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STUDY OF INTERNET MATERIAL USE IN EDUCATION IN FINLAND

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Abstract

The paper views teachers' Internet material use preferences in Finnish education in the light of a user study. The study produces information also for the potential copyright arrangements of the material. The study considers the use and reproduction of non-interactive objectives like text, graphs or pictures from various Internet websites. In the study, which took place in 2005, conjoint analysis was used to measure teachers' individual preferences for different types of Internet material and special attention was given on how teachers wanted to reproduce the material as well how the price paid affected their choices. On the basis of the utility functions estimated the demand for different types of uses was simulated. The study interviewed a representative sample of teachers on all the levels from primary school to universities. We found that at the time of the study the share of internet sources of teaching material was 22 % in primary and secondary schools and 30 % in the universities. Printing has already lost its leading status in universities which favor copying the material into their own presentation as well as e-mail and intranet distribution. Other education levels are following the pattern. User studies of copyrighted digital goods in education or any other field are almost non-existing. With our survey we wish to highlight the value of such studies.

Keywords: Media in education, Teaching strategies, Computer mediated communication

1. Introduction

Today Internet is an indispensable tool in education. Almost all Finnish educational institutions ranging from primary schools to universities had Internet access in 2005. Approximately half of class rooms were equipped with at least one computer and Internet access (Ministry of Education, 2006). Earlier studies indicated that with a PC, Internet access and video projector in a classroom, the use of Internet increases (Ministry of Education, 2006) e.g. teachers use Microsoft Power Point for presentation instead of an overhead projector, while simultaneously using Internet.

Digital Internet material covers a huge range of commodities and services from software to artifacts and simple text, from learning objects to video and audio. The copyright owners' concern is based on three special characteristics of digital goods: they are reproducible without loss of quality, they are easy to transfer and customizable according to individual preferences.

The use of Internet material may be free of charge or the user may be asked to register as a user without a fee. Materials originating from these sites are later referred to as free Internet material. Other sites offer services which include a service fee, and they are later referred as commercial Internet material. In Finland 2005, the relative shares of Internet based material out of all material used were 22 % on the primary and secondary levels, including 2 % commercial material and 30 % in universities, including 6 % commercial material (Ministry of Education, 2006).

If somebody other than the copyright owner wishes to use or copy the work from Internet for educational purposes permission must be asked. For educational and scientific photocopying in the Nordic countries there exists a so-called extended collective license system effective in Finland since 1980's.

In the countries of the European Union (EU) the new copyright legislation which incorporates digital production is on its way to be implemented. In Finland amendments to the Copyright Act were introduced in 2005 following the EU copyright law directive in 2001.

Research problem

In this paper, we consider the user preferences of Internet material in education in Finland. A study was carried out to measure teacher preferences in 2005. The aim was to produce information for the users, the authorities of education as well as the copyright owners to aid in – among other things – the considerations how the copyrighted Internet material could be brought into teachers' reach. The study produced data on the preferred material and reproduction types as well as how the price of the material affects the teachers' choices. On the basis of the results of the study potential arrangements for the reproduction are outlined.

The teacher preferences were studied by choice based conjoint analysis (CBC). In conjoint analysis (CA) the respondents respond to a questionnaire, on the basis of which, utility functions can be estimated. These functions reflect the preferences of the individual respondents concerning different Internet use attributes. Conjoint analysis was chosen to measure the benefits because it allowed the use of a web based questionnaire to reach the representative sample and, moreover, the utility estimation could be carried out by a reliable method, Hierarchical Bayes (Lenk, Desarbo, Green & Young, 1996). In the empirical study, it was emphasized that the respondents should consider also

future needs and pays no attention if the technique they were made to evaluate was not available for them at that time. In the study, the preference results were considered across different categories (geographical, age-based, subject based etc.) among which the educational level was the most important.

Related work

In a review article on the impact of ICT on learning it is stated: "...it is pertinent that ICT contributes positively to the learning in schools..." (Eng, 2005). Today digital content is complementing paper-based material on all levels of teaching and other activities such as collaboratory tasks and even face-to-face events (Santos & Ramos, 2004). The Internet did not only enable new teaching methods but provided a channel of communication and knowledge sharing. There exist several studies that focus on the identification of technology-oriented or educational-belief-type factors explaining computer use (Albirini 2006, Demetriadis, Barbas, Molohides, Palaigeorgiou, Psillos, Vlahavas, et al. 2003, Hermans, Tondeur, van Braak & Valcke, 2008).

