

Biometrics and e-Identity (e-Passport) in the European Union: End-user Perspectives on the Adoption of a Controversial Innovation

Abstract

This study deals with user acceptability of a proposed e-Passport in the European Union (EU). E-passport is an advanced version of a combined national identity card and travelling document which holds digitised biometric features of its associated individual for enhanced security of personal authentication. We attempt here to investigate the nature of the innovation and citizens' attitudes to an e-Passport (or analogous innovation) in a range of socio-political-contexts within which the implementation occur. This paper reports the findings of an Internet Survey, conducted as the second phase following a larger research program on biometrics-based e-Identity (e-Passport) acceptability and deployment issues. The data collected are interpreted under the guidance of the theoretic framework "Price of Convenience" briefly described and fully referenced herein and theories of national culture after (Hofstede, 1983b, Hofstede, 1991). Other contingency factors and indicators for e-Passport acceptance are proposed.

1 Introduction

The focus of the research programme, an aspect of which is reported in this paper, is understanding of the developing adoption attitude and behaviour context for an ICT-based innovation. In this paper, we take as an arbitrary ICT innovation, a proposed biometrically secured electronic identity (e-ID) or e-Passport and focus on the potential contribution of content analysis conducted longitudinally against national public media and interpreted through both the Price of Convenience framework and Hofstede's model of national cultures (both described below) to structure analysis of developing adoption attitude and behaviour during its diffusion. We make no claims for the effectiveness of an e-ID initiative in enhancing national security, nor do we make any value judgements about the appropriate balance between an individual's perception of privacy loss, security (individual or societal), or convenience. We also make no claims for the efficacy of technological, procedural or legislative measures to resolve any of the issues raised. Not only is the adoption of the e-ID not the focus of our interest, but further, the e-ID itself represents only an arbitrary ICT innovation for which sufficient data is available to allow our study. We wish to understand the diffusion of arbitrary members of the class of socially pervasive ICT innovations which interests us.

1.1 Background to the e-ID/e-Passport

The terrorist attacks on mainland USA on September 11, 2001 (hereafter known as 9/11) have transformed the way governments worldwide handle security and immigration control issues. One of the responses is the planned enhancement to identification of citizens, to be deployed worldwide, and based on biometric technologies. Biometrics support automatic association of identification tokens with individuals through comparison of digitised and actual physiological or behavioural characteristics. Although there have been applications in some domains which are quite mature, such as in physical security or in the criminal justice system, the widespread deployment of biometrics has been slow due to various technical, security and standard issues.

Requirements for greater security in the European Union (EU) are driven by both internal and external factors. The introduction of the "Patriot Act"¹ required all Passports for visitors from citizens of the so-called "visa waiver countries" to the USA to be upgraded to contain biometric identifiers. This requirement has resulted in hurried responses to comply and heated discussions among civil libertarians² and privacy conscious societies. The deployment of an e-Passport in the EU is a difficult and a controversial issue. There are many reasons for this controversy, but the two most prominent are:

- the collection and later provision of biometric data is seen as an invasion of personal freedom. For many people, fingerprint identification, for example, is perceived to be too closely associated with criminality, while others report health concerns over to the sharing of testing equipment;

¹ The "Patriot Act" was criticised heavily by civil libertarians, a legislation they felt gave too much power to law enforcement. Source: TIME (2004), "Resigned: John Ashcroft", November 22. p.17

² Further readings on the impact of information technology on civil liberties can be referred to the works of Davies, S. G. (1992) *Big Brother: Australia's Growing Web of Surveillance*. Sydney, Simon and Shuster.; or Agre, P. E. and Harbs, C. A. (1994) Social Choice about Privacy: Intelligent Vehicle-highway Systems in the United State. *Information Technology and People*, 7(4), 63-90.

- “invasion of privacy” and personal security concerns exist over where and how the biometric information will be stored and who will have access to it.

1.2 The Structure of the Research

The study reported here comprises two phases. In the first phase (The Authors, In progress for 2005) we:

- investigated the nature of a potential e-Passport innovation and the socio-political-context within which the implementation would occur;
- evaluated, by means of a set of 10 longitudinal media content analyses (conducted in 5 EU countries and 5 countries outside the EU) current end-user perspectives on the acceptability of e-Passport by analogy with arguably similar systems already or in the process of being introduced both within and without the EU. Our analysis was informed and framed by the Price of Convenience (PoC) (The Authors, 2003a, The Authors, 2004, The Authors, 2002c, The Authors, 2002b, The Authors, 2002a, The Authors, 2003b) framework and Hofstede’s (Hofstede, 1991, Hofstede, 1983b) theories of national culture;

In this paper, we report the second phase of this study – the findings of a questionnaire which was designed directly to elicit opinion about the acceptability of an e-Passport-like innovation. It was tested, translated as appropriate then applied, through the WWW, to groups of MBA students studying in various countries of the European Union³.

This paper is organised as follows we:

- first introduce the domain of study:
 - concepts of biometrics and biometrically-secured identity tokens, then characterise, more precisely, the concept of the e-Passport, which is the concrete innovation which forms the subject of our study
 - briefly characterise the Price of Convenience framework introduce ideas of cultural context (specifically, the work of Hofstede) which, together, structure our analytic approach
- describe our survey approach, present and interpret our findings; and
- conclude by proposing a range of other contingency factors and indicators for e-Passport acceptability.

2 Biometrics and Electronic Identity (e-ID)

The science of biometrics can be defined as the process of locating and determining unique identifiers (physiological features and behavioural characteristics), to identify and verify individuals (Davies, 1994). Biometrics encompasses a wide range of techniques – some with popular connotations of crime investigation techniques – including: fingerprints, hand and finger geometry, facial recognition, voice

³ While it was recognised that the subjects studied were not representative of the general population of the countries in which they were studying, the sample groups were comparable with each other and thus provide an opportunity for a qualitative, empirical investigation of the impact of contextual culture on responses to such a proposal.

authentication, and iris scanning. Digitised biometric information stored on an identity token may therefore logically bind the token to a specific individual.

“Identity”, in information and communication technology terms, refers to the unique name of a person, device, or the combination of both that is recognised by a *system* (Bishop, 2002). The development and implementation of an identity solution requires the convergence and synergy of a number of complementary elements to provide the “what you have, what you know, what you are” key elements of a secure design. Such elements may include the underlying technologies (hardware and software), standards, control and security.

The EU has produced two draft Regulations (25 September 2003) introducing requirements for two sets of biometric data (fingerprints and facial image) on visas and resident permits for third country nationals by 2005. The biometric data and personal details on visas will be stored on national and EU-wide databases and be accessible through the Visa Information System (VIS) held on the Schengen Information Systems (SIS II). If the EU wishes to extend this concept to its own citizens, it is, in essence, faced with the problem of introducing a universally operable identification system which incorporates biometric identifiers.

The EU Commission classified the e-Passport project in its Electronic Whitepaper (2003) as being part of the e-Europe Smartcard Charter. The EU Commission used the term e-ID to denominate a smartcard based token, containing private keys and corresponding public key certificates. As an option, the card may also incorporate visual identification features. The identification of the card holder would be achieved through the use of PKI-based electronic certificates which bind the corresponding public key(s) with personal data or other information (e.g. a pseudonym) which could be used to identify – directly or indirectly – the individual’s identity. The certificate would, thus, be the actual digital counterpart of the visual identity document. For authentication purposes, the smartcard would enable the cardholder to prove that he is the person whose identity is stated in the certificate when the private key corresponds to the unique public key of the certificate. Before the certification process, the identity of the cardholder and his public key would have to be visually checked by the certification authority. After this initial enrolment process by the CA (certification authority), the usage of the stored certificates is each time preceded by checking the biometric token on the card against the actual visual inspection result. This clearly leads to a higher security level and therefore improved trust in any transaction process. It might certainly be possible to allow those types of transaction, which solely rely on the use of the certificates without visual inspection, which is the common approach in smartcard usage today (e.g. mobile phones).

While the decision to implement may have been made, and some of the mechanisms determined, the difficulty of determining diffusing the innovation – the development of broad acceptance – remains unresolved. In addition to popular associations between biometric techniques and crime investigations, biometrics itself has often been associated, in the popular press (and, therefore, we argue, in the public consciousness) with the encroachment of state control through technologies such as wire tapping and CCTV camera surveillances (Davies, 1994, Clarke, 1988). The democratic governments of the EU nations may, therefore, reasonably be wary of introducing potentially unfavourable enabling legislation. The population of Europe may, on the whole, have become educated to the necessity of increased security but it is not clear that there is general acceptance that associated intrusions on their

privacy are either a necessary or an appropriate price to pay for it. In mid-2003, when we began this empirical study, it was apparent that the populations of Member States were at different stages of understanding and acceptance – which we hypothesised to be potentially due to the diversity of social systems, cultural values and experiences of their population – exacerbated by diversity of language leading to “federation” of the debate.

