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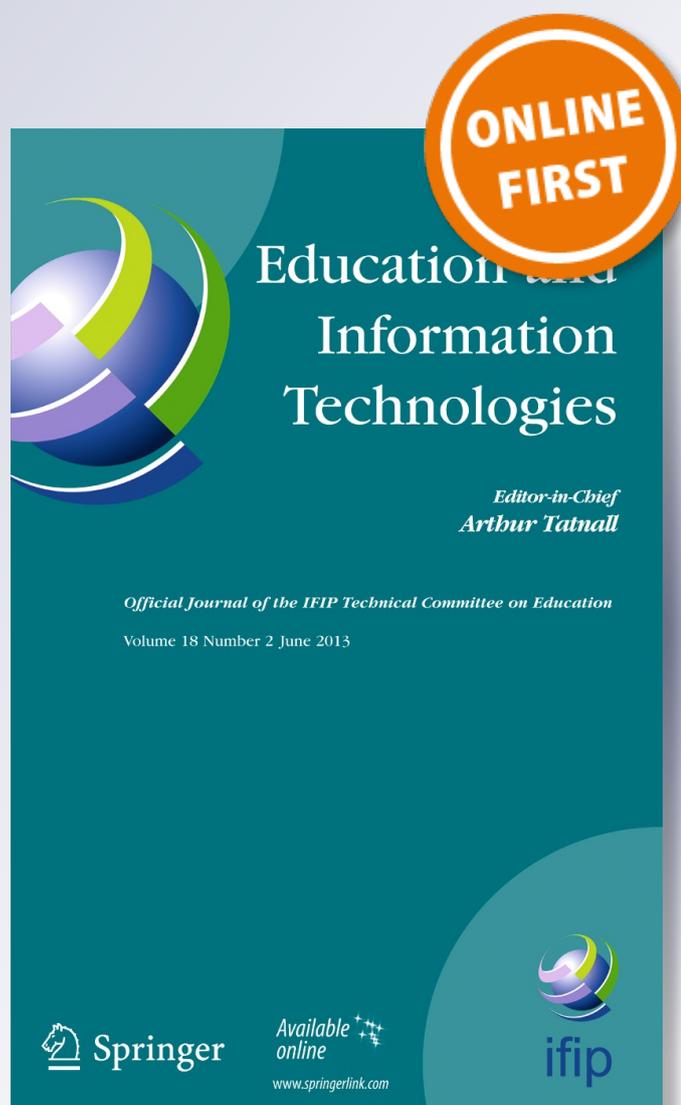
Education and Information Technologies

The Official Journal of the IFIP Technical Committee on Education

ISSN 1360-2357

Educ Inf Technol

DOI 10.1007/s10639-013-9258-8



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Technology and adolescents: Perspectives on the things to come

Raul L. Katz · Max Felix · Madlen Gubernick

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Abstract Assuming that, given the processes of technology diffusion, adolescent behavior forecasts future consumption of digital information, it would seem pertinent to study the characteristics of teenager technology use. This research asks: What are the key patterns regarding the use of technology platforms by teenagers? Is technology usage among teenagers shaped by schools' disparate teaching philosophies and cultures? How is technology usage impacting the consumption of traditional print media? A survey designed to determine how high school students use technology was administered at a private boarding school in New Hampshire and a public school in New York. The research concluded that individuals' residing environment and context shape ICT adoption. School culture and geographic context drive behavioral technology usage patterns. Furthermore, consumption of information appears to be guided by a principle of complementarity. However, technology substitution should

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not be discarded. Finally, school culture incorporating and promoting technology use may contribute positively to knowledge acquisition, although technology adoption without controls could negatively impact the teaching experience. While directionally valid, the study results need to be validated by statistical research and case studies.

Keywords Information technology · Adolescent usage · Learning environment · Social media

1 Introduction

In 2008, Matthew Robson, a 15 year old high school intern at Morgan Stanley's London office spent a few days on assignment asking his friends about their media and communications habits. After informally surveying a number of his acquaintances, he prepared a report that the firm published on the Internet, causing a stir among technology investors. The report concluded:

- Online advertising is extremely annoying and pointless
- Teens cannot be bothered to read a newspaper
- They never buy CDs or use yellow pages and avoid paying for anything other than concerts or cinema tickets
- While cell phones are central to their social lives, teens avoid buying expensive handsets for fear of losing them
- Teens do not use mobile internet as it costs too much; they prefer game consoles (Xbox) for free chat
- In other words, they hate to pay for entertainment and communications
- Teens do not use Twitter because updating it from cell phones would use up credit better used to text friends

Two years later, the Kaiser Foundation published a report compiling the results of an annual tracking survey on technology use among teenagers in the United States. Its primary results, presented in Table 1, provided a glimpse at the increasing exposure of adolescents to information technology.

The research found that children between the ages of eight and eighteen spent 10:45 h per day interacting with media platforms, of which only 38 min were spent reading print material. They spent 29 % of the total 10:45 h multitasking (i.e. interacting with more than one technology at the same time), which meant that the time spent in front of a screen (be it television, computer, videogame console, or cellphone) amounted to 7:38 h per day. This number had been increasing year after year although some clear substitution patterns had started to emerge (e.g. print to digital, television to video content streaming).

Both Matthew Robson's memo and the Kaiser Foundation report demonstrate in both a qualitative and quantitative fashion the dramatic changes taking place in the pattern of adolescent information and entertainment content consumption. Considering that teenage behavior forecasts future mass-market changes in the consumption of digital information, it would seem pertinent to study in-depth

Table 1 Usage of technology (in terms of hours per day)

| | 1999 | 2004 | 2009 | Comments |
|----------------------|------|------|-------|---|
| TV content | 3:47 | 3:51 | 4:29 | The time watching TV is increasing in parallel to the exposure to PCs and cellphones |
| Music/audio | 1:48 | 1:44 | 2:31 | |
| Computer | 0:27 | 1:02 | 1:29 | 84 % have internet access at home |
| Video games | 0:26 | 0:49 | 1:13 | |
| Print | 0:43 | 0:43 | 0:38 | Total reading time is decreasing, although most of it is due to less newspapers and magazines |
| Movies | 0:18 | 0:25 | 0:25 | |
| Total media exposure | 7:29 | 8:33 | 10:45 | Biggest amount of time is clustered among 11–14 and African American/Hispanic youths |
| Multi-tasking factor | 16 % | 26 % | 29 % | |
| Total media use | 6:19 | 6:21 | 7:38 | |

Kaiser, Henry J. *“Daily Media Use Among Children and Teens Up Dramatically from Five Years Ago”*. Henry J Kaiser Foundation. (2010)

the characteristics of teenager technology use. The three main questions guiding this research were:

- What are the key patterns regarding the use of technology platforms by teenagers? This issue covered questions about the number of devices being utilized, their frequency and intensity of usage, the purpose of use, choice of technology, and patterns of consumption (hours per day on weekdays and week-ends, modes of communication by time of day)
- Segmentation: what differences can we identify in the above if data is segmented by type of high school and, by inference, teaching styles, culture and values, social segmentation, and processes of knowledge transmission?
- Impact: is there anything we can stipulate about the potential impact technology usage is having on cognitive ability, and the relation to information consumption (e.g. multi-tasking)?

