd Edition.
- Ajzen, I. & Madden, T.J. (1986). Prediction of Goal-Directed Behavior: Attitudes, Intentions, and Perceived Behavioral Control. *Journal of Experimental Social Psychology* 22, 453-474.
- Alba, J.W. & Hutchinson, J.W. (1987). Dimensions of consumer expertise. *Journal of Consumer Research* 13(4), 411-454.
- Bass, F.M. (1969). A new product growth model for consumer durables. *Management Science* 15, 215-227.
- Bass, F.M. (2004). Comments on "A new product growth for model consumer durables": The Bass model. *Management Science* 50 (12), 1833-1840.
- Bemmaor, A.C. (1995). Predicting Behavior from Intention-to-Buy Measures: The Parametric Case. *Journal of Marketing Research* 32(2), 176-191.
- Butters, G.R. (1977). Equilibrium Distributions of Sales and Advertising Prices. *The Review of Economic Studies* 44(3), 465-491.
- Chandon, P., Morwitz, V.G. & Reinartz, W.J. (2005). Do Intentions Really Predict Behavior? Self-Generated Validity Effects in Survey Research. *Journal of Marketing* 69, 1-14.
- Chang, M.K. (1998). Predicting unethical behaviour: a comparison of the theory of reasoned action and the theory of planned behaviour. *Journal of Business Ethics* 17, 1825-1834.
- Fisher, M.L., Raman, A. & Clelland, A.S. (2000). Rocket Science Retailing Is Almost Here – Are You Ready? *Harvard Business Review*, July-August, 115-124.
- Godin, G., Valois, P. & Lepage, L. (1993). The Pattern of Influence of Perceived Behavioral Control upon Exercising Behavior: An Application of Ajzen's Theory of Planned Behavior. *Journal of Behavioral Medicine* 16(1), 81-201.
- Haining, R., Plummer, P. & Sheppard, E. (1997). Spatial price equilibrium in interdependent markets: Price and sales configurations. *The Journal of the Regional Science Association International* 75(1), 41-64.
- Holt, C.C. (2004). Forecasting seasonals and trends by exponentially weighted moving averages. *International Journal of Forecasting* 20, 5-10.

- Johnson, E.J. & Russo, J.E. (1984). Product familiarity and Learning new information. *Journal of Consumer Research* 11(1), 542-550.
- Kluyver, de C.A. (1980). Bottom-Up Sales Forecasting Through Scenario Analysis. *Industrial Marketing Management* 9, 167-170.
- Lu, Y., Zhou, T. & Wang, B. (2009). Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. *Computers in Human Behavior* 25, 29-39.
- Morwitz, V.G., Steckel, J.H. & Gupta, A. (2007). When do purchase intentions predict sales? *International Journal of Forecasting* 23, 347-364.
- Norton, J.A. & Bass, F.M. (1987). A diffusion theory model of adoption and substitution for successive generations of high-technology products. *Management Science* 33(9), 1069-1086.
- Ozer, M. (2009). The roles of product lead-users and product experts in new product evaluation. *Research Policy* 38, 1340-1349.
- Park, C.W., Mothersbaugh, D.L. & Feick, L. (1994). Consumer Knowledge Assessment. *Journal of Consumer Research* 21(1), 71-82.
- Parker, P.M. (1993). Choosing among diffusion models: some empirical evidence. *Marketing Letters* 4(1), 81-94.
- Parker, P.M. (1994). Aggregate diffusion forecasting models in marketing: A critical review. *International Journal of Forecasting* 10, 353-380.
- Proctor, R.A. (1989). A Different Approach to Sales Forecasting: Using a Spreadsheet. *European Management Journal* 7(3).
- Rijnsoever, van F.J. & Castaldi, C. (2009). Perceived Technology Clusters and Ownership of Related Technologies: The Case of Consumer Electronics. *Journal of the American Society for Information Science and Technology* 60(2), 381-392.
- Rogers, E.M. (2003). *Diffusion of Innovation*. Fifth Edition, Free Press, New York.
- Schmidt, J.B. & Spreng, R.A. (1996). A proposed model of external consumer information search. *Journal of the Academy of Marketing Science* 24(3), 246-256.
- Shepperd, B.H., Hartwick, J. & Warshaw, P.R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendation for Modifications and Future Research. *Journal of Consumer Research* 15, 325-343.

Taylor, S. & Todd, P. (1995). Decomposition and crossover effects in the theory of planned behaviour: A study of consumer adoption intentions. *International Journal of Research in Marketing* 12, 137-155.

Vishwanath, A. (2005). Impact of Personality on Technology Adoption: An Empirical Model. *Journal of the American Society for Information Science and Technology* 56(8), 803-811.