We took the view, therefore, that a socio-technical study, focusing on individual nations and aiming to identify relevant non-technical issues, such as perceptions, both of citizens’ fears and anticipations, was likely to be a prerequisite for the development of a strategy to support the acceptance of such a pervasive innovation across the whole of the EU. The study presented in this paper, while not definitive, supports this preliminary view.

3 The POC Model and e-Passport

The Price of Convenience model (PoC) places the “balancing of costs and conveniences” at the heart of the research framework (The Authors, 2002c). The dimension of cost with which we are currently concerned is that of *privacy* – a fundamental concept in the debate over e-Passport deployment and a key determinant of a smooth adoption process. The e-Passport, with biometric identifiers, requires the disclosure of personal information – just as one would have to disclose location information for GPS tracking purposes in wireless applications. This information will be available to authorised organisations, especially Governmental bodies –and, of perhaps still more concern, responsibility for its non-disclosure to unauthorised bodies is ceded to the network of authorised bodies.

Similar to wireless applications, an e-Passport promises conveniences in terms of enhanced security and easier border control (in speed and accuracy). In addition, in this case, there is the potential for enhanced delivery of e-governmental services by incorporation of currently separate personal documents such as driving license, health and insurance card, and social security card within a single e-Passport. With the intended high security features to be built into the smartcard, proponents claim higher level of trust resulting from the deployment of an e-Passport ⁴

The POC is a way of looking at the entire adoption *system* for an arbitrary innovation, from product introduction to consumer and market response (not necessary in this order) through the balancing of *price* (P), in terms of perceived loss of privacy, of its adoption against the *conveniences* (C) of adoption, and perceived impact on collective *security* (S) (The Authors, 2003b). The analytic methodology with POC at its centre, presents a way to understand interactions at three different levels:

primary – the environment with three main social actors comprising the government, companies and industry groups;

secondary – the media as the forth social actor, user adoption and assimilation issues (related to the diffusion of innovation), subjective norms, and facilitating conditions; and

⁴ See for example: http://www.bundesgrenzschutz.de/Auto_Grenzkontrolle/index.php Bundesgrenzschutz (Accessed on 9 December 2004) Schnell und bequem - erledigen Sie in ZGBunft Ihre Grenzkontrolle einfach selbst Die "Automatisierte und Biometriegestützte Grenzkontrolle" (ABG) auf dem Flughafen Frankfurt/Main, Updated on 22 March 2004.

consequences – PoC balancing. Using media as proxy for the general feelings of the community, we extract issues related to privacy, security and convenience (P-S-C), employing a conceptual mining/semantic analysis technique⁵ for extracting and then visualising changes in (P-S-C) over time; the issues surrounding the changes; and then the *consequences*.

As Figure 1 shows, the system can be described as: “primary authority adoption determinants” acting through the public media, indirectly and generally independently, on end user attitude and adoption behaviour which is also affected through subjective norming channels and facilitating conditions. The public mass media, in addition to acting as an information and opinion dissemination channel, can be considered as a proxy for societal attitude and thus to provide feedback to the primary authority adoption determinants. Naturally, it also provides an indirect mechanism through which the four main classes of actor within the determinant group influence each other, Both end user attitude and behaviour influences the attitude and behaviour of other end users – directly through subjective norming, and indirectly through reports in the media.

The PoC model described above and illustrated in Figure 1 is adopted in this paper to guide understanding of the dynamics of the roles of various actors in the implementation of a biometric e-Passport.

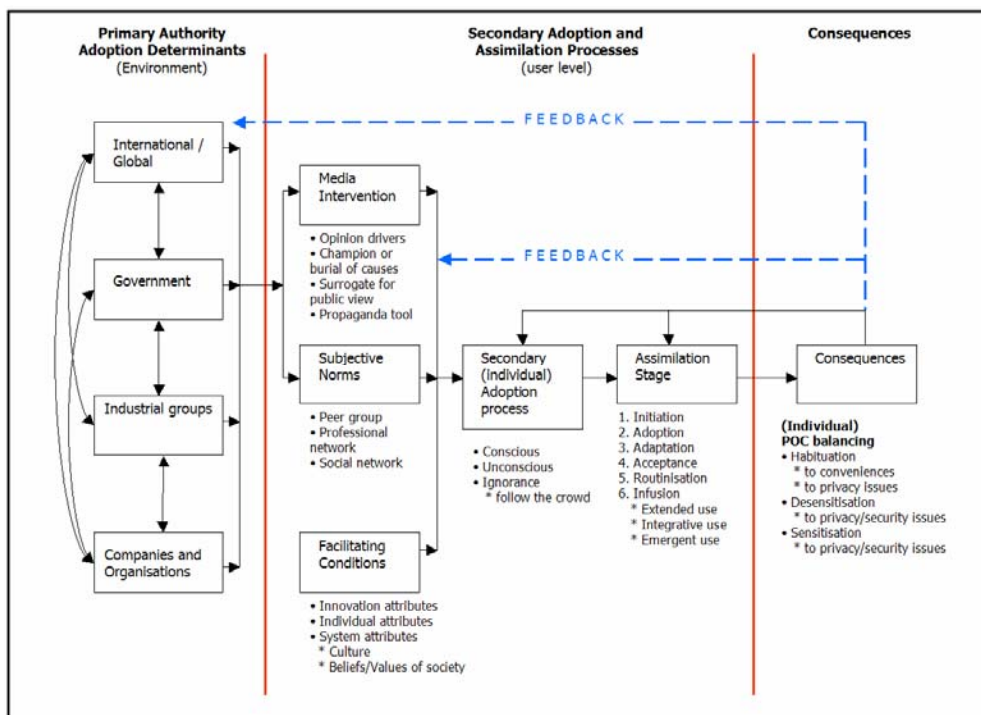


Figure 1 Research model and focus of analysis

Although, a Government may have the power, in theory, to introduce laws to ensure full adoption of e-Passport, a government is ultimately answerable, at the ballot box, to its population. Consider, for example, the introduction of the Euro. A strategy for

⁵ LEXIMANCER (www.lexiomancer.com) data mining software was used earlier within this programme of research to develop the characteristic concept set utilised in the MCA reported here.

the introduction of e-Passport would require successful market introduction which, in turn, means successfully identifying the need for the innovation.

Introducing a social tool such as e-Passport requires social changes which begin with the most committed segment (in Rogers' terms, the Early Adopters) – either technologically or socially-internationally driven and ultimately extend through other segments until it finally covers the entire population. When under time pressure, the Governmental may push or accelerate this change process through aggressive media propaganda, though normally stopping short of a total enforcement – see, for example, the deployment of MyKad by the Malaysian government (Unisys, 2002).

4 Culture and the adoption of innovation

In the first phase of this research⁶ (The Authors, 2005), we have demonstrated through media content analysis, the context within which the debate about an e-Passport (or similar innovation such as an e-ID smartcard or a multipurpose smartcard) – as characterised by the national press – varies significantly from one nation to another. We postulate that this is a natural consequence of national targeting of news stories generally, enhanced by language differences. Irrespective of the reasons, however, the national press provides, in some sense at least, a basis for describing the national context for any debate. We have also shown that the characteristics of the context of the national debate over biometrically-secured e-IDs can be explained, at least in part, by reference to its national culture represented in terms of Hofstede's five dimensions described as follow (Hofstede, 1991, Veiga, Floyd and Dechant, 2001):

Individualism (IDV): The degree of which the people of a country view themselves as either “self-sufficient individuals” (individualist) or as an “integral part of a social group” (collectivist). This factor concerns the tendency of people to look after themselves and their families, to the neglect of wider society. Individualism may be contrasted with an opposing tendency to subordinate *perceived* immediate self-interest to Collective welfare. In our study, while the IDV score associated Great Britain (rank 3/53) is extreme – matched only, in our Phase 1 study, by the referent country USA (rank 2/53) – Individualism is generally fairly high within the EU country sub-sample. This Hofstede dimension speaks directly to the PoC Balancing problem of anticipating attitudes towards e-Passport initiatives across national cultures. Prospective Adopters of e-passports are being asked to sacrifice *individual* privacy for collective security (a PoC Balance decision)—a value-rational decision-making problem we have discussed elsewhere (The Authors, 2002)⁷.

Uncertainty avoidance (UAI): The degree of which the people of a country attempt to avoid or to deal with uncertainty. Countries with high score will tend to use laws, regulations and control to keep uncertainty low (For example, see (Walczuch, Singh and Palmer, 1995)). Countries with low UAI are greater risk takers and are more open to change. Taken in isolation, the influence of this

⁶ InSyL Working Paper 2005/1, *Advance Computing Research Centre*, University of South Australia. Submitted for publication in archival literature.