Underlying these questions are three hypotheses worth testing:

- The adoption and patterns of utilization of information technology are shaped by the cultural parameters that characterize the environment and context within which individuals reside. In other words, contrary to a presumed homogenization of consumption of information goods and communication patterns, individual and social behavior regarding information technology usage is segmented according to pre-existing conditions.
- Contrary to prevalent notions that indicate a substitution between information technologies (e.g. print by digital products, linear TV by over the top video streaming), consumption of information goods appears to be guided by a principle of complementarity. Following the cumulative media effects theory, the more intensely we consume digital goods, the more exposure we gain to print products.

- While social networks tend to address social needs (or so-called “failures”), their usage, even within highly segmented socio-demographic categories, tends to be highly group-specific.

To answer these questions, a survey was designed to determine how high school students use technology. The survey was then distributed at two Northeast schools: a private boarding school in Concord, New Hampshire, and a public school in Manhattan, New York.¹ This paper begins by reviewing the existing research on the topic and then proceeds to present the findings and analysis of results of the survey.

2 Theoretical background

An abundance of studies exists regarding teenagers’ use of digital technology, which refers to mobile phones, on the go devices, computers, televisions, and video game consoles. Further, traditional theory examines the relationship between the medium, culture, and personal interaction, all of which are supported by the findings in this paper.

In today’s world, media permeates nearly every aspect of society, no longer acting “simply [as] technologies that organizations, parties or individuals can choose to use—or not use—as they see fit” (Hjarvard 2008). Media now affects social interaction and dictates communication norms and practices in both the formal and informal settings, a phenomenon covered in the study of “mediatization.” Theorists now work to develop this concept to relate back to a social and cultural process. Relating back to Goffman’s 1959 work on social interaction, media allows users to 1) keep several social interactions going at the same time 2) optimize social interaction to their advantage 3) manage information to and from the participant (Goffman 1959).

Mediatization theorists have identified four ways in which media impact human interaction (Schulz 2004; Hjarvard 2008):

- 1) Extend human communication abilities in time and space
- 2) Substitute social activities that previously took place face-to-face
- 3) Instigate an amalgamation of activities (face-to-face combines with mediated communication)
- 4) Require actors in different sectors to adapt their behavior to accommodate the media’s valuations, formats, and routines

In much the same way that politicians have altered their comments to take future sound bytes into account, today’s teenagers must now write in 140 characters or less when on Twitter, for instance, or word their emails to adults differently than they would an IM to their peers (Schiano et al 2002), with the type of medium chosen affecting the impact of their message. After all, “the medium is the message” (McLuhan and Fiore 1967).

On point, the television presents certain ideas in a linear mode that is visually suitable, print allows for more complex argument than speech because the audience

¹ The survey is included in the appendix of a working paper that can be downloaded from <http://citi.columbia.edu>.

can absorb it more slowly, and the mobile phone makes communicating with multiple parties “on the move” a possibility (Hepp 2011). In this world, theories must view these different forms of media separately and not as a “single ‘media logic’” that assumes they all “operate in one direction, at the same speed, through a parallel mechanism and according to the same calculus of probability” (Couldry 2008). Similarly, mediatization theory also emphasizes the impact that the formatting of media has on interpersonal relations. On the other hand, critics assert that medium theory tends to overlook the potential for culture to shape technology development, stressing the need for mediatization theory to include empirical analysis and examination of specific processes and segments of the population (Krotz 2007; Hjarvard 2008).

While the Internet, like earlier examples of new media, contributes to generation and gender differences in every day culture, this difference is also a result of the combination of media culture, youth culture, and consumer culture. As with any new medium, the Internet has increased media use (Livingstone 2003; Stanger and Gridina 1999), thus impacting the way younger generations constructs their leisure time. Similarly, the introduction of the Internet has shaped teenagers’ view of other forms of media such as the TV, radio, and computer games.

Most of the research on teenager technology use deals with the number of platforms and the frequency/intensity of use in a combined fashion. For example, Gross (2004) sampled a group of over 200 Californian public school students determining that, not surprisingly, the majority (91 %) of teenagers use the Internet at least once a week, while 40 % to 65 % do so on a daily basis. In another study (Greenhow et al. 2009), over 50 % of teenagers owned a cell phone, a gaming console, a computer, and/or a portable gaming device. This, according to the author, allowed 94 % of teenagers to surf the Web, do research, and access social networking sites. Furthermore, 59 % of those teenagers using the Internet access it via a home computer, compared to 41 % who do it at school.

The growing popularity of social networking has come to define this generation’s technology use. Most teens engage in some form of social networking such as Facebook, the most popular social networking site, or Instant Messaging (IM), Twitter, and so forth. However, some young teenagers find social networking so overwhelming that they wish to disconnect and create direct relationships (Rideout and Saphir 2012). Over time, however, as teenage Facebook users narrow their “friends” lists, they tend to feel more comfortable with their profiles on the site and less nervous about strangers (Hampton et al. 2011). Many students have accounts on social networking sites; the majority comprises members of more than one site, and visits these sites multiple times throughout the day. Furthermore, they use social networking to communicate with people outside their direct circles. Sites such as Facebook are not used for direct communication, but more so for low responsive situations such as checking in with old friends as opposed to making plans with new ones (Coyle and Vaughn 2008).

Several patterns have emerged, demonstrating which type of devices teenagers use for specific situations and which devices teenagers tend to favor. For communications purposes, a study by Schiano et al. (2002) determined that teenagers prefer Instant Messaging (IM) to email when communicating amongst each other. When communicating with adults (teachers, family members, etc.), however, they use email. 90 %

of teenagers (Rideout and Saphir 2012) use some form of social media, with 75 % of this group having a social networking profile and 68 % texting on a daily basis. In addition to communication and networking facilitation, sites like Facebook are used for a variety of purposes.

