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Josep Valor  
*IESE Business School*

Sandra Sieber  
*IESE Business School*

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## Uses and Attitudes of Young People toward Technology and Mobile Telephony

Sandra Sieber, Josep Valor Sabatier

IESE Business School, Spain  
Sieber@iese.edu, Valor@iese.edu

### Abstract

*This paper aims at showing how young people are developing new and innovative ways of interacting using technology. Previous literature shows that technology adoption does not only depend on the technology per-se, but also on situational and contextual issues. Regarding young people, mobile telephony has been claimed to change their lifestyles, although only scarce empirical evidence exists. We have conducted an empirical study in which we first analyze the existence of difference in technology adoption, acquisition, and usage of technology and mobile telephony of young people in general and those that are online, finding that there are some significant differences in some dimensions. Next, we carried out the same analysis differentiating between those people that assess themselves as technology savvy and technology inexperts, finding that their patterns of mobile phone usage vary significantly along all analyzed dimensions*

### 1. Introduction

New information and communication technologies are having a profound impact on business and society. Regardless of one's ideological position toward technology, it is changing the ways in which we coordinate everyday life, in which youth interact, in which business is done, and the ways by which we attain and maintain contact with others.

In addition, it has been widely claimed (Tapscott, 1998; Chu, 1997) that new technologies are particularly impacting the younger generations, fundamentally changing their lifestyle. Both the Internet and mobile telephony offer new ways of expressing themselves, and existing relationships of onground reality can be newly created in online reality, as described by Chu (1997) in her exploration of youth zines. This in turn influences onground activities and interactions. In this way, Tapscott (1998) claims that the "net generation or N-Gen which is growing up in a digital environment, is developing new ways of learning, new language and new values. As he point out

“rather than losing social skills, N-Geners are actually developing these skills at an earlier age than their parents’ generation. It’s not just a new toy in the home to share with friends and siblings, but the N-Generation children have a new medium to reach out beyond the immediate world, to experience and to engage in play, learning, and overall social intercourse. Digital kids are learning precisely the social skills which will be required for effective interaction in the digital economy. They are learning about peer relationships, about teamwork, about being critical, about how to have fun online, about friendships across geographies, about standing up for what they think, and about how to effectively communicate their ideas.” (p.107)

As an example, SMS has grown steadily in Europe since its introduction in the mid-1990s, when the youth market discovered that they could send messages to each other anytime and anywhere. Actually, when the service was originally made available, most of the operators were unsure of who would use it, how to market it, and how to charge for it. Young people started exploding the service before the operators could respond, hence being left with a self-educated market forcing them to respond.

Youth tend to be early adopters of technology, not only in Europe but also in the US and Japan (inphomatch, 2001), increasing our understanding of youth behaviour and attitudes toward technology is therefore not only important from a societal point of view, but the identification of the needs of the younger generation will also be critical to understand new uses of technology in society, which in turn will allow new business opportunities to emerge.

On the other hand, technology has often been conceived as deterministic force that shapes individuals’ and organizational lives, allowing to do things in better and faster ways, as well as to do new things that one had not even thought about. Nevertheless, as recent research has shown, this technological determinism does not take into account the intertwininess of technology and its context, as well as its subsequent evolution over time (Suchman, 2000). In this sense, technology has been conceived from a structuration theory point of view, showing how it may help in structuring processes (Barley, 1986) or computer-supported collaborative work (DeSanctis and Poole, 1994). As Orlikowski (1992) coins it, there is a “duality of technology”, in which human action and the social context in which this action takes place shape technology, whereas simultaneously technology influences human actions and social structures. Still, and even more, the technology itself can be perceived in different ways (Orlikowski, 1996; MacKenzie and Wajcman, 1999), and there is a fundamental difference between the technology per se and the practical use of technology.<sup>1</sup>

This paper aims at showing how young people are developing new and innovative ways of interacting using technology. We will also study how the technological background and exposure to technology of young people and the ways in which they acquire new knowledge about technologies influences the ways in which they use technology for day-to-day communication. In particular, we analyze how the exposure to Internet influences not only their overall technological knowledge, but also the ways they use one particular technology: mobile telephony.