⁷ At first blush, we would be inclined to anticipate high levels of Adoption and Assimilation resistance associated with this dimension of culture in the US (which, internationally, ranks second only to Australia on this measure). However, Americans are much less likely to need or hold passports than are nationals of EU countries and so, for many, the PoC issue is moot.

dimension is likely to be negative in relation to e-Passport and similar initiatives - high UAI ranking suggest relatively low tolerance for PoC risks associated with e-Passport. On this dimension (and as shown in Table 1), Greece's rank constitutes an extreme position (UA rank = 1/53). When considered without reference to Greece's outlier position, the EU sub-sample is characterized by low UAI. Considered *in aggregate*, then, we would anticipate modest PoC challenges for the e-Passport initiative in relation to this dimension.

Power distance (PDI): The degree of which the people of the country would be willing to accept an unequal distribution of power⁸. Higher PDI ranking promotes inequality reflected by large power and wealth differences. Whereas very low PDI indicates equal opportunities. Highly equalitarian countries are geographically diverse (ranging from Australia to Israel) yet a 'critical mass' of low PDI EU countries is to be found in Scandinavia. As shown in Table 1, Denmark was rank-ordered at 51/53 and is included in the present study. At the other extreme, individuals in countries ranging from South America to the Middle East tend to exhibit high levels of tolerance for power inequality – High PDI. Within the EU sample, Greece provides the best match with a moderately high score on this dimension (26/53 PDI rank), followed by Spain (31). In general, the EU countries studied manifest low tolerance for PDI (significantly lower than that manifested by the referent countries – excluding the USA – in Phase 1 of our study). All other factors equal, more resistance to e-Passport and comparable government-sponsored initiatives is to be expected in relatively low PDI cultures as the risk of privacy loss associated with the imposition will be perceived as less *legitimate*.

Masculinity index (MAS): The degree of the values that are predominant in a country. Countries with high masculinity carry high levels of gender differentiation due to male domination. Countries with low masculinity reflect greater equality. On this dimension, both the EU and non-EU samples offer well-distributed values (see Table 1).

Time orientation (LTO): The degree of which the people of the country view their perspective in life. A long term orientation would indicate a society that stresses actions that affects the future, while a short term orientation would indicate a society that stresses the present or the events of the past. Since the conceptual relevance of this dimension to the present topic is not apparent it will not be discussed further.

To summarize, the two sub-samples (EU and non-EU) are broadly comparable in the range of media-relevant cultural differences extant and a reasonable distribution of values on four relevant dimensions of culture has been obtained.

We characterise Phase 1 of our study, briefly, here because we utilise some of the findings from that study phase in our analysis of the results of the survey that forms the main focus of this paper. In Phase 1, more than 41 media sources were used, primarily digitised printed materials such as online press releases and databases. Because e-Passport implementation targets the whole population, we aimed to be as

⁸ The power distance dimension and the individualism dimension are negatively correlated. However, Hofstede stresses that power distance and individualism are two different constructs and should be treated as such.

inclusive as possible in terms of data sources – in particular, we attempted to avoid collecting only the voice of the educated middle-classes. We did not fully succeed in attaining this goal – there is, unfortunately, a clear bias in the “voice” which is available in digitised format. Nonetheless, the data available to us presented clearly differentiable stories and clearly differentiable “critical concepts in the debate” from one national context to another.

Two sets of sample countries were selected for Phase 1 of our study:

- EU member countries: Germany, Great Britain, Spain, Denmark and Greece (also the focus of our Phase 2 survey, reported here)
- Non-EU reference countries Malaysia, USA, Taiwan, South Korea and Japan.

The Non-EU reference countries were selected for this project on the basis that they provided the opportunity to explore contexts in which diffusion of biometric-based ID systems had been attempted (some successfully, some not); and because we were able to identify research assistants with appropriate “mother tongues” and were thus able to derive clear perceptions and reactions of citizens towards biometrics and biometric ID systems.

A summary of scores obtained from (Hofstede, 1991) on the sample countries are shown as Table 1 below. Long term orientation is not included here as the scores are not available for all sample countries.

		Hofstede Dimension of Comparative Culture (Rank/53)			
Country		PDI	IDV	MAS	UAI
Reference Countries	Japan	54 (36)	46(22)	95 (1)	92 (7)
	Malaysia	104 (1)	26 (36)	50 (25)	36 (46)
	South Korea	60 (25)	18 (43)	39 (41)	85 (11)
	Taiwan	58 (28)	17 (45)	45 (32)	69 (27)
	USA	40 (38)	91 (1)	62 (16)	46 (44)
EU Member Countries	Denmark	18 (51)	74 (8)	16 (48)	23 (51)
	Germany	35 (44)	67 (15)	66 (9)	65 (30)
	Greece	60 (26)	35 (30)	57 (18)	112 (1)
	Spain	57 (31)	51 (20)	42 (37)	86 (17)
	Great Britain	35 (42)	89 (3)	66 (9)	35 (48)

Table 1 Hofstede’s Cultural Characterisations for Sample Countries

Culture has always been considered as one of the factors influencing the implementation of a new technology (Veiga et al., 2001). The underlying argument for this is based on the premise that a community’s beliefs and values (i.e. culture)

can affect the attitude and behaviour that in turn either promotes or demotes the implementation of technological change. There has been a significant body of research supporting the influence of national culture on values and behaviour, indicating fundamental value differences when the similar technology is implemented in different national environment (Kedia and Bhagat, 1988). Only until recently is national culture is being featured actively in technology acceptance research and in information systems (Veiga et al., 2001, Ein-Dor, Segev and Orgad, 1993).

5 Internet Survey

We now move to the main focus of this paper, our survey of comparable “slices” – of Information Systems/eCommerce literate MBA Students – of the populations of the five EU nations selected, specifically in terms of their opinions of and reactions to a proposed e-Passport. Although the introduction of an e-Passport would be a consequence of action by an EU decision-making body, the distinct background of each member country makes it necessary to understand underlying rationale within and reactions from each member country individually. This survey instrument design was founded on the theoretic framework of the PoC Model (The Authors, 2002c, The Authors, 2003b, The Authors, 2003a) briefly described above. This framework identifies three focal concept sets: *convenience*, *privacy* and *security* which, we have argued, are balanced by prospective adopters of an innovation.

The media content analysis of the previous research phase reveals the interaction between four key players/classes of player; the *Government*, *Industry*, individual *companies* and *Society-at-large*. Users, influenced by – and, to some degree, influencing in their turn – these interacting players [player classes] through the mass media, have an individual attitude and behaviour toward the e-Passport. This survey is applied directly to individuals and aims to build attitude profiles and to detect whether there is an observable relationship between the national context for the debate and the attitudes of individuals exposed to that context.

In order to establish comparable population samples from the five EU countries studied in Phase 1, we identified colleagues teaching MBA classes in Information Systems or eCommerce at universities in: Great Britain, Germany, Spain, Greece and Denmark who were willing to facilitate our application of this survey instrument to their students. While we recognise that these samples are not reflective of the overall populations of their respective countries, we argue that they are, at least, comparable sample groups. There is almost a 100% penetration of Internet to MBA students. Therefore, the web-based nature of the survey had less resistance than might normally be the cause and anticipated a sample relatively aware of the issues we were studying (we expected the sample to be skewed towards Roger’s “early adopter” category).

The English language questionnaire consisted of three sections: screening, main and demographics. The major questions were on the awareness of biometrics identification and on the perception of e-Passport⁹. The instrument was applied between October 2003 and November 2003. Those interviewees, who lack Internet access skills, were unintentionally excluded from the participation. Consequently, the respondents for this survey may be presumed more IT-literate and possibly more technology-sensitive than a general population.

⁹ Please refer to the Appendix 1 for an outline of the Structure and Content of the Questionnaire.

A sample size of at least 50 respondents per country was considered to provide a meaningful representation of the educated, technology sensitive segment of the population. In practice, the web survey could only be applied to 35 respondents from Spain, and 21 from Greece but the target sample size was achieved in all other countries studied. Even though response numbers in Spain and Greece did not meet the target representation level, the result still provides useful descriptive indications of important issues for individuals within each country.

5.1 Findings

5.1.1 Demographics of the respondents

A total of 303 respondents were obtained. Excluding 34 responses from citizens outside the geographic coverage area of the project, 269 responses were considered in our analysis. The highest number of respondents were from Germany n=99 while the lowest response was from Greece n=21.