Waller, D.S., Wang, P.Z., Oppewal, H. & Morrison, M. (2007). Information Acceleration Effects on New Product Purchase Intention: The Case of Blu-Ray DVD recorders. ANZMAC 2007, 880-887.

Waller, D.S., Wang, P.Z., Oppewal, H. & Morrison, M. (2008). Brand Awareness of New Technology in the Introduction Stage: A Study of the Blu-Ray Vs HD-DVD Formats. ANZMAC 2008.

Wentworth, J.R., Schultze, C.L., Eckley, R.S., Lewis, J.P. & Rich, J.L. (1961). Sales forecasting. *Business Horizons* 4(1), 49-58. First International Seminar on Marketing Management.

Winters, P.R. (1960). Forecasting Sales by Exponentially Weighted Moving Averages. *Management Science* 6(3), 324-342.

APPENDIX A | CORRELATION MATRIX

Correlations

		Interest	High income	PC ownership	TV ownership	Current ownership	Intention to purchase in next 12 months	Intention t-1	Ownership t-1	Diffusion t-1	Bought in last 12 months	Difference of current ownership
Interest	Pearson Correlation	1	,352**	,724**	-,586**	,023	,078	,125	,005	,070	,147	-,001
	Sig. (2-tailed)		,000	,000	,000	,774	,328	,138	,957	,408	,063	,986
	N	198	198	198	198	161	161	142	142	142	161	139
High income	Pearson Correlation	,352**	1	,798**	,384**	,014	,119	,176*	-,027	,088	,194*	,072
	Sig. (2-tailed)	,000		,000	,000	,855	,131	,026	,732	,268	,014	,401
	N	198	220	220	220	161	161	160	160	160	161	139
PC ownership	Pearson Correlation	,724**	,798**	1	,577**	,022	,140	,119	-,002	,058	,225**	,013
	Sig. (2-tailed)	,000	,000		,000	,781	,076	,133	,984	,464	,004	,877
	N	198	220	220	220	161	161	160	160	160	161	139
TV ownership	Pearson Correlation	-,586**	,384**	,577**	1	-,018	-,140	,029	-,009	,022	-,227**	-,042
	Sig. (2-tailed)	,000	,000	,000		,817	,076	,717	,907	,786	,004	,626

	N	198	220	220	220	161	161	160	160	160	161	139
Current ownership	Pearson Correlation	,023	,014	,022	-,018	1	,248**	,372**	,980**	,828**	,583**	-,191*
	Sig. (2-tailed)	,774	,855	,781	,817		,002	,000	,000	,000	,000	,024
	N	161	161	161	161	161	161	139	139	139	161	139
Intention to purchase in next 12 months	Pearson Correlation	,078	,119	,140	-,140	,248**	1	,909**	,140	,511**	,748**	,596**
	Sig. (2-tailed)	,328	,131	,076	,076	,002		,000	,100	,000	,000	,000
	N	161	161	161	161	161	161	139	139	139	161	139
Intention t-1	Pearson Correlation	,125	,176*	,119	,029	,372**	,909**	1	,239**	,681**	,839**	,567**
	Sig. (2-tailed)	,138	,026	,133	,717	,000	,000		,002	,000	,000	,000
	N	142	160	160	160	139	139	160	160	160	139	139
Ownership t-1	Pearson Correlation	,005	-,027	-,002	-,009	,980**	,140	,239**	1	,772**	,448**	-,385**
	Sig. (2-tailed)	,957	,732	,984	,907	,000	,100	,002		,000	,000	,000
	N	142	160	160	160	139	139	160	160	160	139	139
Diffusion t-1	Pearson Correlation	,070	,088	,058	,022	,828**	,511**	,681**	,772**	1	,750**	-,001
	Sig. (2-tailed)	,408	,268	,464	,786	,000	,000	,000	,000		,000	,993
	N	142	160	160	160	139	139	160	160	160	139	139

Bought in last 12 months	Pearson Correlation	,147	,194*	,225**	-,227**	,583**	,748**	,839**	,448**	,750**	1	,574**
	Sig. (2-tailed)	,063	,014	,004	,004	,000	,000	,000	,000	,000		,000
	N	161	161	161	161	161	161	139	139	139	161	139
Difference of current ownership	Pearson Correlation	-,001	,072	,013	-,042	-,191*	,596**	,567**	-,385**	-,001	,574**	1
	Sig. (2-tailed)	,986	,401	,877	,626	,024	,000	,000	,000	,993	,000	
	N	139	139	139	139	139	139	139	139	139	139	139

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).