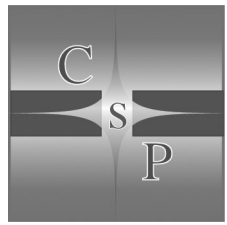
Innovative Technology and Globalization

Innovative Technology and Globalization

Edited by

Chantal Ammi



CAMBRIDGE SCHOLARS PUBLISHING

Innovative Technology and Globalization, edited by Chantal Ammi

This book first published 2007 by

Cambridge Scholars Publishing

15 Angerton Gardens, Newcastle, NE5 2JA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN 1-84718-175-9; ISBN 13: 9781847181756

TABLE OF CONTENTS

INTRODUCTION

Globalization is leading the industry worldwide especially the new technology sector. That process of transformation of the economy has effects on the industry in terms of culture, economics, marketing, and social issues at every scale from local to global.

This book aims to analyze the importance of globalization on the innovative technology sector in terms of social ramifications, and especially the geographical and political and economic contexts, at and between different levels, including the local, the regional and the global.

This book is divided in two parts:

- the first part is focused on topics of themes according to the degree of globalization as: the process of adoption, the weight of the culture, the dynamic capabilities, the change of management…

- the second part is more oriented to the applications at the national or local level in the innovative sector as: the level development, comparisons between countries, the local diffusion of innovation...

In the first part, which is composed of six chapters, the authors aim to show the importance of some factors as the culture, the technology inclination, the usage… in the process of innovation.

Chapter 1 analyzes the effect of cultural dimensions on the technology adoption across the case of three different ICT. Face to a spreading globalization, the global companies have to integrate this factor to adapt their strategy to the local characteristics. The authors want to measure the real weight of this factor in the consumers choice face to other factors as the personal, social…ones?

Chapter 2 analyzes the phenomenon of multiculturality and interculturality in the context of globalization not only across the companies and the consumers but also face to political and social decisions. Making a parallel

with the composite propellant and the creation of a chemical process, the authors want to prove the interference of the politics inside this process

Chapter 3 analyzes the relationship between innovation, networking and performance inside the high tech firms. What are the capabilities for a firm to change their habits, culture and skills in local or global surroundings? The authors try to give an answer across an empirical and real global case.

Chapter 4 analyzes the technology inclination and adoption relationship across a behavioral perspective and a quantitative modeling point of view. According to the authors, the perception advantages as well as the risk hurdles influence the most the perception of the consumers.

Chapter 5 analyzes the process of globalization in the IT technologies. Industrial and financial necessities have created a global market but the consumers have not changed. They are always looking for a local use which seems to be a break for a real and entire globalization of the market

Chapter 6 analyzes the impact of globalization on the business models in the telecommunication sector. With the development of IT technologies and their use the business are changing. The flexible value webs or value networks are replacing the traditional, static and linear value chains not only for the larged-sized and global organizations but also for the small, medium sized and local companies.

In the second part which is composed of six chapters the authors show the importance of the local specificities across many different cases.

Chapter 7 analyzes the role of the IT technologies in the process of economic growth. Is it an engine of growth for the countries? Should their adoption be able to improve the economic growth in the developing countries and narrow the gap between the North and the South? The authors give us some answers across many local examples

Chapter 8 analyzes the diffusion of Internet in India. What are the nature, the intensity and variety of internet use among the sample households? What are the obstacles of its use? Is it a good tool to decrease the gap between the different social classes in India? The author across an empirical studies tries to answer to these different questions.

Chapter 9 analyzes the biometric applications in the private life in different countries: the USA and the European Union. The use is more conditioned by the local legislation according the respect of the private life than by different behaviors or technologies.

Chapter 10 analyzes the introduction of a new type of management into a global organization and its consequences on a cultural point of view. The contemporary resistance to organizational innovation and cultural resistance in social norm are still alive even if the process of globalization is spreading around the world.