On the other hand, research on video consumption indicates that teenagers watch less television, but spend more time online and utilize more Internet video streaming services (Offerman 2012; Seal-Wanner 2007). However, the trend toward relying on video streaming appears to be undergoing a reversal. Offerman (2012) also found that teens are more likely to sit through a linear TV program rather than enduring the intense advertising prevalent in many video-streaming sites (Offerman 2012).

Beyond the pattern of substitution between live TV and video streaming, research indicates a switch from print to video entertainment. The aforementioned Kaiser Foundation study indicated that the total time teenagers spent reading print media declined slightly, while the amount spent playing videogames increased by 50 % in the same period. Coincidentally, Vann (2012) found that teens that play video games on a daily basis spend 30 % less time reading than teens that do not play video games.

Many patterns exist in terms of how teens use technology due to the constant additions of new models and devices. As smartphone ownership increases, time spent on social networking sites increases as well. Similarly, multitasking becomes a more frequently adopted ability by teens as they use their smartphones to watch videos, access social networking sites, and also send text messages and place phone calls (Vahlberg 2012). Magazine and newspaper reading has become a less sought after activity among teens in the past 5 years. However, time spent reading books has increased (Vahlberg 2012). Live television continues to be the primary source for video, although streaming online video is becoming increasingly popular within the teen community (Children and parents 2011).

Beyond the substitution trends identified above, some studies point at the complementarity of technology platforms. For example, Lenhart et al. (2010a, b) discovered that teens that text more also call more and that individuals with social networking accounts use more technology. In addition to the aggregate trends reviewed above, several studies identify differences in teenage behavior across geographic, gender-based, and socio-demographic segments.

Multiple studies have attempted to identify those variables driving different technology usage patterns across teenagers. Research has examined the digital divide and access issues, but in some cases, it may be appropriate to consider the unequal *use* of the Internet amongst groups. For example, Gilbert et al. (2008) analyzed teenagers' usage within urban and rural settings, finding that individuals in rural environments are less likely to use social networking. The authors site geographic proximity to their peers as the driving factor. Coincidentally, a study by Koprowski (2006) pointed to limited accessibility (limited coverage, low quality of service) as the primary culprit behind limited social networking in rural areas. Part of this difference is likely due to the disparity in technology ownership. Rural teens must share a computer more often than teens in urban areas (80 % vs. 67 %), and urban and suburban teens are much more likely to own a smartphone (Madden et al. 2013).

Additionally, multiple studies have also highlighted gender-based differences in technology usage. While both genders tend to have equal access, there exists "considerable differences in the experience of use" (Schmidbauer and Löhr 1999; Thurlow

and McKay 2003). For example, Mazman (2011) determined that males use social networks to communicate and create new friendships, whereas females use them to maintain established friendships. Older studies (Chen 1990) found that boys were more likely to gravitate toward computer programming courses, but that there were no differences in use amongst students of the class regardless of gender. Later research showed that girls may be less willing to use technology, but more contemporary studies found that “although more boys report using computers in school than girls do, there were no sex differences in computer use outside school” (Thurlow and McKay 2003). As the digital divide decreases, “teenage girls and boys especially appear to make increasingly equal use of technologies like the internet.” At the same time, much research continues to highlight the differences in the *way* the genders use the Internet, with boys focusing on the technology itself and its “info-entertainment functions” like computer games or searching for information. Girls tend to care more about the interaction and communication opportunities. The Pew Internet Research Project concluded that females on average use their mobile phones much more than males, despite equal ownership (Madden et al. 2013). Further, girls are much more likely to access the Internet on these devices (29 % vs. 20 %). This trend becomes more significant with age, with 34 % of older teen girls primarily accessing the Internet from their mobile devices.

Finally, income also explains technology usage among teenagers. Murphy (2011) determined that 70 % of low-income families own a computer, compared to 92 % of average-income households. The author also determined that mobile phones are the main communication platform within low-income households while Greenhow et al. (2009) determined that low-income families on average own fewer devices. However, as mobile phones become more affordable and more ubiquitous, this difference has seen some decline. The 2013 Pew Internet report on teens and technology demonstrated that while teens with parents in the highest income bracket are more likely to own cellphones, teens living in households earning less than \$30,000 per year are nearly just as likely (39 % vs. 43 %) to own smartphones as those teens living in households earning more than \$75,000 per year (Madden et al. 2013). The increase in mobile phone ownership amongst all income groups likely contributes to higher Internet access rates, as teens in lower socioeconomic groups are as likely to access the Internet on these devices. Still, overall Internet use amongst teens continues to remain somewhat lower for teens in low-income households when looking at overall Internet use.

To sum up, while research has identified a number of consistent trends concerning the use of technology by teenagers, it has not yet addressed several areas. For example, while studies on social networking behavior have focused on typical patterns such as number of friends or frequency of access, “stalking,”² a widely acknowledged Facebook behavior, has not been as popular in recent studies. Additionally, segmentation studies have addressed demographic and geographic differences, but have not focused on different school environments, as reflective of different teaching philosophies. For example, no research has been conducted comparing students from public versus private institutions or boarding school students. When it comes to usage, very little research addresses the complementarity and/or

² “Stalking” is a term used to describe the action of visiting the profile of a Facebook friend who does not belong in the user’s close social circle.

substitution of different technologies. For example, how much is technology usage increasing in terms of frequency and intensity? Is any particular technology stimulating usage of others? What are the substitution patterns? Finally, partly due to the speed with which some technology usage trends are developing, areas such as streaming video online have not been widely discussed in the research. Many studies have compared live television to video on demand, which includes downloading content from the Internet. However, video on demand may also refer to purchasing a film via the television, a different mode of acquisition from video streaming. The idea of streaming television, live and previously recorded, is a new phenomenon within the teen community that has not yet been fully addressed.

3 Methodology

In order to address some of the issues discussed above, a study was launched to examine how teenagers of different socio economic backgrounds, geographic locations, age, and gender use technology. Technology, in this case, comprises all forms of social media and social networking, as well as television and computer use. These forms of technology are accessible through mobile phones, on the go devices such as e-readers and iPads, as well as on computers and television. The study specifically analyzed the use of Facebook, mobile phones, and online video on demand sites (such as Hulu and Netflix). The research was conducted through a survey of students from the Institute for Collaborative Education (ICE), a public middle and high school located in downtown Manhattan, as well as students from St. Paul's boarding school, located in Concord, New Hampshire.