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<sup>1</sup> This difference has also been labeled as technology-as-artifact and technology-in-practice (Orlikowski, 2000)

## 2. Literature Review

The popular press is full of information about the adoption of mobile telephony, as well as with anecdotal commentary about the impact of mobile telephony on people's lifestyle. Mobile communications are exploding all over the globe, as some of the news collected by Mobileyouth.org show. In September 2002, more than 1 billion SMS messages were sent in the US. On New Years Eve, Italy sent 150 million and the UK over 100 million text greetings. In Austria 91% of the 15-24 year old own a mobile phone at the end of 2002. On January 16, 2003 Lufthansa started the trial of its new FlyNet program of wireless Internet access in transoceanic flights, an industry primer.

The mobile phone is increasingly perceived as a multi-purpose device (Hulme and Peters, 2001) that has a series of social connotations that are reshaping our ways of interactions (Brown, Green and Harper, 2001) Aside of being a communication tool through voice telephony and SMS text messaging, it is an entertainment device through games, a locational device, an information tool, an alarm clock, and an agenda and address book. In this way, the mobile phone covers different needs and motivations (Lin, 1996) of the customer. Some of these are new, and had not traditionally been sought from fixed telephony. As Leung and Wei (2000) found, mobile telephony does not only provide the obvious enhancement of mobility, but also six additional gratifications of the mobile phone are fashion/status, affection/sociability, relaxation, immediate access, instrumentality, and reassurance. Still, the degree to which these objectives are accomplished varies depending on the *culture of interaction* (Sacher and Margolis, 2000), which is shaped by the concepts and protocols that exist in a given culture or subculture

Still, few empirical research studies have been conducted about the social adoption of mobile services (three exceptions are the studies of Hinds and Kiesler, 1995, Manning, 1996, and Green, Harper, Murtagh and Cooper, 2001), and very scarce evidence exists about the particularities of mobile telephony adoption of young people. Taylor and Harper (2002) show how mobile telephony mediates and gives new forms and meanings to a very ancient social practice, gift-giving, among teenage mobile phone users. Using ethnographic techniques, they show that mobile phones provide teenagers with a means of exchanging tangible objects, in forms of SMS messages, which embody shared meanings, thus providing them with new ways of sustaining their relationships.

On the other hand, both businesses and the popular press have devoted wide attention to the adoption of mobile phones and SMS messaging by young people. In this way Siemens conducted a Mobile Lifestyle Survey in the Asia region in 2001, reported similar findings, showing new ways of behaving of the Filipino youth. They used their phone not only to keep in touch via voice or SMS messaging, but as well to exchange jokes (89%) or to cheat during exams (17%). Still, cultural and technological differences matter. In this way, in a qualitative study carried out by mobilethink (2001), it has been found that there are significant differences of mobile phone usage and especially text messaging between teens (age13-15) and young adults (age 18-22). While teens seem to be more lifestyle driven and are more cost conscious just looking for simple phones that are easy to use and offer cheap calls and SMS, young adults are looking for more efficiency driven applications. Ananova (2001) put emphasis on the perceived importance of mobile phones for young people, showing that in the UK more than 82% of 14-16 year-olds own a mobile phone, conceiving it as a fashion statement, therefore changing the cover of handsets and ring-tones.

Nevertheless, most of these affirmations are of a speculative nature, based on some sporadic observations. Other studies have adopted an exploratory, mostly ethnographic approach, which has allowed increasing the comprehension of this emergent phenomenon. Still, little quantitative empirical evidence exists about how technology

adoption and literacy influences the use of mobile telephony among young people, and at the current state of research, we aim at validating some of these insights.

### **3. Research Design and Methodology**

We wanted to investigate whether technological knowledge has any bearing in the way youngsters use mobile telephony in all its dimensions: voice, SMS, games, etc. A two-step approach was adopted for the empirical study. As we wanted to find out if the adoption and uses of mobile telephony varied according to the previous degree of technology expertise, we decided to differentiate among those young people that are intensive users of the Internet, and those that are not. We assumed that Internet users had a higher level of technological expertise than people chosen randomly on the street.