Chapter 11 analyzes the role of the knowledge economy in the process of globalization. Its introduction into the production process implies significant changes in the skill mix of workers. According the countries the adoption will be different. Many factors influence this fact: the institutional and policy environment, the power of the workers, the level of development…. An empirical study has been conducted by the authors in three different countries: Australia, Ireland and Singapore

Chapter 12 analyzes the factors involved in the competitive adavantage of nations and regions by examining and comparing competitiveness trends within the two major regions of the international business community, the US and EU. A dynamic cluster model is developed across an empirical study.

This book has no purpose to be exhaustive and to analyze every aspect of the globalalization in the ICTs. But across these different chapters written by researchers living around the world we wanted to prove that globalization is not uniformity and that it is still necessary to integrate the local characteristics to avoid misunderstandings, rejections or business failures.

PART I:
TOPICS OF THEMES

CHAPTER ONE

EFFECT OF CULTURAL DIMENSIONS ON THE GROWTH RATE OF TECHNOLOGY ADOPTION: A GLOBAL STUDY OF THREE ICT-TECHNOLOGIES

SAKU MAKINEN

1.1. Introduction and the research gap

The globalization is proceeding at an increasing pace due to advances in economic interaction between countries, growing amount of international investments, and supply chains spanning national borders, to name but a few factors creating more and more competitive international business arena for companies to deal with (e.g. Steenkamp & Ter Hofstede, 2002, Stremersch & Tellis, 2004, e.g. Wolf, 2000). From business perspective in this globalizing environment, one of the decisions that companies face is the task of operational planning of their offering in an international scale, and foreseeing the evolution of aggregate global markets consisting of national markets (e.g. Douglas & Craig, 1995). In this heterogeneous international marketplace companies need to analyze the attractiveness of a national markets and understand the their behavioral dynamics (e.g. Talukdar, Sudhir, & Ainslie, 2002). In this decision making companies need to analyze, among other aspects, dynamics of the demand for their offering in differing national environments. In this respect variation between countries has especially critical meaning since national attributes have been found to affect many aspects of technology and product adoption dynamics on a national and international level (e.g. Tellefsen & Takada, 1999, e.g. Tellis, Stremersch, & Yin, 2003) and operations companies need to engage into in national markets (e.g. Triandis, 1989).

There have been contradicting propositions that market behavior is becoming homogenized and global consumer culture is being created (e.g. Alden, Steenkamp, & Batra, 1999) while others have proposed that local, national markets' behavior is steered by their local cultural influences (e.g. Holton, 2000). There exist quite a few studies that find support for globalization having homogenizing effect between national cultures (e.g. Jain, 1989, Levitt, 1983). Also contrary evidence that globalization and economic progress actually results in local national cultural attributes having more effects on business environment than before (e.g. Craig, Douglas, & Grein, 1992, de Mooij, 2000, de Mooij & Hofstede, 2002). One of the reasons for persistence of influences of national cultures is that generally national cultures are expected to remain rather stable and change slowly (Sivakumar & Nakata, 2001).

A crucial topical area for the technology management in companies operating in international markets is the evolutionary trajectory of the adoption of technologies that are innovative and new to the world in their nature. These new technological innovations provide novel solutions for consumers that are not directly comparable to previous solutions and the cumulative adoption may significantly differ from the past. Therefore, since historical analogies may not work and markets may behave differently than in the past identification of variables influencing this dynamics are important glues on detecting systematic patterns in the adoption of new technologies internationally. Technology adoption in the international setting has mostly been traditionally studied with diffusion models (e.g. Dekimpe, Parker, & Sarvary, 1998, Gatignon, Eliashberg, & Robertson, 1989, e.g. Gatignon & Robertson, 1985, Heeler & Hustad, 1980, Helsen, Jedidi, & DeSarbo, 1993, Mahajan & Muller, 1994, Putsis, Balasubramanian, Kaplan, & Sen, 1997, Talukdar, Sudhir, & Ainslie, 2002). The earlier research on international technology adoption has mainly concentrated on comparing diffusion parameter estimates between countries. Earlier studies have reported findings that the adoption process is influenced by product specific, and country specific variables (Gatignon, Eliashberg, & Robertson, 1989, Kumar, Ganesh, & Echambadi, 1998, Takada & Jain, 1991, Tellefsen & Takada, 1999).