3.1 Two different schools

The Institute of Collaborative Education (ICE), a public middle and high school located in downtown Manhattan, has 486 students, of which 251 are in high school.³ Students who attend ICE come from all five boroughs. The average ICE student may live in a small apartment with four other siblings in the Bronx, a brownstone in Brooklyn, a loft downtown, or a townhouse on the Upper East Side. There is no information on average household income for ICE students, but they tend to come from a wide range of social and economic environments. In fact, ICE is a relatively diverse community with 51 % of the student body being Caucasian, 21 % Hispanic, 10 % black, 5 % Asian, and 13 % other. The school has 90 faculty members. Founded in 1995, "the school's teaching philosophy (is) designed to give students the skills needed to be successful in college and beyond. ICE has developed a comfortable but academically stringent learning environment. Using rigorous custom-designed curriculum, (it) challenge(s) students with graduation requirements that surpass state Regents examination and commencement standards, supporting them as they develop a portfolio of their best work. (It) use(s) multi-grade, school-wide projects to explore essential questions that deal with social responsibility and justice, and the world

³ Only high school students from ICE were recorded and analyzed for the purpose of the study, however the demographics represent the school as a whole.

beyond our school doors". (Institute for Collaborative Education 2012). to any obstacle they encounter, allowing them to prioritize, multitask, observe and create.

The typical ICE student takes a 30-min subway ride from the family home to school and attends his first class at 8:30 in the morning. Once in school, he/she moves with the same group of less than 20 students to and from each class. Teachers, ranging in age, race, and education level, encourage group and project-based work, demanding intense use of the Internet, as well as reliance on Manhattan's urban environment. Students commonly text message throughout their classes and access Facebook and other applications via their smartphones or laptops while in class. Most teachers at ICE allow cell phone and computer use through lectures, discussions, and study hall periods. Advisory, ICE's homeroom equivalent, is a semi-weekly period within the school day designed to provide all students with the chance to socialize and/or study. Many students use advisory to access social networking sites. Students in both middle and high school may leave the school to purchase food from local stores during the lunch period, which is a social hour where many students will bring out their laptops at the local grocery or diner. Smartphones are in abundance throughout lunch and the school day.

ICE students have specific difficulties that are a product of the school's philosophy. They commonly lack the ability to focus due to the relaxed class environment. Their difficulties also include memorization, specifically in regards to studying, as well as "shutting down." The entirety of an ICE student's day is engaging with many aspects of technology. Similarly, students commonly feel that they are lacking vocabulary and basic grammar skills. Although taught to write *expressively*, students do not receive the necessary instruction to write *correctly*. The philosophy of the school remains that it is more important for students to say something meaningful than to say something grammatically correct.

St. Paul's is an Episcopal high school in Concord, NH that was founded in 1856. As an all boarding school, the entire student and faculty population lives on campus. There are 540 students from 35 states and 16 countries. St. Paul's student body is comprised of 38 % Black and Hispanic, with 18 % being international students. 36 % of students receive financial aid with the average grant of \$41,660 covering over 90 % of the tuition. Unlike ICE, classes in languages, math, and science are based on ability rather than age. The one exception is the humanities curriculum, a combination of English and History, which is taught by grade.

Although St. Paul's is only 5 min away from Concord, NH, students mainly make use of the resources at St. Paul's rather than go into town. Cell phones are discouraged; students may not use them during class and are not supposed to use them between classes either. There is also no wireless network coverage on campus, which further discourages cell phone use. The vast majority of students have their own laptops, which are permitted in some classes, although most students do not bring them to class. Technology is not frequently used in the classroom; most of the teaching is done traditionally with blackboards and textbooks. Although there are no policies on television viewing, most students do not watch television on a day-to-day basis. The only television sets are located in common areas, so they are exclusively used for group activities such as watching sports or movies.

St. Paul's focuses on academic ability and has high expectations for its students. There are many academic awards at the end of the year awarded for ability in a class as well as for grades, which help to encourage hard work. A C grade in any class will

make a student ineligible for any awards at the end of the year including graduation distinctions. To graduate, students must take 3 years of math, science, humanities, and a second language as well as a four-term arts requirement and one term in religious studies. Further, all students must participate in sports throughout their entire freshmen and sophomore years and for a combined two terms of their junior and senior years. The typical St. Paul's student takes five classes each term: math, science, a language, an elective or art class, and a humanities class. Humanities is a combination of English and history classes focusing more on concepts such as community or identity than typical courses that focus on literature and history.

The school day lasts from 8:00 am to 2:30 pm with a free hour for lunch. Classes typically are 1 h long, with extra time allotted for labs and presentations. Sports begin at 3:00 pm and end between 4:15 pm and 5:30 pm depending on Varsity, Junior Varsity, and non-competitive levels. After sports, dinner is served from 5:30 pm to 7:00 pm. 7:30 pm to 9:00 pm is referred to as study hour, but many groups such as choir, band, and interest groups have meetings during this time so this time is mostly unstructured. Check-in times vary with age; 9th graders must be in the dorm by 9:00 pm, 9:30 pm for 10th and 11th graders, and 10:00 pm for 12th graders. After check-in, students must stay in their dormitories but do not have to be in their rooms. Time after check-in is usually spent finishing homework and spending time with friends in the dormitory. There is no lights out time, but the Internet shuts off at 12:00 am.

In summary, research was conducted within two fairly different environments. To a large degree, both schools exhibit distinct student profiles. In addition, both environments exhibit different philosophies vis-à-vis the use of technology.

3.2 Hypotheses and methodology

These almost polar depictions of the two school environments present an interesting research question. Does the environment shape teenage behavior when it comes to technology, or does technology represent a behavioral constraint so strong that it can override any differences existing within the schools? In other words, is technology usage among teenagers being shaped by the schools' disparate teaching philosophies and cultures, resulting in distinct behavior by each group of students? Or is the influence of technology so strong that it acts as a homogenizing factor, overriding any intentional differences driven by the school's culture? (See Fig. 1).

Along these lines, how are teenagers reacting to the accelerated social deployment of information technologies? The term "technology trends" captures advances in introduction and adoption of information and communication technologies that enable the access of information and entertainment, as well as the creation and sharing of user generated content. In light of these trends, do teenagers undergo a process of substitution (e.g. print by digital products, linear TV by over the top video streaming) or is consumption of information technology guided by a principle of complementarity (in other words, intense reading would be correlated with intense internet use)? Related to the prior hypothesis, can we detect different substitution versus complementarity effects determined by the school culture? Similarly, can we detect different social network behavior across either socio-demographic segments or school cultures?

