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Information Privacy Concerns and E-Commerce: An Empirical Investigation

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ABSTRACT

E-business industry and consumers are struggling to find a balance between consumers' privacy and the promotion of the development of online business. Regulation has widely been considered as an appropriate way to resolve regulatory conflicts in e-commerce. A multitude of surveys have investigated privacy attitudes, revealing a general desire among Internet users to protect their privacy. This paper concentrates on the tension between e-commerce, privacy concerns, and user behavior in Austria with a special focus on the detection of demographic attributes that influence users' perception of privacy issues. The authors present both a conceptual framework and empirical findings pertaining to privacy awareness and user behavior. Our results show that the willingness to provide personal data over the Internet to a certain extent depends on (socio-) demographic characteristics such as gender, knowledge, and experience.

Keywords

Privacy, E-Commerce, Customer Behavior

INTRODUCTION

Security and privacy have been major issues in a number of publications in the last years (e.g. Clarke, 1999, Cranor, 1999, Rust, Kannan and Peng, 2002, Udo, 2001). The Internet allows high-speed connectivity and information exchange, ease of participation, flexibility and efficiency in collecting, storing, processing and analyzing data. Information can be easily obtained, copied, and shared. Detailed databases, intelligent agents and tracking devices are surrounding Internet users with a web of surveillance, which most of the time is hidden and obscure to the users. Cookies and click stream-analyses are tracking the online behavior of Internet users, which lead to extensive user profiles. Subsequently, these profiles may be used for segmenting the market and targeting the most profitable consumers (Kotler and Armstrong, 2001).

This paper investigates significant interrelations between privacy concerns and (socio-) demographic variables. Firstly, we provide a literature review followed by a description of the survey and the sample population. The empirical analysis is divided into two sections: The first part deals with the general attitudes toward online privacy, the second part describes the general privacy awareness of Internet users. Finally, we discuss implications of our findings.

LITERATURE REVIEW

Data Protection and Privacy

Information privacy is "the interest an individual has in controlling or at least significantly influencing, the handling of data about themselves" (Clarke, 1999). Three fundamental approaches have evolved over the past decade addressing the privacy issue: ensuring privacy through law, through self-regulation, or through technical standards. European countries rely very much on the force of regulation. The problem with regulation is, however, that laws take an average of 10 years to come into effect, while the life cycle of information and communication goods is only 3-7 months (Borking, 2000). Data protection has been considered essential for e-commerce since it can be applied as a trust-building measure that makes users feel secure.

They expect that their data will not be used for purposes other than those indicated when originally submitted. For the individual Internet user, privacy threats fall into two main categories:

- Web tracking devices that collect information about the users online behavior (e.g. cookies);
- The misuse of personal information provided by the online user in exchange of specific benefits: increased personalization, web groups, membership, etc.

Attitude versus Behavior

A PriceWaterhouseCoopers study carried out in 2001 shows that nearly two thirds of the consumers cancelled more than once an on-line purchase due to privacy concerns (PWC 2001). Consumer attitudes about privacy are not “black and white” (Campbell, 1997, p. 45), but depend on the situation in which personal information is being collected. Consumers are very concerned when personal and financial information given to one company is sold to another organization without their permission (Wang and Petrison, 1993). What is considered a fair information practice may vary from sector to sector (Culnan, 1995). According to the relevant EU Directive, an “opt-out” regime is sufficient protection for marketing data but “opt-in” is required for “sensitive data” (DTI 2003).

A study by Harris Interactive states that the three biggest consumer concerns in the area of on-line personal information security are companies trading personal data without permission, the consequences of insecure transactions, and theft of personal data (Harris Interactive, 2002). Chellappa and Sin (2002), Hann, Hui, Lee and Png (2002), and Spiekermann, Grossklags and Berendt (2002) found evidence that individuals are willing to trade off privacy for convenience or to bargain the release of personal information in exchange for relatively small rewards.