Culture can be validly conceptualized at the national level if there exists some meaningful degree of within-country commonality and between-country differences in culture (Steenkamp, 2001). Hofstede's definition of culture "the collective programming of the mind which distinguishes the members of one group or category of people from another" (Hofstede, 1997) has been extensively used in previous academic research (Luna & Gupta, 2001). Hofstede's cultural dimensions (power distance, individualism, masculinity, and uncertainty avoidance) represent cultural variability and different value systems in cultures (Hofstede, 1980). Later the Confucian work dynamism i.e. long-term

orientation was added. Of these dimensions individualism, uncertainty avoidance and masculinity relate to consumer behavior and innovativeness (Hofstede, 1997) and are expected to influence technology adoption. Hofstede's dimensions have been used in the earlier research seeking explanatory factors for national level behaviors and cross-cultural variations (e.g. Dawar, Parker, & Price, 1996). Further there exists earlier research findings that support the existence of dimensions and their power of classifying national cultures (e.g. Watson, Lysonski, Gillan, & Raymore, 2002). Even though Hofstede's dimensions have not been left without critique, "they were based on a rigorous design, a systematic data collection and a coherent theory to explain national variations" (Søndergaard, 1994).

National level attributes have been found to have impacts on technology and product adoption in a cross-national setting. For example, Tellis, Stremersch, & Yin (2003) found that products are adopted faster in wealthy countries and in more open economies than in poor or less open economies. Further, earlier research has also found cultural values to be at the root of the consumer processes such as the diffusion of innovations (e.g. Luna & Gupta, 2001). In addition to national attributes also time that has passed after the first global launch of a new technology affects the technology adoption dynamics at national level (Ganesh, Kumar, & Subramaniam, 1997). This is referred to as a'lead-lag effect' (e.g. Takada & Jain, 1991) or as a 'cross-national learning effect' (Ganesh, Kumar, & Subramaniam, 1997). It has also been found that cultural value differences persist, even if markets continue to globalize and national incomes are converging (de Mooij, 2004, Watson, Lysonski, Gillan, & Raymore, 2002). This implies that people are able to spend more money on products that correspond to their value patterns, thus rendering cultural value differences more apparent. However the level of national wealth has effects on adoption dynamics since it partly determines which product or technologies end-users are able and willing to purchase and use. Therefore, society's adoption timing and adoption rate are related to its standard of living and stage of economic development (e.g. Dekimpe, Sarvary, & Parker, 2000) and the dynamics of technology adoption must be analyzed not only as a technological phenomenon but research should take into account as well the socio-cultural features (Daghfous, Petrof, & Pons, 1999).

However, cross-national patterns in the growth of rate national technology adoption remain unexplored to a great extent in current literature. Further, the nonlinear, in addition to linear, nature of the relationship between national attributes and growth rate of technology adoption remain unexplored. Therefore, this paper reports results from a global study on influence that cultural dimensions have on the growth rate of the national technology adoption.

1.2. Research methodology

This paper reports results of a study of the adoption of 3 different ICT (Information and Communication Technology) technologies, namely the ISDN –technology (integrated services digital network), and the analog (1st generation) wireless telephone technology, and the digital (2nd generation) wireless telephone technology globally. Temporally the data included all available years until the end of 2005. The main source for data has been ITU (International Telecommunication Union), OECD, (Organisation for Economic Co-operation) and Development and UN (United Nations).

Technology adoption dynamics can be studied in various ways, for example by comparison of diffusion parameters (e.g. Mahajan & Muller, 1994), analyzing different points in dynamics of adoption (e.g. Tellis, Stremersch, & Yin, 2003) or modeling dynamics with various time series or similar equations (e.g. van den Bulte, 2000). In order to determine the rate of growth in adoption or adoption rate logistic model is generally accepted as a basic model for technology and innovation adoption studies (Dixon, 1980, Fisher & Pry, 1971, Mansfield, 1961, van den Bulte, 2000). The fitting of logistic model results in an unambiguous estimate for a growth parameter that is comparable across time series. For each technology this research identified an estimate for growth rate of the technology adoption using logistic model (following Meyer, Yung, & Ausubel, 1999). Eq. 1 presents analytic solution to the logistic model