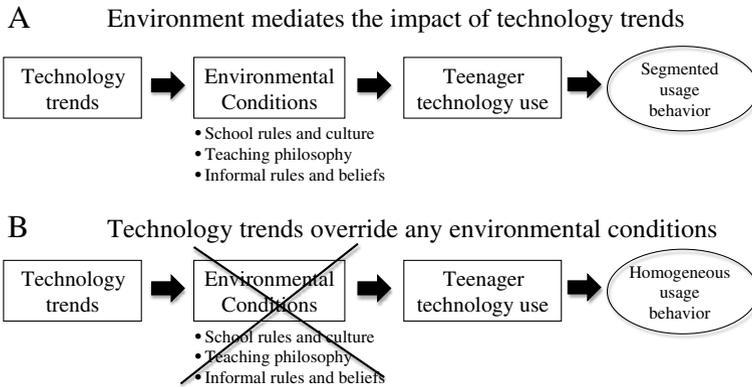


Fig. 1 Two alternative hypotheses

A free response survey that typically took 20 min to complete was developed. The survey asked the subject to describe the technologies they used, their frequency of use, and the pattern of utilization. Users also specified the amount of time they spent using technologies throughout their typical day:

- What kind of technology tools do you own?
- How do you use technology throughout a school day versus during the weekend?
- How do you use Facebook? How many of your “Facebook friends” are “real friends”?
- How do you pay for the technology you use and own?
- How much time do you spend on each technology?
- How do you watch television: streaming versus live?
- What are the most common sites and applications you access?

The purpose of the study was to understand the subject’s routine as well as the role technology played in each part of his day. Averages and percentages were calculated to compare the technology use between students of St. Paul’s and ICE as well as by gender, age, and socioeconomic grouping.

4 Results and discussion

Data collection yielded 165 completed surveys from 155 high school students and ten middle school students (only for ICE). 63 % of respondents were female, but the grade of respondents was equally represented across schools in the 9–11 cohort. Finally, 96.5 % of respondents were between the ages of 14 and 18.⁴

4.1 Technology adoption

The differences in technology adoption confirm the environmental impact hypothesis. In other words, the context in which teenagers live results in slightly different technology ownership (see Table 2).

⁴ See Tables 17, 18, and 19 in appendix.

Table 2 Percent of teenagers that own a technology device

| Device/platform | SPS | | ICE | | Total | |
|-----------------|-------|------------|-------|------------|-------|------------|
| | Total | Percentage | Total | Percentage | Total | Percentage |
| Cellphone | 89 | 91.4 % | 57 | 98.3 % | 146 | 94.2 % |
| PC | 96 | 99.1 % | 48 | 82.8 % | 144 | 92.9 % |
| Videogame | 40 | 44.8 % | 34 | 58.6 % | 74 | 47.7 % |
| Television | 48 | 55.8 % | 48 | 82.8 % | 96 | 61.9 % |
| Facebook user | 95 | 97.9 % | 51 | 87.9 % | 146 | 94.2 % |

Cell phones have not only become universal, but they are slowly becoming a necessity for teenagers and adults of all communities, therefore the fact that nearly all students at both schools own a cell phone is not of any surprise. The slight increase in ICE ownership in cell phones may be due to the urban community, making it virtually impossible, and unsafe, for a teenager not to own such a device. Similarly, due to their environment, St. Paul's students require their own individual computer while away at boarding school, whereas ICE students can use computers available at school or share with their family members. More ICE students own televisions in their bedroom (specified in the questionnaire) simply because they are allowed to do so. St. Paul's students share televisions in common rooms, and are not permitted to have their own television with cable access.

Furthermore, the boarding school schedule does not allow St. Paul's students much free time, explaining why ICE students are more likely to own game consoles (along with other technologies). Finally, the majority of students in both schools have a Facebook account, although the percentage of St. Paul's users is slightly higher than ICE, which could indicate that the social network plays a key role in meeting the socialization needs of boarding school students.

4.2 Technology usage

How often do teenagers use these devices? Are there patterns of frequency and intensity that can be identified? Or alternatively, do adolescents live in an "always on" context from which they rarely disconnect to conduct other activities, furthering multi-tasking patterns? In that context, are reported patterns providing a glimpse of a decline of time employed in other "non technology-based" knowledge gathering or entertainment activities (e.g. reading books)? Three findings are worth exploring in this regard. First, we will discuss the amount of time (per day and on weekends) that teenagers spend interacting with technology. Second, we will explore the extent to which book reading is being influenced by the time spent interacting with technology platforms. Third, we will present data regarding the use of texting in class (a widely discussed topic in current affairs).

Respondents spend on average 554.80 min (or 9.25 h) a day using technology devices during the week. While the data is not strictly comparable, some results are surprisingly different from those findings generated by the Kaiser Foundation's 2009 study (see Table 3).

Table 3 Minutes spent using technology devices: Kaiser Foundation versus this study (Weekdays)

| Device/Medium | Kaiser Foundation (2009) | This study (Week-days) (2012) |
|----------------|--------------------------|---------------------------------|
| Cellphone | – | 191.5 |
| PC | 89 | 279.5 (of which 88 on Facebook) |
| Videogame | 73 | 31.4 |
| Television | 269 | 52.4 |
| Music/audio | 151 | – |
| Print | 38 | – |
| Movies | 25 | – |
| Total exposure | 645 | 554.8 |

The most noticeable difference is the increase in time in front of a PC and the reduction of time spent watching TV. This finding is most likely the consequence of a shift of the primary video access point from television to the PC, resulting from Over The Top (downloading content from the Internet) applications. In addition, the increase of PC time allocation could be the result of the growing network effects of Facebook, comprising one-third of PC connected time, per our results. In addition, videogame playing in our study is less than half the number reported in the Kaiser study (73 min versus 31.4). Part of this difference could be explained by the fact that the segment of videogame players with highest usage pertains, according to Kaiser, to the lower socio-demographic groups, which are considerably underrepresented in our study. The other driver of reduction in videogame time could result from increasing popularity of PC-based gaming, particularly social network-based games such as Zynga.

Although the Kaiser study does not measure cellphone utilization, one could assume that a portion of its reported media consumption takes place on the cellphone. Nevertheless, our study clearly points out that the two prevalent access points to communications, information, and entertainment for teenagers are the cellphone and the PC. Our study also identifies some differences in usage patterns across schools and genders, which again confirm the environmental impact hypothesis (see Table 4).