User awareness, knowledge, and experience with Privacy Practices

One of the most challenging aspects of the Internet is that it enables information transparency. Hence, the customers' demands on service quality are growing. An increasing number of companies accept these challenges and understand digital business technologies as a chance to increase corporate performance and to gain substantial advantage over competitors. Speed and customer-focused responsiveness are the watchwords (Vervest and Dunn 2000, p. 21). Customer education is one of key factors to increase e-commerce revenues. Culnan and Armstrong (1999) show that people who are willing to be profiled for marketing purposes are more likely to have prior experience with direct marketing. The need for more customer education is a typical recommendation in the conclusions of academic studies (e.g. Culnan, 1995; Whitman, Perez and Beise 2001).

The legal protection of privacy rights

There is a general consensus that the level of government involvement in the regulation of information privacy is associated with the level of privacy concerns in a country (Bennett, 1992). Public concern over sophisticated surveillance technology and the computerization of databases during the 1960s prompted the first wave of data protection legislation, beginning with Sweden in 1973 and the United States in 1974 (Bennett, 1992). Regulators and legislators have addressed the controversial privacy issue quite differently across the world (Nakra, 2001). The current European approach is based on three basic tenets (Lillington, 1998):

- Individuals have the right to access any data relating to them and have it kept accurate and up-to-date;
- Data cannot be retained for longer than the purposes for which it was obtained, nor used or disclosed "in a matter incompatible with that purpose", and must be kept only for "lawful purposes";
- Those who control data have "a special duty of care" in relation to the individuals whose data they keep. Data commissioners oversee these rights in each European country and require most "data controllers" – people who handle data – to register with them to track what kind of information is being collected and where that takes place.

Smith, Milberg and Burke (1996) conceptualized informational privacy concerns as "consisting of four major dimensions: (1) collection of data, denoting concerns that there is too much data available in databases, (2) unauthorized, secondary use, relating to concerns that information collected by the organization for one purpose will be used by the same organization for a different, unauthorized purpose (internal use) or given to another party for another purpose (external use), (3) improper access, which refers to concerns that data are readily available to parties not authorized to use it, and (4) errors, namely concerns that protections against both deliberate and accidental errors in the data are not adequate".

The European Union Data Privacy Directive (European Union, 1995) has unified privacy legislation within the Member States of the EU. Countries, which want to join the EU and other nations, which want to ensure smooth trade with the EU, such as Canada and Australia, have enacted data-protection laws similar to the EU Directive (Long and Quek, 2002).

(Socio-)demographic variables

(Socio-)demographic variables such as age, gender, income, and occupation have gained considerable attention in management, psychological, and sociological research (e.g. Bikson and Gutek, 1983, Zedeck and Cascio, 1984). Some researchers report attitudinal differences based on age. They found out that the elderly usually are more concerned about moral issues and the welfare of others (Rest, Thoma, Moon & Getz, 1986) as well as technological issues such as computer viruses (Gattiker and Kelley, 1995). Igbaria and Parasuraman (1989) reported that senior managers' attitudes toward computer technology were more unfavorable and significantly differ from younger managers. Kelley, Gattiker, Paulson and Bathnagar (1994) found a positive relationship between age and respondents' attitudes regarding an information system's ease of interaction (e.g. interactive commands).

Gender is an important variable in explaining differential outcomes in consumer behavior research (Davis, 1970; Qualls, 1987; Ward, 1974). Studies of the communication patterns of men and women indicate that gender differences in communication are apparent. Numerous differences between the gender concerning computer usage have been published. Studies show that men are more interested than women in experimenting with technology (Roper Center, 1998). Beyond the scope of computer usage and on-line communication, research suggests that there are gender differences in terms of marketing communication. Men are more likely than woman to purchase on-line (Briones, 1998, Kramarae and Taylor, 1993). Nowak and Phelps (1992) found out that concerns about threats to personal privacy did not vary between sexes, indicating that perhaps no gender differences exist in the measures men and women take to protect their privacy in direct marketing context. Kehoe and Pitkow (1997) found that women are more concerned about privacy than men and women are more likely than men to provide false information to web sites, attempting to protect their privacy.