$$P(t) = \frac{\kappa}{1 + e^{-\alpha(t-\beta)}} \tag{3}$$

where $P(t)$ describes the level of adoption, κ is a maximum level of penetration, α is the growth rate of adoption and β is a turning point where growth will start to decrease. When fitting to the time series the parameters α, β, and κ of the logistic model form a nonlinear estimation problem and therefore this study used a nonlinear least-squares (NLS) procedure and the parameters were optimized using Levenberg-Marquardt algorithm (Levenberg, 1944, Marquardt, 1963) which was programmed based on (Nørgaard, Ravn, Poulsen, & Hansen, 2000). Because the fitting problem is sensitive to the initial values of the parameters we made 10 evaluations with different initial values and chose the best result. From the above fitting procedure we gained an estimator for the dependent variable, the growth rate of the national technology adoption, α for each technology.

The study used as explanatory variables three Hofstede's dimensions, namely individuality (IDV), masculinity (MAS) and uncertainty avoidance (UAI) and their quadratic forms. Therefore, the study included both linear and

non-linear explanatory variables and their effects were studied with standard multivariate regression analysis with OLS estimation procedure (e.g. Newbold, 1995). In addition, also control variables of GDP (gross-domestic product, purchasing parity corrected for the year 1995) and the launch lag were included in the study. For each country the launch lag was determined as the number of years separating the national launch from the first global launch of the technology.

1.3. Results and discussion

The correlations between the variables used in the study are presented in the Table 1. Although some statistically significant correlations can be observed from the Table 1 multicollinearity did not present serious concerns in the reported results. However, since the linear and non-linear measures of explanatory variables significantly correlate between one another, the results for these variables were studied separately.

Societies with high individuality index (IDV) tend to consider individualistic behaviors as sources of well-being while collectivistic cultures with low individuality index do not follow purely individualistic behaviors. Individualism including personal achievements becomes manifested through self-confidence, task-orientation, and curiosity towards new knowledge (Hofstede, 1997, Tellis, Stremersch, & Yin, 2003). In collectivist cultures people work more for the community and spend their time more in-group settings. “We”-identity, duty and loyalty come first (Hofstede, 1997). Independent decision making and need for personal rewards and initiativeness are preferred values in individual cultures. In collective cultures people look more for acceptance of the group and they express needs for maintaining traditions (Schneider & Barsoux, 1997). In collectivistic cultures communication is more frequent and should also consider new technologies at the market place (Tellefsen & Takada, 1999). This can increase the overall communication and accelerate the rate of adoption

	Mean	SD	N	1	2	3	4	5	6	7	8	9	10	11	12	13
1. IDV	46	25	59	1.00												
2. IDV2	2670	2395	59	.98***	1.00											
3. MAS	51	20	59	0.08	0.08	1.00										
4. MAS2	2951	2167	59	0.14	0.14	.96***	1.00									
5. UAI	67	23	59	-0.17	-0.23*	0.00	-0.05	1.00								
6. UAI2	4940	2844	59	-0.20	-0.26**	-0.04	-0.08	.98***	1.00							
7. A_Alfa	1	0	59	-0.28**	-0.32***	0.08	0.04	0.10	0.11	1.00						
8. A_Lag	9	4	59	-0.35***	-0.34***	-0.05	-0.09	0.28**	0.27**	0.27**	1.00					
9. D_Alfa	1	0	59	-0.08	-0.07	0.09	0.05	0.18	0.15	-0.07	0.06	1.00				
10. D_Lag	2	2	59	-0.49***	-0.50***	0.08	0.04	0.45***	0.42***	0.27**	0.45***	0.01	1.00			
11. I_Alfa	1	1	20	-0.40*	-0.35	-0.10	-0.11	0.18	0.17	0.02	-0.14	0.22	0.53**	1.00		
12. I_Lag	8	2	20	-0.16	-0.22	-0.08	-0.04	0.04	0.03	0.46**	0.79***	-0.09	0.38*	-0.04	1.00	
13. GDP	12508	8076	59	0.65***	0.65***	0.00	0.06	-0.28**	-0.27**	-0.37***	-0.61***	-0.03	-0.60***	-0.19	-0.73**	1.00

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 2: Estimation results

Table 2a.