Internet use includes the problem of copyrights. Arguments in favor and against tight intellectual property rights are abundant. Lessig (2004) argues that current copyright regulations are limiting creativity, stifling innovation, strangling competition, and placing limits to personal freedom. It has been claimed that publishers and society may benefit from weak intellectual property enforcement e.g. by sequential innovation (Bessen and Maskin, 2004). Tsiavos and Latonero (2006) promote the creative commons project which introduced a series of new copy marks. Instead of using copy mark "all rights reserved" copyright owners may choose "some right reserved". In some cases, open access movements have become a success (Lessig, 2004). Ljungberg (2000) states that understanding the open source movement is one key to understanding the future.

The opposing side wants to protect copyrighted work (Epstein, 2005, Long, 1999). Their main argument is that the creative activity typically involves substantial development costs and authors/publishers need a financial return to recoup their development cost. Santos and Ramos proposed a framework for Internet based licensing of learning objects (Santos & Ramos, 2004)

Literature concerning the user preferences or practical arrangements and agreements on either small or large scale copying is almost non-existent. Fetscherin (2006) reported an empirical study of consumer acceptance of Digital Rights Management (DRM) systems based on a sample of 174 students. He emphasizes that digital asset managers have to understand the consumer needs on DRM systems.

2. Materials and Methods

2.1 Materials

The study started with qualitative interviews to characterize the different facets of Internet use in classrooms. The succeeding quantitative part consisted of mainly web based interviews by conjoint analysis.

Interviews

At each education level at least one teacher was interviewed. Altogether a convenience sample of seven technically well-equipped schools was selected, the principal was asked to nominate a teacher

known to use substantially Internet and digital material. Each teacher then had a visit from two of the members of the research group lasting for 45-90 minutes. The purpose of the interviews was to outline the situations of the use of Internet, how and how much the material was reproduced and what the future visions were of the use. The data from this stage of the study served the succeeding quantitative part where the teacher preferences were measured.

Study of teacher preferences

Sample

The educational sector was divided into twelve education levels and in them quota sampling was applied using a link which contained the contact information of the majority of educational institutions. Web questionnaires were sent to teachers in the sample by e-mail with an invitation including a link to the study. Some schools on the primary and secondary level were mailed hard copies of the questionnaire. The reason was that the link list of educational institutions used as a source in sampling lacked part of the schools. The hard copies were mailed to the principals of the schools with a request to distribute them to all teachers. The schools chosen for paper questionnaires were selected by random sampling.

Altogether 1,587 teachers from various educational levels responded to the survey. Each teacher was presented with two questionnaire parts: two out of the three possible which were free Internet, audiovisual material as well as printed and commercial Internet material. Altogether 1,154 teachers filled the questionnaire on free Internet services and 1180 on commercial Internet. The return rate for the free Internet part was 33 % and for the commercial Internet it was 35 %. The use of commercial internet being scarce at the time, we concentrate on presenting the free Internet results.

2.2 Preference measurement by Conjoint Analysis

Conjoint analysis (Green & Wind, 1975, Louviere, 1988) is based on multi-attribute utility theory according to which products/services are composed of multiple attributes that contribute to consumers' satisfaction. A concept is a product/service whose salient attribute values have been defined. The total utility of a concept is a function of its attribute values. These utility functions can then be estimated on the basis of preference information provided by a respondent.

We considered three attributes in the current study: website content, reproduction type and price. The utility function estimated was:

$$\text{total utility of a concept} = u_1 (\text{price}) + u_2 (\text{website content}) + u_3 (\text{reproduction type}) + u_4(\text{reproduction type, price}) \quad (1)$$

where u_1 , u_2 , u_3 and u_4 are partial utility functions. All the attributes have only a finite number of possible attribute values, called *levels*.

Conjoint analysis utility estimation produces both the utility functions as well as the importance of each attribute, both on the individual level. The attribute importance depend on the levels included in the study: thus using e.g. the range [10,20] for prices will end in a smaller importance for price than if [10,30] was used instead.

In a conjoint analysis, typically partial or full profiles are used in the preference elicitation tasks. Full profile is a concept where all the attributes have been chosen a level and in a partial profile a subset of attribute levels are defined. Choice Based Conjoint Analysis offers a predefined number of profiles in each task, of all possible product/service profiles to be evaluated among which the respondent chooses the one he/she most prefers (Figure 1). A number of similar tasks are repeated; in our study we had 15 tasks.