SURVEY METHODOLOGY

Survey Development

Prior to the study, we conducted focus group discussions with privacy experts to solicit their views on privacy practices. According to the prior literature review and inputs of the experts, we developed a conceptual framework and formulated twenty hypotheses relating to dependencies between attitude and behavior influenced by gender, age, education, and occupation.

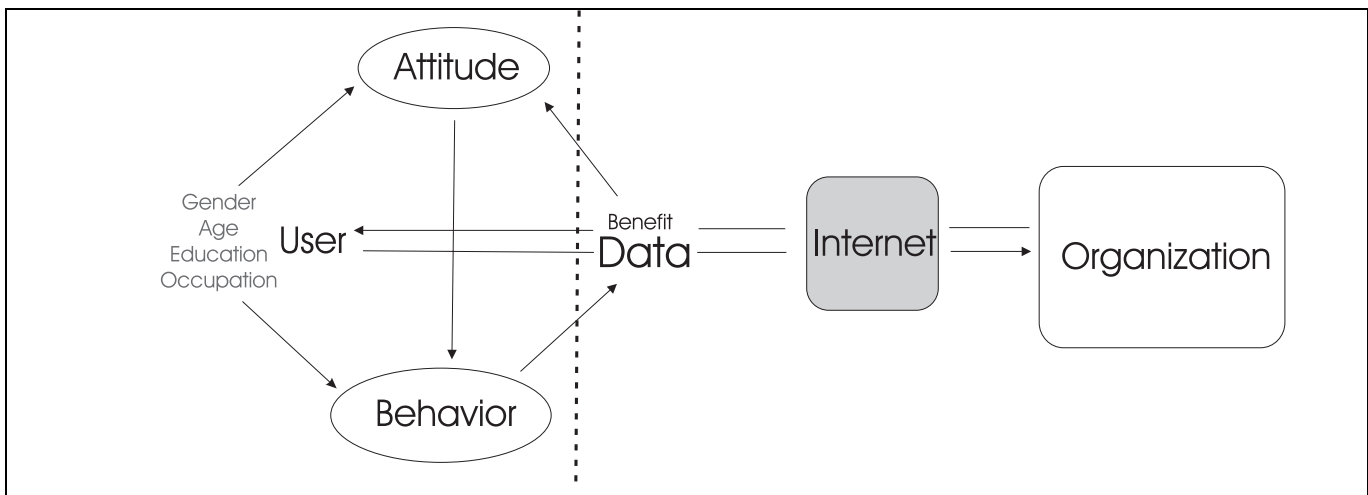


Figure 1. Conceptual Framework

All items used in the survey are based on a 5-point Lickert scale. A pilot test was conducted among a sample of 10 undergraduate students, 10 graduate students, 5 employees of a banking institution, and 10 employees of an IT consultancy company. After conducting a exploratory factor analysis, reliability testing, and a careful examination of the interrelations, items were added, deleted and modified resulting in an extensively revised instrument.

Data Collection

During the winter of 2003 we developed an online survey designed to provide insights into Internet user's awareness of privacy and Data Mining. The survey instrument was an online questionnaire consisting of 30 items. Data was collected at the survey platform of the Vienna University of Economics and Business Administration, which is implemented by the Department of Information Systems.

Sample characteristics

The prospective survey participants were selected on a random basis. The Austrian Economic Chamber supported our survey and asked companies to publish the online survey on their site. In addition to that, the survey was available at the e-learning platform of the Vienna University of Economics and Business Administration. In the following sections, we present the findings from our survey. We have separated this analysis into two sections, namely the respondents' general attitudes about privacy and their behavior.

Summary of Hypotheses

In Table 1 we summarize the hypotheses and describe the test methods we applied in the study. We conducted Chi-Square tests in order to calculate the cumulative distribution and Analyses of Variance (ANOVA) warranting multiple comparisons.