Dependent variable	**A_Alfa**			
Model	**IDV_1**	**IDV_2**	**IDV_3**	**IDV_4**
IDV	-0.004**	-0.003	-0.001	-0.001
Launch lag		0.019		0.008
GDP			-0.000**	0.000
p	0.032	0.035	0.015	0.036
$\mathbf{R^2}$	0.078	0.113	0.139	0.143
Model	**IDV2_1**	**IDV2_2**	**IDV2_3**	**IDV2_4**
IDV2	-0.000***	-0.000*	0.000	0.000
Launch lag		0.018		0.008
GDP			-0.000*	0.000
p	0.014	0.019	0.012	0.028
$\mathbf{R^2}$	0.101	0.132	0.147	0.152

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 2b.

Dependent variable	D_Alfa			
Model	**IDV_5**	**IDV_6**	**IDV_7**	**IDV_8**
IDV	-0.001	-0.001	-0.001	-0.001
Launch lag		-0.005		-0.004
GDP			0.000	0.000
p	0.527	0.792	0.803	0.925
R^2	0.007	0.008	0.008	0.008
Model	**IDV2_5**	**IDV2_6**	**IDV2_7**	**IDV2_8**
IDV2	0.000	0.000	0.000	0.000
Launch lag		-0.004		-0.003
GDP			0.000	0.000
p	0.584	0.841	0.854	0.951
R^2	0.005	0.006	0.006	0.006

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 2c.

Dependent variable	I_Alfa			
Model	**IDV_9**	**IDV_10**	**IDV_11**	**IDV_12**
IDV	-0.015*	-0.015*	-0.014	-0.013
Launch lag		-0.039		-0.102
GDP			0.000	0.000
p	0.077	0.196	0.219	0.301
R^2	0.163	0.174	0.164	0.049
Model	**IDV2_9**	**IDV2_10**	**IDV2_11**	**IDV2_12**
IDV2	0.000	0.000	0.000	0.000
Launch lag		-0.044		-0.115
GDP			0.000	0.000
p	0.130	0.286	0.323	0.382
R^2	0.123	0.137	0.124	0.170

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

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

* Correlation is significant at the 0.10 level (2-tailed).

The estimation results with linear and non-linear (quadratic) individuality index as explanatory variable (unstandardized coefficients, dependent variable of the growth rate of the technology adoption: A_alfa (analog), D_Alfa (digital) and I_Alfa (ISDN))

Statistically significant models in the Table 2 are models IDV_1, IDV_2, IDV_3, IDV_4, and IDV_9 for the linear form of the individuality index and for the non-linear quadratic form of the individuality index statistically significant models are IDV2_1, IDV2_2, IDV2_3 and IDV2_4 ($p < 0.05$ for all these models). Notably, in the models IDV_1 and IDV_9 linear form of the individuality index as a sole explanatory variable explains 7.8 % and 16.3 % of the variation in the growth rate, respectively. In contrast, the non-linear form of the individuality index in the model IDV2_1 is better both in statistical significance and explanatory power, explaining 10.1 % of the variations in the dependent variable. Therefore, individuality index seems to influence the growth rate of the technology adoption but the results remain partial since none of the models or explanatory variables are statistically significant for the digital mobile telephony technology and partially for the ISDN technology. In addition, the launch lag and the GDP variables significantly increase the explanatory power of the individuality index, as witnessed in the models IDV_4 and IDV2_4.