We conducted 156 structured closed interviews with young people aged between 14 and 22. The number of interviews in each two-year bracket was proportional to the population census. We chose this age span to be able to analyze both the so-called “teens” (14-18) and “young adults” (19-22). Interviewees were purposefully chosen among the overall population of young people in Catalonia, Spain, in representative schools and shopping malls, spanning both the Barcelona metropolitan area and the surrounding less industrial belt. Interviews were conducted in August and September of 2002. In each interview we asked questions about technology and mobile telephony, including the following dimensions:

Technology:

- Self-assessed level of technology knowledge,
- Ways in which this knowledge had been acquired
- How do they get informed about technology news

Mobile telephony:

- Ownership of a mobile phone
- Main uses of the mobile phone
- Who influenced the decision to adopt the technology
- What services are used and their relative importance, both voice and non-voice

Afterward, an online survey with identical questions was conducted between October 15 and the end of November 30, 2002. Banners and the corresponding links were published in the most popular sites for the targeted audience in Spain (Portalmix, Lycos). By responding the survey, participants entered a raffle of a top-of-the-line multimedia G 2.5 mobile phone. As a result, 1274 valid responses were collected, which, when estimating proportions, resulted in a 2,7% error margin at a 95% level of confidence.

Questions referring to the relative use of different services and their importance were asked in textual form, like from very high to very low, and not using a 1-5 Likert scale. We did not want to make the assumption that a reply of “Very High” (a 5) was 5 times more valuable than a “Very Low” (a 1) and 1.7 times better than an “Average” (a 3)

reply. This decision forced us to compare the results of the different cohorts using contingency tables and Chi-square test of independence<sup>2</sup>.

The research was designed establishing six hypotheses:

- H1: The level of (self assessed) technological knowledge is different in the Internet respondents than in the off-line interviewees.
- H2a: The primary source of technological knowledge is different in the two groups.
- H2b: The primary source of technology news is different in the two groups.
- H3: Mobile phone ownership is different in the Internet cohort than in the off-line respondent set
- H4: The prescriptors of the purchase are different in the two groups
- H5a: The pattern of use of voice communication is different in the two groups
- H5b: The pattern of use of SMS is different in the two groups
- H5c: The pattern of use of games is different in the two groups
- H5d: The pattern of use of news by SMS is different in the two groups
- H5e: The pattern of use of calendar features is different in the two groups
- H5f: The pattern of use of Internet access is different in the two groups
- H6: The relative attractiveness of the different mobile services is different in two groups

The results of the interviews and online survey were first analyzed separately. Next, we started a comparison to assess the eventual existence of differences among offline interviews and the online surveys. As Spain is a country with very limited Internet readiness of the population, we considered that we could use Internet usage as a proxy for early technology adapters. Finally, we analyzed data comparing young people who consider themselves technology savvy and those who consider themselves less knowledgeable looking for significant differences on the adoption and use of mobile telephony.

## **4. Results<sup>3</sup>:**

### **4.1 Comparison of Results between Off-line and On-line Survey**

Both the off-line interviews and online surveys show that young people of both samples consider themselves technologically savvy rather than ignorant. The comparison of both samples shows that our first hypothesis of significant differences in self-assessed knowledge can be accepted at a 95% confidence level (Table 1).

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<sup>2</sup> Contingency tables are used to test dependence between multinomial data classified on two scales. The actual statistic computed is the Chi-square statistic, and the result of the test is a “p” value that specifies the probability that the two variables being in fact dependent, that is, that knowing the value of one variable provides us with some indication of the value of the other. “p” values of less than 0.05 indicate that we can reject the hypothesis of independence with 95% confidence.

<sup>3</sup> In all statistical tests, we have marked (\*) when significance is at the 95% level, (\*\*) at the 99%, and (+) when differences are not statically significant.