Figure1. Example of a task in the questionnaire

You have at your disposal free Internet services. You wish to distribute the content to your students to supplement your teaching. .
Choose the alternative best suited for you by clicking the ball in the lower part of the card.

<p>Website: Communication material of companies and public administration</p> <p>Usage: Scanning into Power Point</p> <p>Price: 9 euros per year/student (above normal)</p> <p><input type="radio"/></p>	<p>Website: Scientific material</p> <p>Usage: Copying and delivery in Intranet</p> <p>Price: 5 euros per year/student (below normal)</p> <p><input type="radio"/></p>	<p>Website: Educational material of educational institutions</p> <p>Usage: Printing for students</p> <p>Price: 4 euros per year/student (normal)</p> <p><input type="radio"/></p>
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Assume each time three profiles 1, 2 and 3 are offered for evaluation. The employed conjoint model predicts which of them the respondent will choose. The choice model used was multinomial logit which was also used in the simulations of the relative demand (Orme 2006). If the estimated total utilities for three options are A (profile 1), B (profile 2) and C (profile 3), the probability of profile 1 being chosen by the respondent is

$$\frac{\exp(A)}{\exp(A)+\exp(B)+\exp(C)} \quad (2)$$

A, B and C, which are functions of partial utilities (1) are estimated in such a way that the probability (2), is as close as possible with the choices made by the respondent.

The process of CA can be described with the following phases (e.g. Lehmann, Gupta & Steckel, 1997): choice of product attributes and attribute levels, stimulus (product profile) representation, choice of data gathering method, choice of utility function and estimation method and, finally, analysis of the results.

Choice of CA attributes and their values

In a conjoint study, this is the critical stage. When choice based conjoint analysis with full profiles is used, the number of attributes should remain fairly low, that is, not to increase the cognitive

burden. In our study, the choice of attributes is based on qualitative teacher interviews preceding the CA study.

Attributes of major importance to users are the website content as well as the way material is copied and distributed (later referred to as type of reproduction). The price attribute was included in the study owing to its core importance to the right holders. Moreover there existed no previous information on teacher attitudes towards the prices. With the collective license used for printing the teachers did not make purchasing decisions - a situation which may change with the future reproduction arrangements of digital material.

All the attributes and their levels are listed in Appendix A. The types of reproduction included: printing, copying into own presentation (e.g. Power Point) and copy and delivery via intranet and e-mail (later referred to as intranet distribution). The prices were chosen with the photocopying collective license prices as a reference. For each usage type a normal price level was defined to act as a reference point. In addition, the preferences of rises and falls of 50 per cent from the normal price were measured.

For printing the actual current price was 4 Euros per student per year. The normal prices for the remaining usage types were chosen to reflect the “harm” the use of the material causes to the right holder. Digital copying with its quality equal to the original as well as its ease in distribution was considered more harmful for the right holder than printing. The price for printing was used as a benchmark value for the other usages and its multiples were used as a reference price (multipliers 1.5 and 2.5 for the “copying into own presentation” and “intranet distribution”).

Prior to the fielding of the study several testing iterations, participated by 2-5 teachers, were needed to reach the final version.

Product profile representation in the questionnaire

The product profiles were illustrated using verbal descriptions as shown in Figure 1. That was practically the only feasible way to present the stimuli realistically.

Choice of data gathering method

The web based interviewing turned out to be the most efficient way to reach the respondents. Some of the principals of the schools were sent a bunch of hard copies of the questionnaire with a request to distribute them among the teachers who were also able to use internet to respond, if they wished.

Choice of the utility function and estimation method

The simplest utility function would have been the additive function that contains only the main effects of the attributes. It cannot take into account that the amount of satisfaction (dissatisfaction) of the fall (rise) in a price can vary among the different types of reproduction. It was assumed to be possible that a 50 per cent increase in the price of traditional printing has not necessarily the same effect on a respondent’s preferences as an increase in the price of intranet distribution. Thus (1) was the utility function that was estimated with the Hierarchical Regression method.

Analysis of the results

In conjoint analysis the results are usually produced by simulating the relative demands or “market shares” of alternative profiles, consisting of attribute levels, the utilities of which have been measured in the study. Simulators with several options are routinely included in conjoint analysis software. The simulations presented here are based on the multinomial logit model of choice discussed briefly in section 2.1. In simulation iteration every respondent’s choice among a set of

defined product concepts is simulated. The probability that a concept is chosen is defined by (2) in the case of three concepts.