Social roles of genders are in many societies significantly differing. The genders also have dissimilar preferences and attitudes towards various subjects. According to earlier research women attach more importance to social goals such as relationships and men attach more importance to ego goals such as careers and status (Hofstede, 2001). Masculinity is in many cases associated with assertiveness, high competition, ambition and forms of materialism like money and earnings. In contrast, femininity is attributed more to taking care of people, equality in relationships, and concern for work life and environment. Generally the gender roles are more equal in feminine cultures than in masculine cultures (Hofstede, 1997). In earlier literature it has been found that the degree of masculinity has effects on, for example, ownership of different (luxury) articles which manifests greater success and attracts more members of masculine cultures than members of feminine cultures (de Mooij & Hofstede, 2002). In addition, the adoption of new products or technologies might be important aspect in exhibiting wealth and success, which may be more compatible with masculine societies (Tellis, Stremersch, & Yin, 2003). Further, it has been found that consumer innovativeness is higher in countries whose national culture is characterized by higher levels of masculinity (Steenkamp, Hofstede, & Wedel, 1999).

Table 3: Estimation Results

Table 3a.

Dependent variable	A_Alfa			
Model	**MAS_1**	**MAS_2**	**MAS_3**	**MAS_4**
MAS	0.001	0.002	0.001	0.002
Launch lag		0.026**		0.008
GDP			-0.000***	-0.000**
p	0.558	0.092	0.014	0.033
R^2	0.006	0.082	0.142	0.146
Model	**MAS2_1**	**MAS2_2**	**MAS2_3**	**MAS2_4**
MAS2	0.000	0.000	0.000	0.000
Launch lag		0.027**		0.008
GDP			-0.000***	-0.000**
p	0.753	0.104	0.015	0.035
R^2	0.002	0.078	0.140	0.144

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 3b.

Dependent variable	D_Alfa			
Model	**MAS_5**	**MAS_6**	**MAS_7**	**MAS_8**
MAS	0.001	0.001	0.001	0.001
Launch lag		0.000		-0.003
GDP			0.000	0.000
p	0.512	0.808	0.782	0.916
R^2	0.008	0.008	0.009	0.009
Model	**MAS2_5**	**MAS2_6**	**MAS2_7**	**MAS2_8**
MAS2	0.000	0.000	0.000	0.000
Launch lag		0.001		-0.002
GDP			0.000	0.000
p	0.691	0.923	0.890	0.969
R^2	0.003	0.003	0.004	0.004

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 3c.

Dependent variable	I_Alfa			
Model	**MAS_9**	**MAS_10**	**MAS_11**	**MAS_12**
MAS	-0.004	-0.004	-0.005	-0.009
Launch lag		-0.017		-0.171
GDP			0.000	0.000
p	0.680	0.903	0.634	0.453
R^2	0.010	0.012	0.052	0.147
Model	**MAS2_9**	**MAS2_10**	**MAS2_11**	**MAS2_12**
MAS2	0.000	0.000	0.000	-0.009
Launch lag		-0.016		-0.171
GDP			0.000	0.000
p	0.630	0.879	0.619	0.453
R^2	0.013	0.015	0.055	0.147

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

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

* Correlation is significant at the 0.10 level (2-tailed).

The estimation results with linear and non-linear (quadratic) masculinity index as explanatory variable (unstandardized coefficients, dependent variable of the growth rate of the technology adoption: A_alfa (analog), D_Alfa (digital) and I_Alfa (ISDN))

None of the models presented in the Table 3 including masculinity index as an explanatory variable is statistically significant, neither is the masculinity index statistically significant in the models. Therefore, according to the results masculinity index does not influence the growth rate of the technology adoption.

Extreme uncertainty necessarily creates anxiety and human societies and individuals cope with anxiety and uncertainty with technology (artifacts), laws (rules), and religion (knowledge of unknown) (Hofstede, 1997). Higher uncertainty avoidance creates group pressure and fosters avoidance of being different from the social group that individuals belong to. High uncertainty avoidance index is attached to a strong identification with one's own group and its rules (Dawar, Parker, & Price, 1996). This identification fosters a belief that threats to existing structures are to be avoided and group opinion is to be followed. It has been found that low uncertainty avoidance index results in faster overall adoption (Tellis, Stremersch, & Yin, 2003). Further, it has been found that cultures with high uncertainty avoidance index are intolerant of ambiguity and distrustful of new ideas or behaviors (Dawar, Parker, & Price, 1996). Also earlier empirical research has found that high uncertainty index hinders adoption of new products (Sivakumar & Nakata, 2001) and products takeoff faster in countries with low uncertainty avoidance index (Tellis, Stremersch, & Yin, 2003).