Hypothesis	Test	Significance*
1a Interrelation between age and using a protection software	Chi-Square	No
1b Interrelation between age and used browser protection settings	Chi-Square	No
1c Interrelation between age and usage of anonymization software	Chi-Square	No
1d Interrelation between age and likelihood of providing real name	ANOVA	Yes
1e Interrelation between age and annoyance when companies give customer data to 3rd parties	ANOVA	Partly
1f Interrelation between age and attitude toward importance of (legal) data protection	ANOVA	Yes
2a Interrelation between gender and usage of a protection software	Chi-Square	Yes
2b Interrelation between gender and used browser protection settings	Chi-Square	No
2c Interrelation between gender and usage of anonymization software	Chi-Square	Yes
2d Interrelation between gender and likelihood of providing real name	ANOVA	Partly
2e Interrelation between gender and annoyance when companies give customer data to 3rd parties	ANOVA	No
2f Interrelation between gender and attitude toward importance of (legal) data protection	ANOVA	Yes
3a Interrelation between education and usage of a protection software	Chi-Square	No
3b Interrelation between education and used browser protection settings	Chi-Square	No
3c Interrelation between education und usage of anonymization software	Chi-Square	No
3d Interrelation between education and likelihood of providing real name	ANOVA	No
3e Interrelation between education and annoyance when companies give customer data to 3rd parties	ANOVA	No
3f Interrelation between education and attitude toward importance of (legal) data protection	ANOVA	No
4a Interrelation between occupation as student and likelihood of providing real name	ANOVA	No
4b Interrelation between occupation as student and annoyance when Companies give Customer data to 3rd parties	ANOVA	No

* Significance level: 0.05

Table 1: Hypotheses, Test Methods, and Results

RESULTS

Demographics of sample

A total of 433 Internet users filled in and submitted our online questionnaire. We highlight some important results in Table 2. Almost two thirds of our respondents are male, females and male compromise 34.4% and 64.9% of the respondents. The ratio of participants is highest with people aged between 18 and 25 years and is the lower the more senior the age groups are.

	Frequency	Percent
Gender		
Female	149	34.4 %
Male	281	64.9 %
Not Specified	3	.7 %
Age		
18-25	180	41.6 %
26-35	130	30.0 %
36-45	81	18.7 %
>45	39	9.0 %
Not Specified	3	.7 %
Education Level Attained		
Academic Degree	158	36.5 %
High School with Diploma	233	53.8 %
High School without Diploma	29	6.7 %
Job status		
Employed/Unemployed/retired	252	58.2 %
Student	175	40.4 %
Not Specified	6	1.4 %
Frequency of Internet Usage		
Daily	387	89.4 %
Several Times a Week	45	10.4 %
Less Frequently	1	.2 %
Internet Bandwidth		
>512 Kb/s	196	45.3 %
512 Kb/s	55	12.7 %
128 Kb/s	43	9.9 %
56 Kb/s or 56 Kb/s	33	7.6 %
< 56 Kb/s	5	1.2 %
Other	19	4.4 %
Not Specified	82	18.9 %

Table 2: Characteristics of Respondents (n=433)

Remarkable is the high participation-rate of students on our survey (40.4%). Another 53.8% of our respondents have High School Diploma Education Level. A high majority of the users (89.4%) use Internet on a daily basis and more than half of our respondents are connected via a broadband connection.

Descriptive analysis - General Attitudes of privacy

We used 7 items to analyze the general attitude toward privacy. We highlight some important results considering the general attitudes of privacy and data protection. These results lead us to the assumption that customer awareness on data protection issues in Austria lies on a high level.