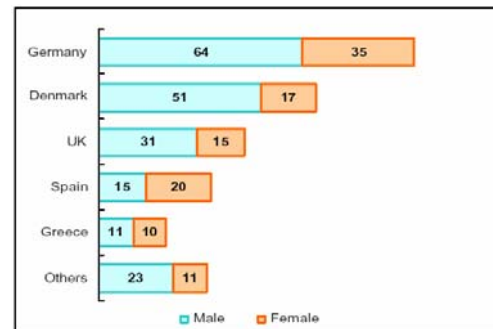


Figure 2 Profile of respondents by country (N=303)

64% of respondents were male; 57% are aged in their 20s, 28% in their 30s. 22% of total respondents have educational qualifications higher than bachelors level. 92% of respondents currently possess a passport. The highest rate of the Passport possession was amongst Danish respondents (97%) and the lowest amongst Greek respondents (86%) – adequate to justify the sampling relevance. 38% of respondents have resided overseas for longer than six months – a high mobility level.

The sample population, therefore, can be characterised as being young, well educated both in general and, in particular, in relation to the issue under discussion. In addition, the subject of the study was perceived to have some personal impact on those questioned.

5.1.2 Awareness of biometrics

There was a generally high level of awareness (average 65%) of biometrics across the whole sample. The highest levels were from Germany, Spain and Denmark (71%, 70% and 69%, respectively). Great Britain and Greece showed moderate awareness (54% and 43%, respectively).

German national culture is considered to exhibit a high level of uncertainty avoidance, in fact, the highest level in Western Europe (Hofstede, 1991). Unsurprisingly, therefore, discussions on this new technology and its effects on privacy invasion in the mass media have been active and multi-perspective and have increased the awareness of biometrics generally and the adaptation of biometrics into national identification systems in the country (see research Phase I) (The Authors, 2005). In our Phase I analysis of German media content, we considered human rights groups to be the initiators of 27% of relevant media stories and to be much more active in this regard than either Industry or Government. Consequently the media enhances the weight of the privacy concept within the social context.

In the case of Spain, the results reflected a sudden peak of interest. Coincidentally, immediately prior to the web survey, an article on the biometric identification in the US was published by a large Spanish newspaper “20 Minutos”. This newspaper was distributed to local students without charge, thus increasing awareness dramatically almost overnight.

5.1.3 Perception of the e-Passport

Taken overall, the survey suggested that informed EU citizens of the five countries surveyed might feel quite positively toward a proposed Passport secured with biometric information (57% responding positively, 13% responding negatively). In fact, however, there is a quite marked difference in perception between countries. The most attractive implications of an e-Passport were perceived to be protection from forgery and crime and, thus, enhancement of personal security. A simplified and shortened identification process was also recognised as a benefit. Convenience factors such as usage as a multi-function (identification/bank access/medical record/social security/driving licence/etc) card and national security benefits – eg as a tool for protection from terrorism – were not strong enough arguments to attract users.

The most important negative aspect of the proposed e-Passport was invasion of privacy (mentioned by 30% of negative respondents) in information collection while other perceived disadvantages were all related to safety/security of the information – the fear of illegal access and abuse of personal information.

Denmark had both the highest level of awareness of biometrics and the most positive view of the proposed e-Passport of any country studied (41% - selecting [1] “Extremely favourable” on our Likert scale); while Greece (only 5% positive) exhibited the greatest level of negative feeling about the proposal.

In terms of technology diffusion, Greece lags behind than other EU member countries. Economically, Greece has a high dependence on agriculture and tourism, and a lower competence in high-tech industries. Lack of debate in Greece resulted in a low awareness of biometrics and may have led to the minimal acceptability we encountered.

We summarise our results in Table 2 and note that these are consistent with the balancing of concerns of convenience, security and privacy as premised by the POC Model.

Perceived Positive (N=150)		Perceived Negative (N=30)	
Protection from crime/fraud	29%	Privacy invasion	30%
Security	19%	Abuse of information	13%
Speeding up of identification process	8%	Access to information	13%
Convenience	8%	Monitoring/Surveillance	10%
Innovative technology	5%	No benefits to citizens	10%
Accurate identification	5%	Accuracy of technology (doubts)	7%
Additional functionalities			

Table 2 Perceptions of e-Passport adoption

5.1.4 Information sharing with other organisations

Negative respondents see e-Passport as having significant negative privacy consequences. Except in Denmark, respondents expressed particular concern about information access. Only 23% of respondents felt comfortable with information accessibility by “other” organizations than those that they had specifically authorised – and worry about potential abuse of their personal information by unauthorized bodies. Even positive respondents state data safety as a precondition. Storage of electronic data is perceived to be questionable.

The level of concern about information security is linked to the amount of information stored in the e-Passport. The more data is stored, the more concerned the prospective user. There exists a certain level of concern over information sharing. Only 23% of the respondents are unconcerned (“feel comfortable” and “feel very comfortable” combined) at the prospect of different organizations accessing biometric information. Greeks, in particular, express a great concern (57% of respondents “feel very uncomfortable” or “feel uncomfortable”). Danes, by contrast, seem to be comfortable with the information access. Denmark has already established a central database for all of its citizens that functions as an identification system.

The degree of comfort with broad information access appears correlated with overall impression of e-Passport.

Reasons for Positive Reactions (N=62)		Reasons for Negative Reactions (N=117)	
Safety of data should be guaranteed	32%	Abuse of information	30%
Authority holds this information	10%	Privacy (private information)	12%
One-fit-all card is convenient	6%	Too much information on one card	8%
Only for government use	3%	Safety of data	4%
Separate financial information	3%	Separate financial information	3%
		Only for government access	3%

Table 3 Reasons given for reaction to the possibility of information access by other organisations

The respondents, who are favourable to information access by other organisations, still share a concern about the security of the data. 30% are concerned over information access (the who, and what) as a possibility for third parties. For instance, an insurance company might make use of the medical information to increase the insurance premium, or spam mail for commercial purposes. The integration of the identification and the other personal information on the e-Passport present a look risky outlook for the respondents who are against. 8% are uncomfortable of a “one-fit-all” card, which contains, in their opinion, too much information in one place, while

3% request separation of the additional information from the identification information.

5.1.5 Preferred type of biometric identifiers

Fingerprint and iris identifiers received the highest preference from the respondents with 57% and 53% each. Fingerprints have already been used as additional identification mechanism in many national ID systems and thus are more found acceptable. Iris scanning attracted many respondents in spite of the fact that it is not widespread technology for identification. It seems that generous coverage in movies like the “James Bond” series, “Minority Report” and “Mission Impossible”, has helped portray iris scanning as inherently attractive to this sample.

5.1.6 Attribute test of the e-Passport

The clear majority of the respondents (64%) agree that an e-Passport would increase protection from forgery while only 48% view e-Passport as an anti-terrorism vehicle.

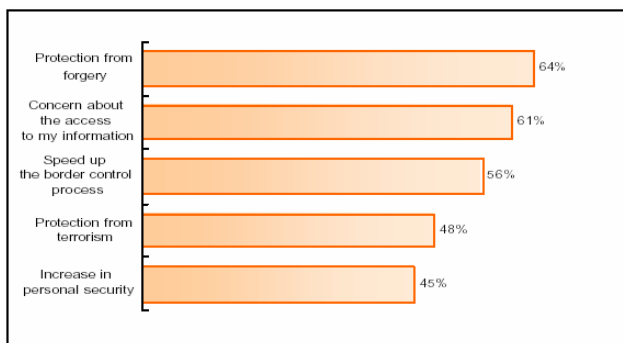


Figure 3 Favourable attributes of e-Passport (N=269)

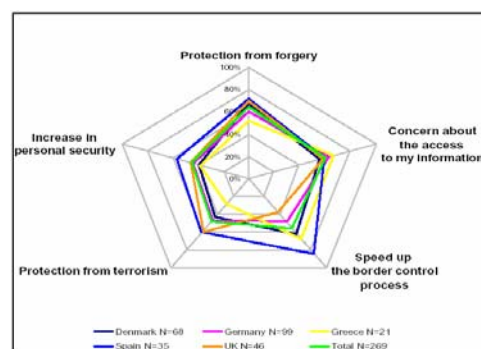


Figure 4 Country by country agreement to the attributes of e-Passport

Figure 4 demonstrates that the Greek sample exhibited relatively weak agreement to almost all attributes of e-Passport. The perception of each national sample to attributes of protection – from terrorism to process improvement in immigration border control – was heterogeneous. The cause could be a consequence of differing national contexts or of differing national cultures – we are unable, at this time, to do other than speculate. For instance, at the time of the study, the UK and Spain were most aligned with the US’s anti-terror activities. These two countries recorded the highest agreement (59% and 60%, respectively) for the anti-terrorism potential of e-Passport. Both historically and at the time of the survey, Spain by the activities of the Basque separation movement lead by ETA while UK may be influenced by the activities of the IRA.