We report here sensitivity analysis simulations where the alternative concepts, the “market shares” of which are considered, differ only in one attribute. We present the analyses in starting by website content, then continue with type of reproduction and conclude by considering the type of reproduction concomitantly with the price. In the simulations thus each respondent’s choice is simulated using the individual utility function estimated.

The respondents were described also according to their specialization, their location and their current use of material. In this paper the results are discussed in two user groups representing the extreme levels of education: in primary and secondary education and in the universities.

3. Results

First the importance of the different attributes (website content, reproduction type and price) was analyzed. It turned out that on all educational levels the website content was number one its share being slightly below 60 per cent. The reproduction type was the next in importance, 25 per cent, somewhat higher in primary and secondary education and somewhat lower in universities. The price was the least important attribute its importance being 15 per cent.

The preference results presented next have been produced by simulating the respondent’s choice. These figures reflecting preference are often called “market shares” or relative demand. The “market shares” of the levels of attribute k ($k = 1, 2, 3$) were produced in such a way that the rest of the attributes had fixed levels and the respondent choice was simulated only among the levels of attribute k . In the simulations concerning the type of reproduction the price was set on the normal level.

3.1 Website content

In the website content the preferences varied across educational levels very much as expected; universities valued scientific material and the primary and secondary levels the educational material (Appendix B). The high importance the website content reached in conjoint analysis is affected by the fact that the same conjoint design was used for all educational levels. In primary and secondary schools scientific material is not much used so if that material was included in the choice task it was not chosen no matter what the type of reproduction and price were.

3.2 Type of reproduction

The type of reproduction had three levels. Their relative demands were simulated with price fixed on the normal level and the results can be seen in Table 1. Universities are more prepared to adopt methods other than printing to distribute the material. In the universities “copying into own presentation” was already more popular than printing. The lower education levels are expected to follow the pattern. Today they, however, still favor the hard copy delivery. Intranet and e-mail delivery are, however, not insignificant.

Table 1. The relative demand for free internet material of different types of reproduction in primary and secondary schools and in universities, with normal price

	<i>Primary and secondary school, N = 451</i>	<i>Universities, N = 442</i>
Printing	54	35
Copying into own presentation	34	42
Intranet and e-mail distribution	12	23
Total	100	100

The replacing technology for printing is “copying into own presentation” and vice versa. The results with already remarkable demand for intranet and e-mail delivery place a challenge for the copyright arrangements.

As for the commercial internet material, the results are much the same. The only exception is that printing the commercial material in universities is more popular than printing free internet material. This could reflect the fact that commercial internet includes the scientific journal articles that typically are printed for reading.

3.3 Price and type of reproduction

Table 1 presents the simulated demand of different types of reproduction with normal prices. Next it was studied how the demand figures changed when the price of *one* reproduction type at a time was increased or decreased. In Table 2 each figure is a result of a separate simulation. To produce, for example, the upper left corner figure the price of printing was increased by 50 % from the normal level while the rest of the reproduction types had the normal price level. Figure -14 in the table is the *relative* change in the demand of printing in the primary and secondary levels. The corresponding price elasticity figure would be $-0.14/0.5 = -0.28$. The demand of printing is far less sensitive to the 50 % price change than the demands of the two other types of reproduction. It should be noted that if the 50 % reduction in normal price was realistic even primary and secondary schools would increasingly prefer e-mail and intranet delivery.

With printing, the 50 % rise in price affected (in absolute terms) the relative demand more than a 50 % price fall. This was the case also with “copying material into own presentation” as can be seen in Table 2. As for the intranet there is a remarkable change in demand caused by a 50 % price fall. It should be noted that reactions to the price changes in printing and “copying into own presentation” are in harmony with prospect theory (Tversky & Kahneman, 1991) of human behavior. According to that theory an increase in price from a reference level is a “loss” and leads to “displeasure” greater in absolute terms than the “pleasure” caused by a price decrease of similar size. Why intranet behaves in a different way is a matter of further consideration.

Table 2

Summary of simulated demand changes (%) when the price of one reproduction type is changed at a time while the rest of the reproduction type prices remain on the normal level. Different user groups.