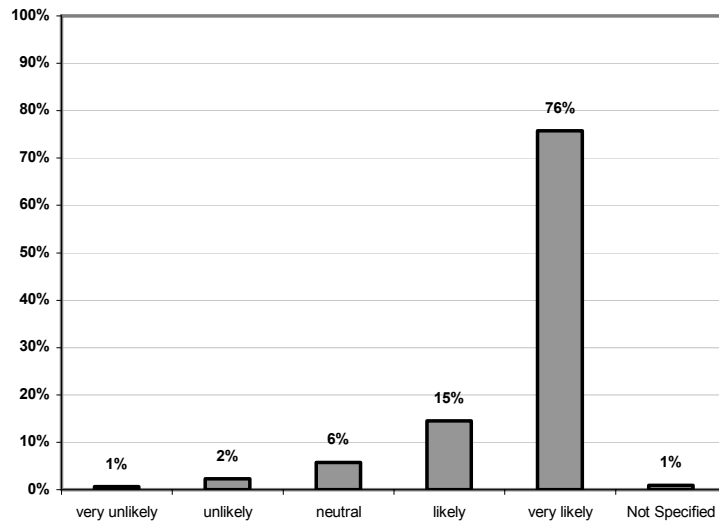


Figure 1: Annoyance when companies transfer customer data to 3rd parties (n=433)

As indicated in Figure 1, 76% of the respondents indicate to be very likely annoyed when companies transfer their data to 3rd parties. Figure 2 shows the distribution of attitudes toward the importance of (legal) data protection. 66% of these respondents appeal to increase their importance.

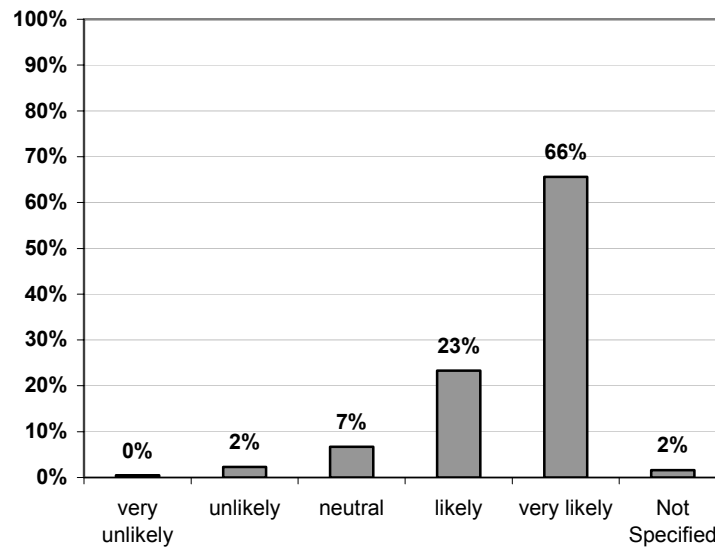


Figure 2: Attitude toward raising importance of (legal) data protection (n=433)

Descriptive analysis – User Behavior

We used 5 items to analyze user behavior concerning general attitudes of online privacy. Two of them are presented in Figures 3 and 4.

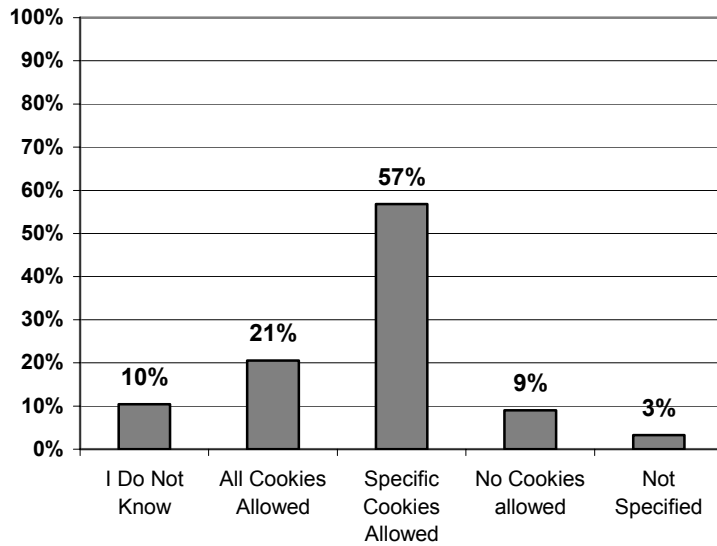


Figure 3: Used browser protection settings (n=433)

We asked the respondents to indicate their browser settings. The answers are summarized by Figure 3. 10% are not aware of their cookie settings, whereas 21% stated that they allow all cookies to be stored on their personal computers and 57% only accept specific cookies. 9% do not permit any cookies.