5.1.7 Preferred Additional Functions of the e-Passport

The most common ID card carried by an EU citizen is the driving license. In our sample, this was closely followed by the national ID card, unsurprisingly, received the highest response. Interest in overloading the e-Passport with other functions such as bank and credit cards remained low at around 20%. This reaction correlates with the information access and the privacy issue. Respondents feel insecure that their personal information, particularly financial, could be inappropriately accessed. Interestingly, Danes not only preferred more additional functions on the e-Passport than respondents from other countries but, uniquely, amongst our sample were more positive about the prospect of an e-Passport the more the e-Passport was overloaded. We speculate that this is a consequence of experience of the Danish central citizens database – that is, it is a habituation effect. Our media content analysis (Phase I of this study) showed that Danes are more exposed to such information sharing than any other European citizens.

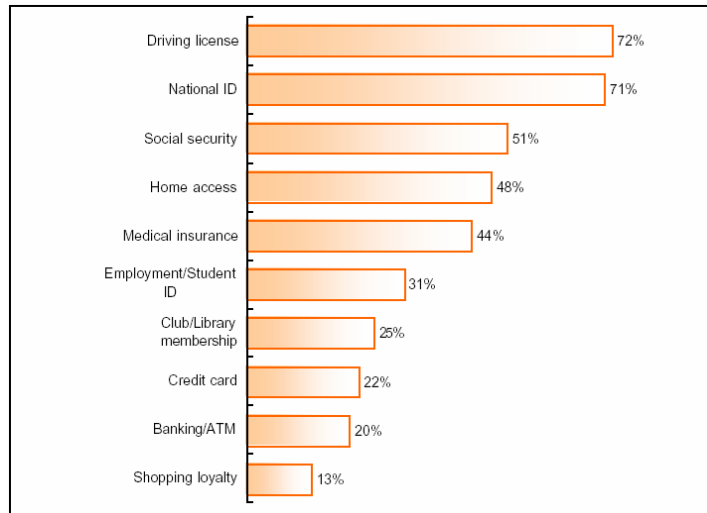


Figure 5 Preferred additional functions of e-Passport (N=269)

Additional functions beyond those already discussed, such as social security, home access and medical insurance functions appear controversial and finance-related functions were very poorly supported. Danes, once again showed higher level of acceptance for even these additional functions, on average 10% higher than other countries, for each function.

Additional functions beyond those already discussed, such as social security, home access and medical insurance functions appear controversial and finance-related functions were very poorly supported. Danes, once again showed higher level of acceptance for even these additional functions, on average 10% higher than other countries, for each function.

5.1.8 Improvement through the e-Passport

When respondents were considering the proposal for an e-Passport as a whole, enhanced security and convenience are motivators for adoption – reduced cost and privacy protection are not seen as potential benefits. This confirms the perception that an e-Passport would have only a negative effect on individual privacy.

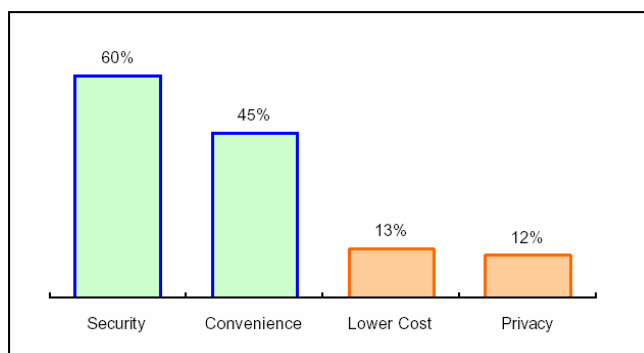
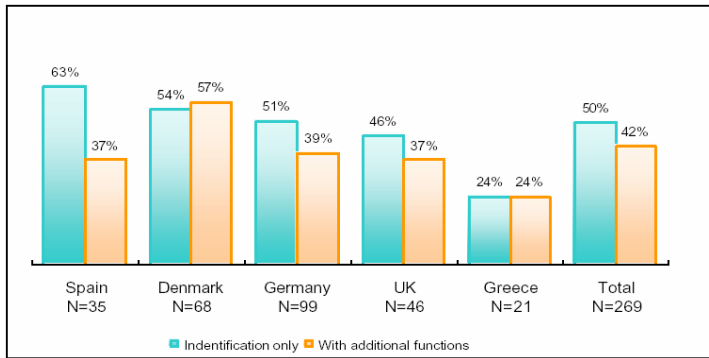


Figure 6 Expected improvement through e-Passport (N=269)

individual privacy.

Figure 7 e-Passport: Application intention



On average, 50% of respondents are likely or very likely to apply for e-Passport when it contains only identification information. The application intention goes down to 42% for e-Passport with additional functions such as a credit card access. As mentioned above, the Danish response was unique and

interesting. Media content analysis in Phase I, indicated that Danes may be characterised as technology-oriented and have generally high level awareness of the issues surrounding biometric identification. Spanish respondents exhibited the most significant negative variation of adoption intent as feature overloading was suggested with application intention amongst the sample declining from 63% to 37%. In general, it appears that a multi-functional e-Passport would be perceived by EU citizens to be risky. Female respondents showed higher level of application intent than males (56% versus 47%) for a basic e-Passport but were, by far, more significantly affected by the prospects of feature overloading: adoption intention amongst female respondents dropped from 56% to 37% while intention amongst male respondents was little affected, dropping from 47% to 45%.

5.2 Cultural Commentary

5.2.1 Germany

There appears to have been strong, relatively “objective” reporting of issues and significant debate surrounding biometric identification over the last few years in Germany. The required law for biometric data in IDs has already been passed and approved, but actual implementation will take a longer time to materialise. The media has contributed to the scepticism of German citizens. Biometric opponents further took advantage of the hesitant population to slow down the implementation process.

The US media suggested that Germany could be one of the first EU countries holding biometric features on their national ID. However, due to a resistant society, Germany might actually be one of the last countries implementing it. There is a critical balance to be managed between technological advancement and data privacy laws.

Hofstede’s analysis for Germany shows high levels of IDV, MAS, and UAI. PDI is ranked considerably lower than the others and illustrates Germany’s belief in equality and the rights of the citizen. Potential for upward mobility is a feature of German culture. A consequence is, however, that the decision-making process in Germany has a significant consensus component and thus decision making and implementation is a lengthy process with a focus on security and assurance. Rules and regulations are a prerequisite, characterising the country as rather risk averse. Quick changes are, therefore, not easily accepted.

In Germany, therefore, an e-Passport implementation could not be introduced the way it was in Malaysia as German Society is are resistant to a government directed

implementation and, indeed, to the concept of a central database of personal data. Public awareness has been raised through the media and the privacy-security-convenience debate in the German media was the most intense of any of the countries studied. In order to convince the Society to agree upon a new national ID system with embedded biometric data, the advantages of security and convenience would have to outweigh the respect for data protection and the fear of a potentially “high” error rate. Germans will not easily give up their perceived freedom that for an unclear enhancement of security.

Security is, however, of great importance – and this is one factor promoting e-Passport introduction. However, the long decision making process can be expected to be a barrier to deployment.

5.2.2 Denmark

Analysis of Danish culture highlights a high level of trust in Government and the general concern on security within Society. Denmark has the lowest level of UAI, PDI, and MAS amongst the sampled countries indicating that rules and laws that protect individuals are prized. Danish Society does not support great inequalities in power and wealth. Denmark is more open to changes than is, for example, Germany, and is thus more flexible. People, therefore, tolerate behaviours and opinions different from their own because they do not feel threatened by them and they have a tendency to feel relatively secure. The reduction of uncertainty is not a pressing concern.

There is no national ID card in Denmark but all citizens are registered in the National Civil Registry and have a personal identification number (CPR). As the CPR is widely used, citizens (Society), are eager to have their privacy protected. Therefore, the Government invests significant effort to convince its citizens of any new innovations. Society requires complete trust in the systems, and the public sector requires a high level of security to handle a large part of the electronic transactions with the citizens. A digital signature for citizens, companies, and public institutions is a major component of Denmark’s e-Government strategy. Based upon the survey by World Economic Forum (Nov 2002), the country reveals the highest trust towards its government in the world. Citizens concerns over personal/social security are likely to be the key argument in any debate over the acceptability of a proposed biometrically secured passport.

5.2.3 Spain

The fast growth and development of Spain during the last 30 years has required the Spaniards to accept rapid change and also to welcome new technologies which are expected to, in the long run, improve the country’s economy. Our survey indicated no “in principle” opposition to an e-Passport proposal. Spanish opinion has been influenced by two main factors: security and immigration. Spanish culture reflects a high UAI ranking which indicates a relatively high level of anxiety in people as they try to create a secure environment. Spain shows little tolerance for ambiguity, and the high levels of PDI – reflected in a hierarchical power structure – suggest the possible responsiveness to a Government promoted biometrically secured passport initiative.