Table 4: Estimation Results

Table 4a.

Dependent variable	A_Alfa			
Model	**UAI_1**	**UAI_2**	**UAI_3**	**UAI_4**
UAI	0.002	0.000	0.000	0.000
Launch lag		0.025*		0.007
GDP			-0.000***	-0.000**
p	0.448	0.116	0.017	0.039
$\mathbf{R^2}$	0.010	0.074	0.136	0.140
Model	**UAI2_1**	**UAI2_2**	**UAI2_3**	**UAI2_4**
UAI2	0.000	0.000	0.000	0.000
Launch lag		0.025*		0.007
GDP			-0.000***	-0.000**
p	0.396	0.113	0.016	0.039
$\mathbf{R^2}$	0.013	0.075	0.137	0.140

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 4b.

Dependent variable	D_Alfa			
Model	**UAI_5**	**UAI_6**	**UAI_7**	**UAI_8**
UAI	0.002	0.002	0.002	0.002
Launch lag		-0.010		-0.012
GDP			0.000	0.000
p	0.172	0.333	0.394	0.525
R^2	0.032	0.039	0.033	0.039
Model	**UAI2_5**	**UAI2_6**	**UAI2_7**	**UAI2_8**
UAI2	0.000	0.000	0.000	0.000
Launch lag		-0.007		-0.010
GDP			0.000	0.000
p	0.272	0.502	0.550	0.699
R^2	0.021	0.024	0.021	0.025

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 4c.

Dependent variable	I_Alfa			
Model	**UAI_9**	**UAI_10**	**UAI_11**	**UAI_12**
UAI	0.006	0.006	0.005	0.004
Launch lag		-0.017		-0.129
GDP			0.000	0.000
p	0.448	0.742	0.607	0.571
R^2	0.032	0.034	0.057	0.115
Model	**UAI2_9**	**UAI2_10**	**UAI2_11**	**UAI2_12**
UAI2	0.000	0.000	0.000	0.000
Launch lag		-0.016		-0.130
GDP			0.000	0.000
p	0.446	0.759	0.619	0.578
R^2	0.030	0.032	0.055	0.113

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

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

* Correlation is significant at the 0.10 level (2-tailed).

The estimation results with linear and non-linear (quadratic) uncertainty avoidance index as explanatory variable (unstandardized coefficients, dependent variable of the growth rate of the technology adoption: A_alfa (analog), D_Alfa (digital) and I_Alfa (ISDN))

The results presented in the Table 4 show that none of the uncertainty avoidance index variables are statistically significant as explaining the variation in the growth rate of technology adoption. Therefore, according to the results uncertainty avoidance index does not influence the growth rate of technology adoption, contrary to the existing literature.

In addition to studying the influence of the cultural dimensions on the growth rate individually, Table 5 reports results on their aggregate influences.

Table 5: Estimation Results

Table 5a.

Dependent variable	**A_Alfa**				**D_Alfa**			
Model	**A_1**	**A_2**	**A_3**	**A_4**	**D_1**	**D_2**	**D_3**	**D_4**
IDV	-0.004**	-0.003	-0.001	-0.001	0.000	-0.001	-0.001	-0.001
MAS	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
UAI	0.001	0.000	0.000	0.000	0.001	0.002	0.002	0.002
Launch lag		0.019		0.009		-0.019		-0.017
GDP			-0.000*	0.000			0.000	0.000
p	0.153	0.124	0.070	0.113	0.478	0.480	0.596	0.624
R^2	0.091	0.123	0.146	0.151	0.044	0.061	0.049	0.062
Model	**A2_1**	**A2_2**	**A2_3**	**A2_4**	**D2_1**	**D2_2**	**D2_3**	**D2_4**
IDV2	-0.000**	-0.000*	0.000	0.000	0.000	0.000	0.000	0.000
MAS2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
UAI2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Launch lag		0.018		0.009		-0.013		-0.013
GDP			-0.000*	0.000			0.000	0.000
p	0.091	0.080	0.058	0.094	0.673	0.732	0.807	0.849
R^2	0.110	0.141	0.153	0.158	0.027	0.036	0.029	0.036

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

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

* Correlation is significant at the 0.10 level (2-tailed).