**Table 1: Self-assessed Level of Technology Knowledge**

	On-line survey	Off-line interviews
Very low	1%	2%
Low	7%	8%
Medium	54%	48%
High	31%	28%
Very high	7%	14%

Chi-square                    11,16  
 p                                    0,025 \*

Our second hypothesis was the existence of differences in the way people acquire technological knowledge and in which they know about new technologies. The chi-square test shows that the differences are not significant and both hypothesis 2a and 2b have to be rejected (see Table 2).

**Table 2a: Primary Sources of Technology Knowledge Acquisition**

Acquisition of new technology knowledge

	On-line survey	Off-line interviews
Self-learning	51%	52%
Structured courses / school	21%	28%
Friend	6%	7%
Browsing Internet	15%	9%
Books or specialized magazines	3%	2%
Other	4%	3%

Chi-square                    8,21  
 p                                    0,116 (non significative)

**Table 2b: Primary Sources of Technology News Acquisition**

How do you get aware about new technologies

	Online survey	Off-line interview
Banners	1%	4%
Advertising emails	5%	7%
Browsing the Web	81%	55%
Pop ups	5%	15%
Specialized press	2%	1%
Others	7%	18%

chi-square                    66,33  
 p                                    5,95E-13 \*\*

Regarding mobile phone ownership, almost the same proportion of young people had cell-phones, at 89% and 88% respectively for online and offline respondents. No differences could be found regarding the prescriptors either (Table 3).

**Table 3: Mobile Phone Purchase Prescriptors**

	On-line survey	Off-line interviews
Friends	38%	29%
Nobody prescribes	29%	35%
Parents	18%	16%
Advertising	3%	0%
Company	1%	7%
Teachers / Professors	1%	1%
Others	7%	8%
No response	4%	3%

chi-square 29,92  
 p 9,816E-05 \*\*

Finally, regarding the use and attractiveness of mobile phones, some differences can be reported. Different uses have been found for voice, SMS, calendar, and mobile Internet. No statistical relevant differences were found for games and news. The results of the test are shown in Appendix 1.

**4.2 Comparison of Results between High Technology and Low Technology Expertise Levels in the On-line Cohort**

In a second analysis we set up contingency tables between technology-savvy and non-technology literates, and compared then using chi-square tests. To do this, we group together those responses that considered themselves as having “very high” and “high” technological knowledge, as well as those that considered themselves having “very poor” and “poor” technological knowledge, thus ending up with three categories. In the tables below, we label these categories “High”, “Average” and “Low.” The statistical analysis showed that we got statistically relevant differences in almost all categories.

Regarding the acquisition of new knowledge and the sources of information about new technologies (see Table 4) we see that self-instruction is significantly higher for the technology savvy that from the other two groups, that are taught by friends in a much higher proportion than the first group. The Web is the primary source of technology news for all three groups, but with higher weight as the respondents consider themselves more knowledgeable.

**Table 4: Acquisition of New Knowledge and Technology Information**

How do you get aware about new technologies?

	High	Average	Low
Banners	1%	1%	2%
Adverising emails	4%	6%	5%
Browsing the WEB	81%	82%	68%
Others	4%	5%	14%
Pop ups	2%	2%	4%
Specialized press	9%	5%	7%

**Chi-square** **38,281**  
**p** **3E-05 \*\***

Acquisition of new technology knowledge

	High	Average	Low
Self-learning	55%	48%	48%
Structured courses / school	24%	20%	11%
Friend	3%	7%	14%
Browsing the Internet	11%	18%	20%
Other	3%	4%	6%
Books or specialized magazines	4%	3%	1%

**Chi-square** **43,937**  
**p** **3E-06 \*\***

Regarding the prescription of mobile technology, the differences are statistically significant at the 95% level (Hypothesis 4 accepted, see Table 5) and basically due to the high proportion of knowledgeable respondents that use no advice 34% versus 21% from people with low knowledge. It is also interesting to note the extremely low percentage of youngsters stating that they were advised by advertising: 2 to 3%. This self-stated low impact of advertising is in itself peculiar and should be put in the context of the 34% of knowledgeable respondents that claim that they take advise from nobody for their technology purchases.