5.2.4 Great Britain (GB)

Britain has deeply ingrained suspicion of national ID Cards. The British media seized upon any proposals (e.g. Youth Cards, Entitlement Cards, and Health Cards) as subversive approaches by the Government. Biometrics, as an identification technology has similarly become enmeshed within this debate. The one area to have escaped from extreme negative press is Smart Passports; this may be due to public acceptance of Passports as a necessity. This specific area of acceptance has not escaped the attention of the Government, which will proceed to use Biometric Passports as the tool to push for higher levels of identification, with national IDs as the potential ultimate goal.

The cultural dimensions of Great Britain include high IDV indicating a loosely integrated Society focusing on self-interest at the expense of group-interest. Britain has a low ranking in UAI, indicative of a Society that has few rules and does not attempt to control all outcomes and results. Britain also has a low level of PDI indicating that equality of influence between societal levels, Government, organizations, and families is important. Britain is flexible and responsive to new initiatives generally (it has a low UAI index), and is especially responsive to those initiatives which are perceived to potentially boost the economy. However, Society's opinion is of great importance is the Government were to wish to introduce an e-Passport. British Society seems unlikely to blindly accept a proposal for a biometrically secured ID card and is likely to favour involvement in the decision making process.

5.2.5 Greece

Greece displayed rather different cultural features to the other EU member countries studied. A very low score in IDV and a high score in PDI, might suggest that Greeks should feel comfortable with the Government's plans and abide by them. The industrial structure of Greece remains underdeveloped, with the most important industries being agriculture and tourism.

With regard to the e-Passport, Greece is driven by a strong economic motivation and attempts to enter the realm of a "developed market" within Europe (TWG, 2002). A key driver of Greek economic development is the process of convergence with the rest of the EU countries. Greece is the largest beneficiary (with Spain) of financial aid from the EU. Thus compliance to EU standards becomes a necessity.

In June 2003, all EU countries gathered in Athens to discuss the implementation of biometric Passport. A trial version of biometric Passport was scheduled to be issued to Greek citizens sometime in 2004 (Dimitriadis, 2003). As seen in the national ID implementation, the affiliation of religion might come up again as an issue for the e-Passport in Greece. Considering a weak level of discussion and debate among social actors in Greece, the Greek Government initiative is expected to play a key role in implementing any EU requirements.

Greek society exhibits an extremely high level of UAI consequently ambiguity is unwelcome and Greeks, especially the older generation, have a preference for tradition over change. A moderate degree of MAS and PDI emphasize the centralization of authority and somewhat autocratic leadership within the Society. However, low IDV indicate that Greeks, like many Mediterranean's, have strong

group ties and the people are tightly integrated within their communities. Similar to Spain, Greek society places great emphasis on security.

The e-Passport could, in principle, therefore, be acceptable to Greek society and security would be an important aspect of the national debate. A key factor would, however, be the support of the Greek Orthodox Church (to which approximately 98% of the population belongs). The Church opposed a change to the National ID card when religious belief was removed from the information contained thereon (BBC, Jan. 2003).

6 Other contingent factors and Indicators for e-Passport Acceptance

It is not adequate to interpret the findings solely through Hofstede's cultural dimensions. On one hand it provides a possible explanation to generalising attitudes and behaviour of the adopting population, on the other hand many other contingency factors (Moore and Benbasat, 1991) exist that need equal attention, and other indicators that can be used in parallel in order to understand user acceptability issues and innovation takeoff better.

6.1 Contingent factors

According to (Garland, 1991), other "people" issues to be considered in diffusion and adaptation of an innovation include: culture-tradition, risk averseness, knowledge level and user acceptability. Described in the case of e-Passport in relation to the issues or constraints that might influence its adoption process would be the following:

Cultural aspects: The Hofstede cultural analysis revealed interesting assumptions regarding the four cultural dimensions. The similarities and references of EU and non-EU countries revealed how these countries are culturally compatible in some aspects but have different attitudes regarding new technology innovations, such as South Korea and Greece, for example. High UAI suggests a more difficult and longer adoption process of new technology, and higher PDI indicates that a top-down introduction fastens the adoption process. Cultural aspects influence the adoption process, in the time frame required for acceptance and full complete deployment.

Prior acceptance of national ID cards: The countries within the EU are at various stages of acceptance of national ID cards. Some have used them for some years (Germany) and others have only recently introduced plans to adopt them (United Kingdom). Bearing in mind it took the Netherlands almost eight years from the official start of the debate until physical distribution of ID cards; one should not underestimate the importance of previous experience of similar innovation.

Prior acceptance of biometrics into identification systems: Biometrics technology is a controversial technology and its adaptation into e-Passports and other such identification systems has so far been a controversial one. Governments of the EU are at various stages of acceptance as are their populations and this also severely impacts a country's position of diffusion of technology. It should be mentioned that Greece and Spain's government show willingness to accept biometrics due to the high funding they depend on from the EU, and that although Germany's government has approved its implementation, political

debates about the actual implementation of biometrics in ID cards is still ongoing. The UK's main concern was with the actual card itself, the information biometric or otherwise was of lesser importance.

Trust in government: The level to which a Government is trusted and accepted by its population will impact acceptance. In societies with high power distance, this trust might not be as influential as in countries with lower power distance, for example. It should be stated that within the EU the ranges are not considerable but the influence is strong enough for it to have an effect upon a country's position. The corruption perception index (CPI) can be used as one of the measurement instruments. The Transparency International or TI Corruption Perceptions Index (CPI) this year ranked 102 countries in terms of the degree to which corruption is perceived to exist among public officials and politicians. It is a composite index, drawing on 15 different polls and surveys from nine independent institutions carried out among business people and country analysts, including surveys of residents, both local and expatriate. The CPI focuses on corruption in the public sector and defines corruption as the abuse of public office for private gain. This index can be used as a base for indicating the depth of trust between population and the governments of the reference country's studied. The level of trust and willingness to accept propositions from a government would be a barrier or supporter of an innovation such as the e-Passport.

Level of security: The level of perceived security within a country has an impact upon the likelihood of acceptance of the e-Passport. We observed the change in opinion towards security measures post 9/11. Ideally a country assessment of the relative safety would have been preferential to a city assessment. However, the research conducted proved unsuccessful in identifying a suitable survey index that covered the countries this report is interested in. Therefore the capital cities for the countries researched were used as security indicators.

*Mercer Human Resource Consulting*¹⁰ compiles what is termed a 'Quality of Life' index for all the leading cities around the world. The survey takes into account various criteria, such as personal security, political consideration, economic consideration and several others. These criteria have each, one specific weighting in the overall survey reports. Thus personal criteria as one criterion has more weight than the others. The criterion, personal security, is an area that is critical to the e-Passport adoption. Personal safety scores are based on crime levels, law enforcement, and internal stability. Cities are ranked against New York as the base city, which has a rating of 100. The analysis is part of a worldwide quality of life survey, covering 215 cities, to help governments and major companies to place employees on international assignments.

The perceived level of security within a country or in this case city is a contributory factor to the adoption of an e-Passport (as identified in the media content analysis from Phase I). We found that a country with a requirement for security will be more likely to adopt a technological innovation such as the e-Passport.

¹⁰ Mercer Human Resource Consulting (March 2004), "World Wide Quality of Life Survey". Source : <http://www.mercerhr.com/summary.jhtml/dynamic/idContent/1128760>, Accessed on February 15, 2005.

Immigration level: The EU is experiencing high levels of immigration, both legal and illegal and is unifying its protection of its borders. The BBC news revealed that in all of the researched EU countries, Spain and the UK's immigration has increased over the last few years whereas in Germany and Denmark immigration it has decreased due to tighter restrictions. However, the problem of illegal immigrants is not the problem of one single country. The governments of the EU, despite objections from free rights and racial groups, are using this issue as a reason for greater identification security over citizens and visitors, *this should be seen as a positive influence for biometrics introduction and provides forward momentum for the introduction and acceptance of the system.*

The media content analysis from Phase I (The Authors, In progress for 2005) and cultural analysis from both Phases revealed that the German population is not yet eager to accept the biometric technology. Denmark does not see a particular need in implementing a national ID with biometric features because the state already maintains a central database and an open policy even though the media expressed some social security concerns. Germany, however, shows scepticism due to privacy and accuracy reasons. The UK expressed some insecurity within the population mainly because they seem to associate any biometrics with the national ID card, which is unpopular. Spain expressed no true opposition and Greece would comply to EU standards since it depends greatly on its funding. However, technology, security and trust of the government body remain critical aspects in the final innovation adoption process positioning

6.2 Indicators for e-Passport adoption

6.2.1 Internet penetration

The Internet penetration study is one of several indicators commissioned by the (UN, 2002) for measuring and tracking improvements in the human conditions¹¹. The survey has collated information over the last five years to measure the number of Internet users per 100 of the population. The level of use of the Internet is an indicator of how technologically aware a country is. The ease with which a country adopts to this technology is an indicator of its probable acceptance of other technologically intensive systems such as the biometric Passport. The populations of Germany (38,4%), UK (57,2%) and Denmark's (62,7%) have higher Internet access levels compared to Spain (24,7%) and Greece (9,9%). Hence, the countries revealing higher Internet penetration could be placed in the biometric technology adoption process as early majority or even as early adopters. Spain and more so Greece would represent here the late majority and possibly even laggards since the populations does not seem to be eager to enrich its technology standards. However, it has to be taken into consideration that all five countries Internet's penetration have increased steadily over the last four years indicating an increasing level of technology awareness and acceptance.