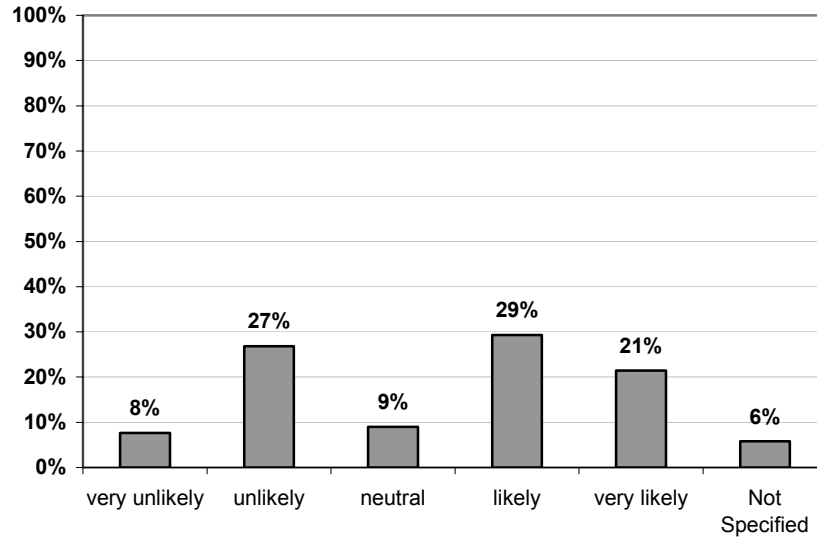


Figure 4: Likelihood of users to provide real names (n=433)

The likelihood of our sample to provide real names during Internet activities is shown in Figure 4. Although there is a balanced distribution, relatively few users indicate to be neutral to this question (9%).

Matched Samples

The survey items were used to measure the influence of external and (socio-) demographic variables on data privacy concerns, user behavior, and attitude. As mentioned before, we defined twenty hypotheses and tested the variables as

described in Table 1. We applied Chi-Square tests (Pearson-Test) to hypotheses 2a, 2b, 3a and 3b and found significant results in frequency of gender and restrictive browser settings (.005), gender and browser settings (.000), education and firewall used (.002), as well as education and anti virus software usage (.002). The summary of the tests is shown in Table 3.

Hypothesis	Items	Chi-Square	df	Significance value
2a	Gender / Firewall	3.393	1	.065
	Gender / Anti Virus Software	.015	1	.901
	Gender / Restrictive Browser Settings	7.930	1	.005**
	Gender / No Protection Software used	.129	1	.719
	Gender / Do not know Protection Software	.064	1	.800
2b	Gender / Browser Settings Used	20.836	3	.000**
3a	Education / Firewall	11.985	2	.002**
	Education / Anti Virus Software	12.091	2	.002**
	Education / Restrictive Browser Settings	.951	2	.621
	Education / No Protection Software used	1.377	2	.502
	Education / Do not know Protection Software	1.242	2	.538
3b	Education / Browser Settings Used	3.446	6	.751

Table 3: Chi-Square tests for selected hypotheses

We found out that age interrelates with likelihood to use real name. We applied the Duncan Test to analyze this outcome and came to the result that Internet users older than 45 tend to not using their real names. The following table shows the results of testing Hypothesis 1d that shows a significant interrelation between education and likelihood to provide the real name. The summary of the test is described in Table 4.

	Square sum	df	Average of squares	F	Significance
Between groups	7.452	3	2.484	5.978	.001
Inside groups	166.616	401	.416		
Entire	174.068	404			

Table 4: Variance Analysis for Hypothesis 1d - Likelihood for real name by age

	N	Subgroup for Alpha = .05.	
age		1	2
>45	33	-.2576	
36-45	73		.1438
26-35	124		.1452
18-25	175		.2571
Significance		1.000	.333

Table 5: Duncan test for Hypothesis 1d - Likelihood for real name by age

Analyzing the Hypothesis 3d, we defined 3 groups of education level: university, high school with diploma and high school without diploma. The result is a significant interrelation between education level and providing real name. We applied the Duncan test and did not find homogeneous groups. In Tables 6 and 7 we highlight our results on Hypothesis 3d.