ICE students on average use all technologies more frequently than do St. Paul's students. This is most likely a direct consequence of the school's approach to technology usage of intense embedding of platforms in the teaching experience, augmented by the pressure of the urban context. In fact, the primary driver of usage intensity between St. Paul's and ICE students is the cellphone. Secondary drivers of ICE's usage intensity are television viewing and videogame playing. On the other hand, PC usage (280.6 min at St. Paul's and 277.22 at ICE) and Facebook connectivity (85.97 min at St. Paul's and 91.51 at ICE) are similar across students in both schools.⁵

⁵ Frequency and allocation of time changes, as expected, during weekends only for the technologies where data was captured (see Table 12 in appendix). Total exposure to television and PC jumps on weekends, as expected. However, ICE students watch more than twice the amount of television than St. Paul's students do, and marginally use their computers more. Girls at ICE tend to watch more television than boys on weekends.

Table 4 Minutes spent using technology devices (Weekdays)

| Device | SPS | | | ICE | | | Total | | |
|---------------------|-------|-------|---------|-------|-------|---------|-------|-------|---------|
| | Boys | Girls | Average | Boys | Girls | Average | Boys | Girls | Average |
| Cellphone | 127.2 | 170.8 | 157 | 239.6 | 262.9 | 254.43 | 167.7 | 204.1 | 191.5 |
| PC | 275.3 | 283.4 | 280.6 | 271.7 | 280.7 | 277.22 | 274 | 282.4 | 279.5 |
| (Of which Facebook) | 80.3 | 89.0 | 85.97 | 90.33 | 92.06 | 91.51 | 83.9 | 90.1 | 88.0 |
| Videogame | 50 | 7.4 | 24.4 | 99.3 | 20.5 | 49.04 | 67.7 | 12.1 | 31.4 |
| Television | 53.1 | 13.8 | 27.6 | 116.3 | 86.0 | 96.5 | 75.9 | 39.9 | 52.4 |
| Total exposure | 505.6 | 475.4 | 489.6 | 726.9 | 650.1 | 677.19 | 585.3 | 538.5 | 554.8 |

Note: Facebook is included within PC time

| | | | |
|--|-----------------------|--|-------------------------|
| | Similar usage pattern | | Different usage pattern |
|--|-----------------------|--|-------------------------|

How about gender differences? Girls in both schools spend less overall time interacting with technology than boys. This difference in frequency is driven by a completely different usage pattern. While girls use both their cellphones and PCs more (in both schools), they spend less time playing videogames and watching TV than do boys. Facebook connectivity is fairly homogeneous across genders and schools. As a result, differences in frequency of technology usage are driven by a combination of school culture and gender, although social networking and PC usage remain similar across segments.

The time of day also influences technology usage patterns. Responses to the survey enabled a break down of technology use by time of day. For this purpose, four periods were defined:

- Before School: Time from waking up until first morning class
- During School: Once first morning class begins, through lunch, until last class is dismissed
- After School: After last class is dismissed, when home and completing homework, up until dinner
- Evening: The beginning of dinner until the bed time

ICE students responded to this question for the four periods, while St. Paul's students responded for two periods: during school and after school. The results are presented in Tables 5 and 6.

At ICE, after school time is somewhat shared between PC usage and television watching (probably in a multi-tasking mode). At St. Paul's, television watching comprises less of the after school time, though PC usage comprises more. This probably indicates that, despite the existence of televisions in common areas at St. Paul's, students prefer PCs since the device allows for more individual choice of content.⁶

⁶ See Table 20 in appendix or technology usage on week-ends.

Table 5 Average time spent by technology: ICE High School (week-days) (in minutes)

| | Before school | During school | After school | Evening | Total |
|----------------|---------------|---------------|--------------|---------|--------|
| Cell phone | 31.96 | 14.7 | 147.4 | 60.37 | 254.43 |
| Television | 10.17 | 0 | 113.94 | 74.51 | 198.62 |
| Computer | 13.5 | 3.87 | 191.8 | 68.05 | 277.22 |
| Video-games | 2.39 | 1.05 | 22.98 | 22.62 | 49.04 |
| Total exposure | 58.02 | 19.63 | 476.15 | 226.61 | 780.38 |

4.3 Technology usage and book reading

A widely reported trend in the research literature on technology impact has been the decline in leisure book reading on the part of teenagers. While the survey does not provide an understanding of the trend, it gives a glimpse into the amount of books read by adolescents at this point in time (see Table 7).

Teenagers read for leisure an average of 5.6 books per year. Girls tend to read more than boys (6.6 vs. 3.9). The higher levels of video game playing amongst boys could partly explain this trend. ICE students read significantly more than St. Paul's students (10.7 books versus 3.4). This could mean that, *prima facie*, boarding school schedules negatively affect leisure reading. In addition, several dynamics might be at work in this regard. For example, ICE students need to travel to and from school every day, where as St. Paul's students only travel from their room to each class. The subway, bus, or car ride gives each ICE student anywhere from 20 min to an hour of extra time for reading, playing portable video games, using their cell phones, etc. In this case, many ICE students need to take theft into consideration and likely engage in reading books as opposed to using expensive electronics.

In addition to this contextually driven difference, an intriguing pattern emerges (see Table 8).

The same data has been plotted graphically to depict the differences (see Fig. 2).

According to the data, out-of-class reading is correlated with media and technology exposure. ICE students systematically score higher in terms of both interactions with digital devices and book reading (the only area where St. Paul's girls score highest is in terms of PC usage, except that the range between highest and lowest is fairly small). This finding would support two of the three hypotheses raised above. First, the school culture (public day versus private boarding) and the geographic

Table 6 Average time spent by technology: St. Paul's (week-days) (in minutes)

| | Before school | During school | After school | Evening | Total |
|----------------|---------------|---------------|--------------|---------|-------|
| Cell phone | – | 6.5 | 150.5 | – | – |
| Television | – | 0 | 86 | – | – |
| Computer | – | 15.2 | 265.4 | – | – |
| Video-games | – | 0 | 24.4 | – | – |
| Total exposure | – | 21.7 | 526.3 | – | – |

Table 7 Number of books read

| | SPS | ICE | Total |
|-------|-----|------|-------|
| Boys | 2.9 | 6.3 | 3.9 |
| Girls | 3.6 | 12.9 | 6.6 |
| Total | 3.4 | 10.7 | 5.6 |

context (city versus semi-rural area) are two factors driving specific behavioral patterns vis-à-vis technology usage. A school culture that incorporates technology into its curriculum and defines rules that encourage rather than prevent technology use, combined with an urban context, might result in a stimulating environment for knowledge acquisition in all its manifestations. Second, a complementarity pattern appears to exist, whereby if teens are intense users of digital technology, they will remain frequent book readers. This would support the original media cumulative impact hypothesis. On the other hand, substitution between technologies should not be discarded. Television and videogames exhibit high time allocation for boys, who also depict lower time for PC time. Girls exhibit exactly the inverse pattern (with the exception of ICE girls television viewing patterns).