¹¹ Millennium Project Homepage. Task Force on Science, Technology, and Innovation: "Innovation: applying knowledge in development". Source: <http://unmp.forumone.com/index.html> Accessed on February 11, 2005.

6.2.2 E-readiness index

Another possible indicator of technology acceptance is the e-readiness index. The Economist Intelligence Unit's e-readiness rankings (TheEconomist, 2002) provide an established benchmark for countries to compare and assess their e-business environments. "E-readiness", or the extent to which a market is conducive to Internet-based opportunities, taken into account a wide range of factors, from the quality of IT infrastructure to the ambition of government initiatives and the degree to which the Internet is creating real commercial efficiencies. Covering the world's 60 largest economies, the rankings suggest areas in which government policy and funds can be focused.

They also provide a useful guide for multinationals seeking to invest in technologically innovative countries and tailor their Internet strategies to local conditions.

The index is used to allow positioning of the reference countries in relation to the level of acceptance of technology. The index goes up to 100 and the higher the score the more technologically innovative the country is. How likely is Country A to accept a technological innovation such as an e-Passport when compared to Country B? These two-technology indicators that place the EU studied countries, offers some contradictory analysis with our prior results in the media content analysis. According to the media analysis, Germans, for example, oppose this new biometric technology due to several reasons, whereas Spanish would accept it in spite of its low Internet penetration rate and low e-readiness score. The Greeks, although demonstrated to be least technology responsive country in both technology indicators and in the media analysis, however, by being dependent on EU for funding, the government would probably comply to EU's request.

6.2.3 Scoreboard for Environmental Analysis

The Scoreboard proposed here is modified from (European-Commission, 2003). It can be used to map the EU countries to track the evolution of the innovation (e-Passport) over time and the factors that these changes (See Appendix 2). The Scoreboard complements the POC model (and empirical study such as e-Passport here) by providing a way to quantify *part of* the findings. It serves as guidelines for potential statistical analysis. It allows for identification of groups (e.g. countries, communities or clusters) that are similar across the structural and socio-cultural indicators; and for identification of structural and socio-technical-cultural indicators that may be correlated with measures of innovation adoption readiness. It uses a range of proxy indicators that are easily available to users. And because of its frequent updates, this option provides a more robust and "all-rounded" innovation and diffusion indicators as compared to, for example, the cultural dimensions of Hofstede (Hofstede, 1983a, Hofstede, 1983b, Hofstede, 1991). Where using POC-based media content analysis and the internet survey will tell the story of *why* something occurs and the *consequences*, the Scoreboard will tell us more about the environment – the primary and secondary level, including socio-technical-cultural and conditions of innovation/adoption, of which it occurs, quantitatively.

The Scoreboard can be used here to illustrate richer extraction of deployment and adoption issues. As mentioned in the preceding chapter, the Scoreboard consists of two main categories that influence the innovation acceptability and its diffusion capabilities. The first consists of structural, economic characteristics, economy and

the distribution of economic activity by sector. The second category relates to socio-technical issues and conditions that encourage or inhibits innovation acceptability and its diffusion capabilities. Both categories are used here as main determinants of trajectory of end user adoption of an biometric-based passport, through possible extrapolation from the national level to the user level, thus enriching the depth of content analysis that was based on the POC Model.

7 Conclusion

The Internet survey was conducted to help understand the reaction of the EU citizens and complements the results from our Phase I media content analysis. The survey was directed to audiences of MBA students (and selected employees of companies) within Europe achieved over 300 respondents. Several interesting conclusions were derived. The survey population as a whole recorded over a 65% rating for knowledge of biometrics. As a consequence of the nature of the sample this figure, we suggest, overstates the appreciation of the general population, suggesting that awareness in the public-at-large needs to be improved. Their knowledge of biometric systems leads us to conclude that Iris- and Fingerprint-recognition systems are likely to be the most preferred methods of identification and therefore these systems should be considered first for implementation into ID systems. Finally, a clear preference was measured in the respect of applications with Banking and Government types of applications (driving license, national ID and Passport). These views, however, differed markedly from country to country and by gender – consequently there is a limit to the practicality of a ‘one-size-fits-all card’.

The results of both phases of research could be interpreted and analysed, in part, using cultural-based interpretation of the countries. Cultural dimensions, as identified by Hofstede (Hofstede, 1983b, Hofstede, 1991), impact the way populations accept or reject innovations. Therefore, being familiar with a country’s culture can be of great advantage in order to change or adjust the perception of the population towards new innovation, such as biometric identity. Although a direct and complete extrapolation of results from countries of similar cultural dimensions to another is not possible, limited referencing is still possible and provides a rather rich understanding of a country when is used together with other dimensions of study. In Phase I, Non-EU countries and EU countries that seemed superficially to be so different proved to be similar (although in limited aspects) according to Hofstede’s dimension analysis. We found power distance and uncertainty avoidance as most useful for the e-Passport study as they demonstrate a population’s interest in being involved in governmental decisions and also the level that a group would feel comfortable without knowing all information. Although useful in helping to draw parallels between different countries, Hofstede’s work is not all encompassing and it is important to understand that other contingent factors, such as technology adoption, can make countries with similar cultural dimensions appear very different in biometric technological adoption.

References

- Agre, P. E. and Harbs, C. A. (1994) Social Choice about Privacy: Intelligent Vehicle-highway Systems in the United State. *Information Technology and People*, **7**(4), 63-90.
- Bishop, M. (2002) *Computer Security: Art and Science*. Boston, Pearson Education (Addison Wesley).
- Clarke, R. (1988) Information Technology and Dataveillance. *Communications of the ACM*, **31**(5), 498-512.
- Davies, S. G. (1992) *Big Brother: Australia's Growing Web of Surveillance*. Sydney, Simon and Shuster.
- Davies, S. G. (1994) Touching Big Brother: How biometrics technology will fuse flesh and machine. *Information Technology and People*, **7**(4).
- Dimitriadis, C. K. (2003) Personal Interview on e-Passport Acceptability Issues in Germany. (Eds, Miranda, I. F. C., Fawkes, N., Ilic, D., Jeong, H. and Kobayashi, T.) SIMT, Stuttgart.
- Ein-Dor, P., Segev, E. and Orgad, M. (1993) The effect of national culture on IS: Implications for international information systems. *Journal of Global Information Management*, **1**(1), 33-46.
- European-Commission (2003) *2003 European Innovation Scoreboard: Technical Paper No5 National Innovation System Indicators*. European Commission Enterprise Directorate-General, Brussels. October 31.
- Garland, K. P. (1991) Diffusion and Adoption of Instructional Technology. In: (Ed, Anglin, G.) *Instructional Technology: Past, Present, and Future* Englewood, CO, Libraries Unlimited, Incorporated. 253-258.
- Hofstede, G. (1983a) The cultural relativity of organizational practices and theories. *Journal of International Business Studies*, **14**(2), 75-89.
- Hofstede, G. (1983b) National Cultures in Four Dimensions: A Research-Based Theory of Cultural Differences Among Nations. *International Studies of Management & Organization*, **13**(1-2), 46-74.
- Hofstede, G. (1991) *Cultures and Organizations: Software of the Mind*. England, McGraw-Hill.
- Kedia, B. L. and Bhagat, R. S. (1988) Cultural Constraints on Transfer of Technology Across Nations: Implications for Research in International and Comparative Management. *Academy of Management Review*, **13**(4), 559-571.
- Moore, G. C. and Benbasat, I. (1991) Development of an instrument as measure the perception of adopting and information technology innovation. *Information systems research*, **2**(3), 192-222.
- The Authors. (2003a) Interfaces in adoption of an evolving innovation: An Activity-theoretical Perspective and the Price of Convenience. In: *Proceedings of the 11th European Conference on Information Systems*. Naples, Italy. June 19-21.
- The Authors. (2004) End-user perspectives on the Adoption of Ubiquitous Wireless Applications: Price of Convenience and a System for User Acceptability and Product Uptake. In: *Proceedings of the ACIS2004*. University of Tasmania, Hobart, Tasmania. December 1-3.
- The Authors. (In progress for 2005) Biometrics and e-Identity (e-Passport) in the European Union: Overcoming POC-Cultural diversity for Common Cause? In: *Proceedings of the IADIS International Conference: e-Society 2005*. Qawra, Malta. 27-30 June.
- The Authors. (2002a) Innovation Uptake Through the Metaphorical Lens of the Price of Convenience. *Journal of Doing Business Across Borders*, **1**(2), 101-112.
- The Authors. (2002b) Price of Convenience: Dynamics of Adoption Attitudes and Privacy Sensitivity Over Time. In: *Proceedings of the 2002 COLLECTeR (Australia) Conference on Electronic Commerce*. Melbourne, Australia. December.
- The Authors. (2002c) The Price of Convenience: Privacy and Mobile Commerce. *Quarterly Journal of Electronic Commerce*, **3**(3), 273-385.
- The Authors. (2003b) The Price of Convenience: Developing a Framework for Analysing Privacy Sensitivity in the Adoption of Wireless Applications. In: *Proceedings of the 16th BLED International Conference on Electronic Commerce*. (Eds, Wigand, R. T., Tan, Y.-H., Gricar, J. e., Pucihar, A. and Lunar, T.) Bled, Slovenia. June 9-11. 480-500.
- The Authors. (2005) *Biometrics and e-Identity (e-Passport) in the European Union: Overcoming POC-Cultural Diversity for Common Cause?* Advanced Computing Research Centre, University of South Australia, Adelaide.
- The Authors. (2002) Weberian Socioeconomic Behavioral Analysis and Price-of-convenience Sensitivity: Implications for M-Commerce and Location-based Applications. In: *Proceedings of the 2002 COLLECTeR (Europe) Conference on Electronic Commerce*. Centre de Congres, Toulouse, France.