**Table 5: Prescriptors for Adoption of Mobile Phones**

Prescriptors

	High	Average	Low
Friends	36%	38%	37%
Empolyer	2%	1%	0%
Nobody	34%	26%	21%
Don't know / No answer	2%	5%	5%
Others	7%	7%	5%
Professors	1%	1%	2%
Advertising	3%	3%	2%
Parents	15%	18%	29%

**Chi-square** **23,987**  
**p** **0,046 \***

Regarding the tests of mobile services use, the results are shown in the tables in Appendix 2. In summary, all uses are higher in the high knowledge group, but the statistically significant differences are in SMS, Games, Calendar, and Internet Access. Traditional voice communication and Internet Access are not statically different.

## **5. Discussion**

The results of our analysis show that both being online on the Internet and the self-assessed perception of technology savviness affect the ways young people use and adopt technology in general, and mobile telephony in particular.

The first part of our results show that significant differences exist among young people that are using Internet and the general young population regarding their self-assessment of knowledge expertise (H1 accepted). Nevertheless, no significant differences can be reported regarding the ways in which young people acquire new technology knowledge, although Internet does change the way young people get aware of new technologies (H2a rejected, H2b accepted). In this sense, online young people consider themselves more knowledgeable about technologies, and the Internet increases their awareness about news in the technology arena, although it is not changing the way in which people learn about these technologies. Therefore, it seems that the Internet is more an information seeking tool than fundamentally affecting learning attitudes of young people. Nevertheless, online young people do show a different adoption (H4 accepted), usage (H5a, H5b, H5e, H5f accepted) and value pattern of mobile telephony in a series of dimensions. In this sense, online youngsters use mobile telephony for voice more often, send more SMS messages, and do use the calendar function of the handset, although the uses for games and news reception are low and similar in both cohorts.

The second part of the analysis shows even stronger differences among technology savvy and technology inexperienced young people, as all hypotheses can be accepted. In this way, while all youngsters rely on self-learning for the acquisition of new technology knowledge, young people with high technology expertise rely more in self instruction and they combine it with structured courses, while those youngsters with low expertise adopt a more unstructured approach to it, combining it with Internet browsing. Obviously our research does not show which is the cause and which the effect, of more knowledgeable people being the heavier users of structured training. Also, browsing the web is the preferred mode of getting awareness about new technologies, but low technology knowledgeable youngsters combine it with getting opinions from others. Regarding the ownership of mobile phones, no significant differences exist, and it can be said that the mobile phone is not considered to be a technological tool, as we could not find any differences in non of our tests. Nevertheless, young people do rely on different prescriptors, with more technology knowledgeable people relying either on friends or on themselves, while those young people with low technology knowledge also rely very frequently on the opinion of their parents. It is noticeable that advertising has only a very small impact (2-3%) on mobile acquisition decisions of any youngster. Still, usage among different groups differs, and high technology youngsters use their mobile phones more frequent for all activities, and especially for SMS, games and mobile Internet. Thus, while young people with low technology knowledge consider the mobile mainly as a communication tool, technology-savvies also use it for entertainment, information gathering and organizing purposes.

## 6. Conclusions and Further Research

In this research we have contributed empirical evidence that support some of the previous theoretical developments and insights from qualitative research. In this way, we have shown that the adoption of technology does not depend only on technological knowledge, but also on the overall environment of young people, as young people in Spain adopt mobile phones regardless of their technology expertise or the influence of advertising. Nevertheless, usage of the phone does vary depending on the technology savviness of each youngster, and only those young people with high technology knowledge conceive their mobile phone as a multi-purpose device, as suggested by Hulmes and Peters (2001), while it is reshaping the ways of interaction and lifestyle of some youngsters (Leung and Wei, 2000), as well as covering different needs and motivations (Lin, 1996).

Still, more research is needed, and further research will consist in the analysis of differences between teens and young adults, as well as the examination of possible gender differences. Also, we will need to relate our findings to the overall Internet behaviour of young people and analyze in some way the possible effect of self-selection bias in the online survey.