	<i>Primary and secondary school, N = 451</i>	<i>Universities, N = 442</i>
Printing, price rise 50 %	-14	-20
Printing, price fall 50 %	11	14
Copying into own presentation, price rise 50 %	-38	-23
Copying into own presentation, price fall 50 %	23	21
Intranet distribution, rise 50 %	-16	-22
Intranet distribution, price fall 50 %	71	27

The price considerations with commercial internet material are very similar. For both of the user groups a price fall of printing does not significantly increase its demand but a 50 % price rise decreases its demand by 20 per cent. With “copying into own presentation” in the primary and secondary levels the effect of a 50 % price rise and fall on demand is symmetric the absolute value being 29 %. The same is true in universities where the change is 19 %. However, on the primary and secondary levels a 50 % price fall of intranet increases demand by 81 % whereas a 50 % price rise causes a decrease of 37 %.

4. Discussion

The results of the study showed which website contents and types of reproduction were preferred by teachers on the different levels of education. Primary and secondary schools preferred printing but for the university teachers the most preferred type of use was “copying into own presentation”. In addition, university teachers valued more the possibility to deliver the copy material via intranet and e-mail. When the three alternative ways to reproduce material were considered with normal prices the relative demand for intranet and e-mail delivery was for university teachers 23 % and for primary and secondary school teachers 12 %.

We discovered that how the prices affected teacher preferences was dependent on the type of reproduction. The price changes from the reference price level affected the demand much less in printing than “intranet and e-mail distribution”.

Teachers must be able to reproduce and deliver internet material to meet the requirements of modern information society. In the absence of legal production unauthorized copying of internet material takes place. In music industry, when the internet distribution started to grow, initially the intellectual property rights holders attempted to prohibit it by legal actions (Levine, Dato-on, & Rhee, 2005; Hill, 2007). Nowadays, legal commercial music trading sites have turned the music industry to growth (McGuire, 2004).

It has turned out that there exist roughly three alternatives to arrange the legal use of Internet material in education: to prohibit the use of their material, to allow free or some use it or to provide legal services to distribute the material. The last alternative includes also the sales of the material by an agent as well as a collective license. The reported study results provide important information on the preferred reproduction types as well as price attitudes for the copyright owners, teachers and authorities. After the publication of the study discussions on how to arrange the legal use of “copying into own presentation” were initiated. The study not only showed the status of the material use and immediate licensing needs but provided a platform for discussion.

Conclusions

In the field of education, published information on what kinds of Internet material teachers want to use, what their reproduction preferences are and what are the teachers’ attitudes towards price cannot be found. In this paper we describe such a study producing information in Finland with a representative sample of teachers. The educational institutions’ practices in the distribution and reproduction of material are no minor factor in the adoption and development of information technology culture in a society. Educational institutes are among the most important socialization agents; the time spent in them is remarkable, they are part of everybody’s life and they provide a model for life. The most daring forecasts see every student with a laptop of their own in a few years. It will also be interesting to see how the increasing digital reproduction will change the material types. Are graphs and pictures taking over the texts, are we going to see a switch from textbooks to articles in universities?

In education the volume of reproduction needed is substantial. Moreover on the elementary education levels the future citizens adopt the skills of information technology indicating that the arrangements in education have remarkable and long-term effects.

The studies on teacher benefits and preferences in the continuously changing educational environment are few if non-existing. With this paper we wish to highlight the value of such studies.

Appendix A. The attributes and their levels included in the research: free Internet material

Website content	Type of reproduction	Price
1. Publishers' open educational material websites	1. Printing/copying to students	1. 4 euros per year / student, <i>when type of reproduction is 1</i>
2. Educational material by educational institutions and educational administration	2. Copying into own presentation, e.g. Power Point	2. 6 euros per year / student, <i>when type of reproduction is 2</i>
3. News; e.g. articles and websites	3. Delivery to students in school Intranet or email	3. 10 euros per year / student, <i>when type of reproduction is 3</i>
4. Scientific material from universities and research institutes		
5. Pictures; photographs, drawings, maps		
6. Communications of companies and public administration. Instructions, product and service information		

Appendix B. The relative demand of different website types in free Internet material. Different user groups

<i>Website content</i>	<i>Primary and secondary school, N = 451</i>	<i>Universities, N = 442</i>
1. Publishers' open educational material websites	35	17
2. Educational material by educational institutions and educational administration	23	12
3. News; e.g. articles and websites	16	12
4. Scientific material from universities and research institutes	5	42
5. Pictures; photographs, drawings, maps	18	9
6. Communications of companies and public administration. Instructions, product and service information	3	8

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