	Square sum	df	Average of squares	F	Significance
Between groups	2.727	2	1.364	3.208	.042
Inside groups	167.066	393	.425		
Entire	169.793	395			

Table 6: Analysis of Variance for Hypothesis 3d - Likelihood for real name by education

We used the Duncan test to analyze the differences of using real name and education. We defined 3 groups; university, high School without diploma, and high School with diploma. The test shows a significance of .163.

	N	Subgroup for Alpha = .05
education		1
university	146	.0582
high school without diploma	28	.0893
high school with diploma	222	.2297
Significance		.163

Table 7: Duncan test for Hypothesis 3d - Likelihood for real name by education

We also found dependencies between age and attitude toward importance of (legal) data protection. Younger Internet users are less concerned on (legal) data protection, whereas older Internet users are more concerned about the importance of legal data protection issues.

	Square sum	df	Average of squares	F	Significance
Between groups	.509	3	.170	1.159	.325
Inside groups	61.305	419	.146		
Entire	61.813	422			

Table 8: Analysis of Variance for Hypothesis 1f - Attitude toward importance of (legal) data protection by age

	N	Subgroup for Alpha = .05
age		1
36-45	80	.7188
>45	39	.7436
18-25	177	.7599
26-35	127	.8150
Significance		.157

Table 9: Duncan test for Hypothesis 6b - Attitude toward importance of (legal) data protection by age

Finally, we identified an interrelation between annoyance when companies give customer data to 3rd parties and occupation as a student As mentioned before, we realized that most of the respondents were students, so we defined Hypotheses 4a and 4b and tested the interrelation between a current occupation as student and the likelihood to provide the real name and annoyance when Companies gives Customer data to 3rd parties. Both tested hypotheses show no significance.

	Square sum	df	Average of squares	F	Significance
Between groups	1.262	1	1.262	2.919	.088
Inside groups	173.296	401	.432		
Entire	174.557	402			

Table 10: Analysis of Variance for Hypothesis 4a - Annoyance when companies give customer data to 3rd party by occupation as student

DISCUSSION

The purpose of our survey is to test hypotheses about the influence of (socio) demographic variables on Web privacy concerns in Austria. Since many students responded to the on-line survey, our results are unlikely to reflect the concerns of all consumers within Austria. The results of this survey should be further examined in order to determine the role of Privacy standards, policies, and disclosure practices of e-commerce web sites. Such an analysis should correlate how these vary with the age, gender, level of education, computer experience, and other demographics of the Internet user community. Such studies would provide useful information about the dynamics of the e-commerce market place.

As the results above have shown, different user groups have varying attitudes toward privacy, which can be put down to the (socio-) demographic variables associated with tracking user behavior and attitude. The approaches on privacy discussed in the literature review are well suited for determining that various (socio-) demographic differences, different needs and beliefs influence privacy issues. We assume that levels of technology acceptance could possibly affect user behavior on the Web. In evaluating the results, some limitations should be taken into account. First, most participants of the survey came from a university environment. Their high level of education may have created a group which may have more trust in data protection regulations. The high-bandwidth online connection may have induced participants to engage more actively in on-line surveys in general.

CONCLUSION

A key issue for e-commerce in the next few years will be providing visible and effective protection of consumers' data. These results suggest that there is need for educating computer-literate on-line users on privacy issues and instruct them to protect themselves from of self-disclosure to an extent they are afraid of. There is also a need of customer education of older people. The education of customers should be a major concern of companies, because only if customers trust online companies with their data, those companies will be able to exploit the potentials of database marketing, which leads to a better customer service and increased e-commerce revenue. Another important factor is the role of privacy standards and policies of companies.

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