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**Appendix 1 – Comparison of Different Intensity of Use of Various Mobile Services by Online and Offline Respondants**

	Online survey	Off-line interviews
Many times a day	63%	39%
Almost all days	27%	39%
Once a week	5%	9%
Around twice a month	2%	4%
Once a month	1%	2%
Never or almost never	1%	4%
No response	1%	3%

chisquare 36,42  
 p 2,2876E-06 \*\*

Voice usage

SMS usage

	Online survey	Off-line interviews
Many times every day	63%	39%
Almost every day	27%	39%
Two messages per week	5%	9%
Two messages per week	2%	4%
One message per week	1%	2%
Never or almost never	1%	4%
No response	1%	3%

chi-square 36,42  
 p 2,288E-06 \*\*

Games usage

	Online survey	Off-line interviews
Many times a day	15%	15%
Almost every day	17%	15%
Once a week	15%	14%
Around twice a month	10%	7%
Once a month	9%	7%
Never or almost never	30%	34%
No response	4%	9%

chi-square 9,06  
 p 0,17 (non-significative)

News via SMS

	Online survey	Off-line interviews
Many times a day	12%	16%
Almost every day	11%	7%
Once a week	8%	10%
Around twice a month	10%	5%
Once a month	8%	9%
Never or almost never	45%	43%
No response	7%	9%

chi-square 7,9  
 p 0,245 (non-significative)

Calendar usage

	Online survey	Off-line interviews
Many times a day	42%	23%
Almost all days	21%	22%
Once a week	9%	11%
Around twice a month	4%	4%
Once a month	3%	7%
Never or almost never	16%	23%
No response	5%	10%

chi-square 28,07  
 p 9,1153E-05

Use of Mobile Internet

	Online survey	Off-line interviews
Many times a day	7%	7%
Almost all days	7%	2%
Once a week	4%	4%
Around twice a month	5%	5%
Once a month	7%	12%
Never or almost never	57%	51%
No response	13%	19%

chi-square 12,2  
 p 0,058 +

**Appendix 2 – Uses of Mobile Service by the High, Average, and Low Technologically Savvy Youngsters**

Voice Calls

	High	Average	Low
Many times a day	34%	26%	25%
Amost every day	32%	33%	24%
Once a week	18%	21%	20%
About twice a month	8%	12%	11%
Once a month	4%	3%	9%
Never or almost never	2%	4%	7%
No response	2%	2%	3%

**Chi-square** 26,663  
**p** 0,0213 +

Use of SMSs

	High	Average	Low
Many times a day	66%	63%	52%
Amost every day	26%	28%	30%
Once a week	4%	5%	5%
About twice a month	2%	1%	2%
Once a month	0%	1%	3%
Never or almost never	0%	1%	5%
No response	2%	1%	3%

**Chi-square** 33,668  
**p** 0,0023 \*\*

Use of Games

	High	Average	Low
Many times a day	17%	14%	13%
Amost every day	14%	19%	13%
Once a week	18%	13%	14%
About twice a month	11%	10%	3%
Once a month	9%	9%	10%
Never or almost never	28%	29%	40%
No response	3%	5%	7%

**Chi-square** 21,261  
**p** 0,0951 \*\*

News by SMS

	High	Average	Low
Many times a day	14%	10%	10%
Almost every day	12%	10%	9%
Once a week	10%	8%	6%
About twice a month	11%	9%	7%
Once a month	9%	7%	6%
Never or almost never	39%	48%	53%
No response	5%	8%	9%

**Chi-square** 19,441  
**p** 0,1488 +

Calendar

	High	Average	Low
Many times a day	46%	40%	32%
Almost every day	20%	23%	16%
Once a week	9%	9%	10%
About twice a month	5%	4%	2%
Once a month	2%	3%	3%
Never or almost never	14%	15%	26%
No response	3%	6%	9%

**Chi-square** 22,179  
**p** 0,075 \*

Mobile Internet

	High	Average	Low
Many times a day	8%	7%	5%
Almost every day	6%	8%	2%
Once a week	5%	4%	6%
About twice a month	7%	3%	5%
Once a month	10%	6%	2%
Never or almost never	53%	60%	64%
No response	11%	14%	16%

**Chi-square** 32,874  
**p** 0,003 \*\*