- Tellis, G. J., S., S. and E., Y. (2003) The international take-off of new products: the role of economics, culture and country innovativeness. *Marketing Science*, **22**188-208.
- TheEconomist (2002) *The 2002 e-readiness rankings: A white paper from the Economist Intelligence Unit*. The Economist & IBM, London, New York and Hong Kong.
- TWG (2002) The Greek Economy in 2001. *In Trade With Greece*.
- UN (2002) *Internet penetration per 100 of the population*. United Nations, Geneva.
- Unisys (2002) *Unisys Public Case Study: Malaysia Smart Card*. [online]. Unisys. Available from: http://www.unisys.com/public_sector/clients/featured_case_studies/malaysia_smart_card.htm. [Accessed January 18, 2005].
- Veiga, J. F., Floyd, S. and Dechant, K. (2001) Towards modelling the effects of national culture on IT implementation and acceptance. *Journal of Information Technology*, (16), 145-158.
- Walczuch, R. M., Singh, S. K. and Palmer, T. S. (1995) An analysis of the cultural motivations for transborder data flow legislation. *Information Technology and People*, **8**(2), 37-57.

Appendix 1

Contents of Internet Survey

Section	Contents	Structure
Screening	<ul style="list-style-type: none"> • Gender • Age • Passport holder • Nationality • Current residence country • Experience of overseas residence 	All closed-end answers
Main body of Questionnaire	<ul style="list-style-type: none"> • Awareness of biometrics/ biometrics identification • Holder of different ID cards • Perception of e-Passport (first thing that comes to mind) • Acceptance attributes of e-Passport • Comparison of e-Passport to conventional travel document • Preferred form of biometric identifier(s) • Acceptance of personal information on e-Passport • Acceptance of additional function on e-Passport • Perception of privacy invasion of e-Passport • Behavioural: Adoption of e-Passport • Pricing issue 	Mainly structured (Likert scale: 1 – 5) or Yes/No. 2 open-end questions for reasoning.
Demographics	<ul style="list-style-type: none"> • Education background • Occupation 	All structured

Appendix 2

Structural and Socio-Technical-Cultural Indicators for e-Passport Evaluation and Diffusion in the European Union

STRUCTURAL INDICATORS Categories		Relevant Data Sources
1	Demand potential for innovations	
	GDP per capita	Eurostat: Structural indicator ⁱ
	Young/Old ratio	Eurostat: Demographics ⁱⁱ
	Average time for sales to takeoff (years)	(Tellis, S. and E., 2003)
2	Industry Structure	
	Percent of all private sector value added (primary, manufacturing & services) from private services.	OECD (STAN) ⁱⁱⁱ
	Percent of all manufacturing value-added from low med-low technology manufacturing.	OECD (STAN) ^{iv}
3	Trade Openness	
	Transnationality Index ^v	UNCTAD, World Investment Report ^{vi}
	Trade openness: Imports + exports of goods and services divided by GDP.	Eurostat: Structural indicator ^{vii}
	Foreign-funded R&D as a percentage of total R&D	Eurostat: Structural indicator ^{viii}

SOCIO-TECHNICAL-CULTURAL INDICATORS Categories		Relevant Data Sources
1	Receptiveness to new ideas	
	GDP per capita	OECD – Education at a glance
	Percent students from abroad	Standard Eurobarometer 55 ^{ix}
	Languages: percent of population that can converse in at least one foreign language	
	Urban households	EUROSTAT (Urbanization rates)
2	Attitude towards risk	Eurostat: Structural indicator
	Positive attitude to self-employment	Flash Eurobarometer ^x 134
	Positive attitude to starting a financially risky business	Flash Eurobarometer 83
3	Social capital	
	Trust	European Values Study Survey ^{xi} or World Values Study Survey

ⁱ Refer to the Statistical Office of the European Communities at: <http://europa.eu.int/comm/eurostat/>

ⁱⁱ Refer to the Statistical Office of the European Communities at: <http://europa.eu.int/comm/eurostat/>

ⁱⁱⁱ Refer to Organisation for Economic Co-operation and Development (OECD)'s SStructural ANalysis database (STAN) Indicators Database at: http://www.oecd.org/document/54/0,2340,en_2649_201185_21573686_119656_1_1_1,00.html.

^{iv} Refer to Organisation for Economic Co-operation and Development (OECD)'s SStructural ANalysis database (STAN) Indicators Database at: http://www.oecd.org/document/54/0,2340,en_2649_201185_21573686_119656_1_1_1,00.html.

^v Calculated as the average of FDI inflows as a percent of gross fixed capital formation, FDI inward stock as a percent of the year's GDP, value added of foreign affiliates as a percent of GDP, and employment of foreign affiliates as a percent of total year's employment. European-Commission (2003) *2003 European Innovation Scoreboard: Technical Paper No5 National Innovation System Indicators*. European Commission Enterprise Directorate-General, Brussels. October 31.

^{vi} United Nations Conference on Trade and Development (UNCTAD)'s World Investment Report focuses on trends in foreign direct investment (FDI) worldwide, at the regional and country levels and emerging measures to improve its contribution to development. Every issue of the Report has: (1) analysis of the trends in FDI during the previous year, with especial emphasis on the development implications; (2) ranking of the largest transnational corporations in the world; (3) in-depth analysis of a selected topic related to FDI; and (4) policy analysis and recommendations. Refer to <http://www.unctad.org/Templates/Page.asp?intltemID=1465> for further information.

^{vii} Refer to the Statistical Office of the European Communities at: <http://europa.eu.int/comm/eurostat/>

^{viii} Refer to the Statistical Office of the European Communities at: <http://europa.eu.int/comm/eurostat/>

^{ix} The Standard Eurobarometer survey series is a unique program of cross-national and cross-temporal comparative social research. See http://www.gesis.org/en/data_service/eurobarometer/standard_eb/

^x Flash Eurobarometer, launched by the European Commission in the late 80s, complements the Standard Eurobarometer survey series. The Flash includes special target group polls, the data are free for secondary analyses one year after the fieldwork date. See http://www.gesis.org/en/data_service/eurobarometer/flash/ for more details.

^{xi} Refer to European Values Surveys at: <http://www.europeanvalues.nl/index2.htm> or World Values Surveys at <http://www.worldvaluessurvey.org/>. The "Human Beliefs and Values", a cross-cultural sourcebook based on the European Values Study 1999/2000 and the World Values Survey 2000/2002 was merged and published based on data from 13 countries. Surveys were carried out between the period of 1995-1997 but not in 1999-2002. The sourcebook discusses issues on: Perceptions of Life, Environment, Work, Family, Politics and Society, Religion and Morale, and National Identity. For more details refer to the following website: http://www.niwi.knaw.nl/nl/maatschappijwetenschappen/steinmetzarchief/new_2/new_2/