4.4 Texting versus calling

Overall 36 % of teenagers report that they text in class. The proportion is significantly higher (48 %) at ICE than St. Paul's, partly due to the “no cellphone” policy imposed at the latter school (see Table 9).

On average, students report sending 10.8 texts per class (see Table 18 in appendix). Even in a school where cellphones are not allowed, texting remains significant. Based on the findings of the research regarding multi-tasking reviewed above, the intensity of texting in class should be a matter of concern when it comes to the quality of the learning experience.

While self-reported, the information collected in the survey responses provides a glimpse into the purpose and functions supported by technology platforms used by adolescents. There are two aspects that are particularly interesting in this regard: first, teenagers' choice of communication platforms (in other words, what type of platform is utilized to communicate with whom and is the content of the communication and context guiding the choice of technology) and second, the function fulfilled by teenager utilization of social networks (as an example, solidify pre-existing relationships, make new acquaintances, or get information about people that are not real “friends”).

Table 8 Book reading versus technology usage

| | Highest | Medium-High | Medium-Low | Lowest |
|-----------------|-------------------|-------------------|-------------------|------------------|
| Cellphone usage | ICE girls (262.9) | ICE boys (239.6) | SPS girls (170.8) | SPS boys (127.2) |
| PC usage | SPS girls (283.4) | ICE girls (280.7) | SPS boys (275.3) | ICE boys (271.7) |
| Television | ICE boys (116.3) | ICE girls (86) | SPS boys (53.1) | SPS girls (13.9) |
| Videogames | ICE boys (99.3) | SPS boys (50) | ICE girls (20.5) | SPS girls (7.4) |
| Facebook time | ICE girls (92.6) | ICE boys (85.97) | SPS girls (89.0) | SPS boys (80.3) |
| Books read | ICE girls (12.9) | ICE boys (6.3) | SPS girls (3.6) | SPS boys (2.9) |

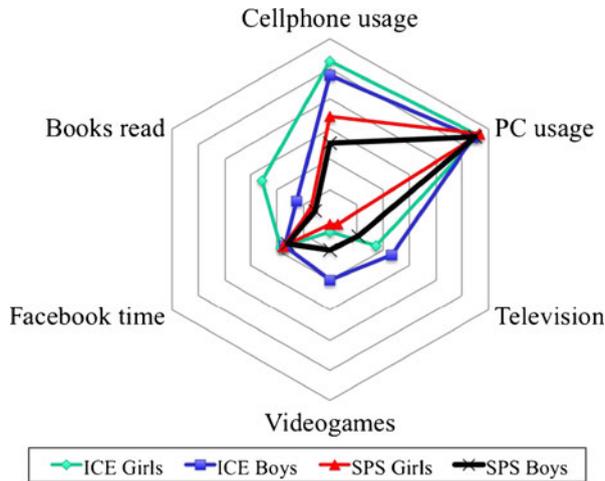


Fig. 2 Comparative cumulative media and technology usage

Research literature widely demonstrates that students prefer texting over placing voice calls, which our survey confirms; 69 % of students text more than they call (see Table 19). Participants of the study noted that the people *to whom* they are talking dictates whether they text or call. Participants are aware of the preferences of their friends and families and abide by them. “I ask them if they want me to call or text them,” one student commented. The most popular response was captured in one participant’s response, “If it is urgent, I will call. If it can wait or is not as important, I will text.”

4.5 Social network usage

Social networks allow users to negotiate presentations of self and connect with others. The public displays of connections serve as identity signals (degree of “popularity”). Research of the networking that occurs via social networks indicates that links generally tend to occur between “latent ties” that share some off-line connection. In that sense, the social network primarily supports pre-existing social relationships. However, research done by Piskorski (2009) also found that the network serves as a way of providing visibility on strangers’ behaviors or as a tool to kick-start linkages.

We asked high school students how many Facebook friends they have and how many of those friends they consider to be real friends (see Table 10).

While St. Paul’s students have, on average, more Facebook “friends” than ICE students (928 versus 455), ICE students on average have more “real” friends (25.2 %

Table 9 Texting in class

| | Boys | Girls | Average |
|-----|---------|---------|---------|
| SPS | 27.78 % | 30.00 % | 29.17 % |
| ICE | 47.62 % | 48.65 % | 48.28 % |
| | | | 36.36 % |

Table 10 Total number of friends

| | Total friends | Real friends | % Real friends |
|--------------------|---------------|--------------|----------------|
| St. Paul's average | 928 | 233.6 | 25.2 % |
| St. Paul's boys | 794.7 | 189.1 | 23.8 % |
| St. Paul's girls | 994.7 | 256.7 | 25.8 % |
| ICE average | 455.2 | 172.9 | 38 % |
| ICE boys | 527.1 | 215.3 | 40.8 % |
| ICE girls | 419.3 | 153.1 | 36.5 % |
| Total average | 756.1 | 212.0 | 28 % |

at St. Paul's versus 38 % at ICE).⁷ The ratio is fairly similar for boys as for girls at both schools, which could mean that the type of school affects the different patterns. Because St. Paul's is a larger school, students are naturally bound to have more Facebook friends. Similarly, because ICE is a smaller school, the students are going to have more "real friends" represented on their Facebook accounts. The numbers represented highlight differences between a boarding school and a public day school.

Our research indicates that, on average, teens self-report spending close to 2 h a day on Facebook⁸ (see Table 11).

The distribution of time spent on Facebook would appear to indicate that 60 % of teenagers spend one hour or less, while 39.8 % spend between one and two hours.⁹ What do teens do while on Facebook? Respondents self-reported an estimate of their time spent on Facebook (see Table 12).

This time is comparable to Piskorski's results (2009) in his research of the general population of a social networking site (see Table 13).

While considering that Piskorski's data is based on monitoring clicks of 320,000 users and our data is based on self-reporting metrics, the differences in time allocation are significant:

- Teenagers appear to be less prone than the general population to view pages of strangers or people to whom they are not close (we recognize that a bias could exist in self-reporting an activity that is not socially acceptable). This could mean that the concept of "network as covers" developed by Piskorski, according to which social networks provide a cover allowing actors to engage in activities other than "keeping up with friends" (e.g. search for romantic partners) might not be applicable to teenagers. This finding is consistent with research among university students that indicates that their primary behavior is focused on searching for people with whom they have an offline connection rather than "browse" for strangers
- Teenagers are more likely to rely on the social network for communication purposes. This trend reveals a shift in both attitudes and positioning of social

⁷ Lampe (2009) found in his research of Facebook behavior among college students that the average total number of "friends" had increased from 338 in 2006 to 441 in 2008.