Table 5b.

Dependent variable	I_Alfa			
Model	**I_1**	**I_2**	**I_3**	**I_4**
IDV	-0.014	-0.015	-0.014	-0.011
MAS	-0.004	-0.004	-0.004	-0.007
UAI	0.006	0.006	0.006	0.005
Launch lag		-0.043		-0.118
GDP			0.000	0.000
p	0.313	0.445	0.485	0.530
R^2	0.194	0.208	0.195	0.235
Model	**I2_1**	**I2_2**	**I2_3**	**I2_4**
IDV2	0.000	0.000	0.000	0.000
MAS2	0.000	0.000	0.000	0.000
UAI2	0.000	0.000	0.000	0.000
Launch lag		-0.043		-0.128
GDP			0.000	0.000
p	0.487	0.625	0.662	0.654
R^2	0.137	0.151	0.374	0.193

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

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

* Correlation is significant at the 0.10 level (2-tailed).

The estimation results with linear and non-linear (quadratic) uncertainty avoidance index as explanatory variable (unstandardized coefficients, dependent variable of the growth rate of the technology adoption: A_alfa (analog), D_Alfa (digital) and I_Alfa (ISDN))

The only cultural dimension showing statistical significance in the Table 5 is the individuality index when considering the three cultural dimensions as explanatory variables together. In the model A_1 the linear individuality index is statistically significant while the model remains statistically insignificant. The only model with the linear explanatory variables presenting statistical significance is the A_3 ($p = 0.070$) and only GDP as a single variable is statistically significant in this model. However, all the non-linear models explaining the growth rate of the analog mobile telephone technology are statistically significant and the individuality index is statistically significant in the models A2_1 and A2_2.

1.4. Conclusions and limitations

In conclusion, the results presented above suggest that the cultural dimensions have only minimal influence on the growth rate of technology adoption. The results support the propositions (e.g. Alden, Steenkamp, & Batra, 1999) that global consumer culture results in a more homogenous population level adoption behavior considering the national technology diffusion. However, the results also suggest that the level of individuality as a cultural trait influences technology adoption since the analog telephone technology and ISDN technology were adopted slower in countries which had high individuality index value (especially models IDV_1, IDV_9, IDV_10, IDV2_1 and IDV2_2). This is in line with the existing literature finding of collectivistic cultures adopting new technologies faster. In practice technology management and marketing throughout the evolutionary life cycle of technology should bare in mind this notion of collectivism playing a role in the technology adoption. However, in summary the mixed results presented above call for additional research on the relationship between the growth rate of the technology adoption and national attributes.

First of all, only the individuality index of the cultural dimensions seems to have influence on the growth rate of technology adoption and even this explanatory variable receives scant support for its influence on the growth rate. Secondly, the non-linear nature of the relationship between the cultural dimensions and the growth rate of analog mobile telephone technology suggests that the relationship is much more complex that earlier literature has considered. Thirdly, the results suggest that the cultural dimensions' influence on the growth rate of technology adoption is dependent on the industry specific factors, as suggested by some earlier research results on different adoption attributes. However, even the best model, in terms of the explanatory power, explains only 16.3 % of national variation in the growth rate. Therefore, industry and technology specific factors or other variables not included in this study influence the growth rate of technology adoption.

For academic research the results raise more questions than gives answers. In clear contradiction to existing research results none of the cultural attributes were found to have statistically significant part in explaining variation in adoption rates in all technologies. Earlier studies have found that cultural attributes have effect on number of other variables measuring technology and product adoption. The reason for this might be the procedure that was used to define and measure adoption rate in this study. Failure to reach statistical significance may also be due to the nature of the industry under study. It might be that in ICT -industry cultural attributes are not the determining factors in adoption rate rather other factors like pricing dynamics, regulatory and legal