⁸ Lampe also determined that 79 % of college students spend 15 min per day on Facebook, while 9 % spend over 2 h

⁹ We consider the 27 responses stating more than 160 min as being misinterpreted answers, which based the estimate as time the platform was open on the screen although the user was not necessarily interacting with it.

Table 11 Time spent on facebook (minutes per day)

| | St. Paul's | ICE | Average |
|---------|------------|------|---------|
| Boys | 80.3 | 90.3 | 83.6 |
| Girls | 89 | 92.1 | 90.1 |
| Average | 86 | 91.5 | 87.9 |

networks from conventional networking sites to communications utilities. This difference between teenagers and adults in utilization of social networks for one-to-one communications (versus conventional email platforms) has also been identified in prior research.

Male students at the ICE School spend a significantly higher percentage of their time Facebook stalking (21 %) than do the boys at St. Paul's School (10 %) (see Table 14).

One explanation of this difference could be that the boys at St. Paul's have, on average, many more friends on Facebook (794.7) than those at the ICE School (527.1). Therefore what boys at ICE might qualify as "stalking," boys at St. Paul's would simply refer to as "keeping up with friends" because they have a much larger Facebook friend base. The combined time for these two categories is very similar between both groups; the boys at St. Paul's on average spend a combined 35.3 min a day in these two activities while the boys at the ICE School spend a combined 32.9 min. In sum, while both groups spend comparable amounts of time watching other people's pages, they might have different definitions for what constitutes friendship and what they would consider stalking.

4.6 Video consumption

We surveyed the ways in which high school students watch videos as Internet streaming becomes more popular (see Table 15).

70 % of high school students stream from the Internet more than they watch television. Within the same school, girls stream more videos than boys. One possible explanation for the gender-based difference is that girls and boys watch different programs. Boys typically watch more sports than girls do: 42.9 % more in St. Paul's

Table 12 Facebook time allocation

| | Watching friends' pages | Inputting information in own page | Watching pages of people not close to | Writing on other people's walls, chatting | Total |
|--------------------|-------------------------|-----------------------------------|---------------------------------------|---|-------|
| St. Paul's average | 36.3 (29 %) | 13.6 (11 %) | 16.5 (13 %) | 58.3 (47 %) | 124.7 |
| St. Paul's boys | 26.3 (31 %) | 13.3 (16 %) | 9 (10 %) | 36.6 (43 %) | 85.2 |
| St. Paul's girls | 42.5 (29 %) | 13.8 (9 %) | 24 (16 %) | 67.7 (46 %) | 148 |
| ICE average | 21.8 (22 %) | 20 (20 %) | 15.6 (16 %) | 42.2 (42 %) | 99.6 |
| ICE boys | 13.7 (15 %) | 18.1 (19 %) | 19.2 (21 %) | 42.5 (45 %) | 93.5 |
| ICE girls | 26 (25 %) | 21 (21 %) | 13.8 (13 %) | 42.1 (41 %) | 102.9 |
| Total average | 30.9 (27 %) | 16.3 (14 %) | 15.8 (14 %) | 51.8 (45 %) | 114.8 |

Table 13 Social network comparative time allocation

| | Piskorski (2008) | This study | St. Paul's | ICE |
|----------------------------|------------------|------------|------------|------|
| View profiles of friends | 35 % | 27 % | 29 % | 22 % |
| View profiles of strangers | 35 % | 14 % | 13 % | 16 % |
| View own profile | 9 % | 14 % | 11 % | 20 % |
| Add or delete friends | 8 % | | | |
| Add content to profile | 8 % | | | |
| Email, chat | 5 % | 45 % | 47 % | 42 % |

case and at the ICE School, none of the girls surveyed watch sports programs. Netflix and Hulu are designed for watching television series and movies, not for streaming live sports. While it is possible to watch sports games live at Hulu Plus, we expect that most male students would prefer to watch sports live on television with other friends rather than pay for Hulu Plus and watch it by themselves. For girls, Netflix and Hulu work perfectly with their preferences because TV programs are often on live television at less reliable and convenient times that may interfere with homework or other activities. Therefore, it is far more convenient to catch up on lengthy television series via online services at their own pace and without commercials.

St. Paul's students stream more than ICE students. The gap between the streaming tendencies of St. Paul's students and ICE students results from the differences between boarding and city schools. As a boarding school, St. Paul's does not allow its students to have their own televisions; therefore they must rely on the televisions in the common areas of the school. Because there is a lack of accessibility and convenience for watching television, the students at St. Paul's tend to watch it online more than those students at ICE.

Table 16 provides a summary of all findings.

5 Conclusion

At a high level, the study has validated to a large extent the hypotheses raised. First, contrary to the presumed homogenization of information goods consumption and communication patterns, the adoption and patterns of information technology use are shaped by the individuals' residing environment and context, a point that supports the theory and studies discussed in the earlier section. More specifically, evidence from this study indicates that school culture (public day versus private boarding) and the

Table 14 Minutes spent watching profiles of strangers

| | Boys | Girls | Average |
|-----|-------------|-------------|-------------|
| SPS | 9 (10 %) | 24 (16 %) | 16.5 (13 %) |
| ICE | 19.2 (21 %) | 13.8 (13 %) | 15.6 (16 %) |
| | | | 15.8 (14 %) |

Table 15 Percentage of respondents that stream more than watch linear TV

| | Boys | Girls | Average |
|-----|--------|--------|---------|
| SPS | 68.6 % | 82.8 % | 77.4 % |
| ICE | 41.7 % | 52.4 % | 48.5 % |
| | | | 69.8 % |

geographic context (city versus semi-rural) are two factors driving specific behavioral patterns vis-à-vis technology usage.

Table 16 Study conclusions

| Research domain | Sub-domain | Finding | |
|-------------------|-------------------------------------|---|--|
| Use of technology | Number of devices/frequency of use | <ul style="list-style-type: none"> • The majority of SPS students own computers (99 %), compared to the 82 % of ICE students. • The majority of ICE students own cellphones (98 %), a television (82 %) and are users of Facebook (87 %). • The two most popular technologies used by participants were Facebook and cellphones. | |
| | Purpose of use/choice of technology | Communication platform | <ul style="list-style-type: none"> • Participants spend most time on Facebook communicating with friends as opposed to “stalking”, playing games, or uploading material. |
| | | Video consumption | <ul style="list-style-type: none"> • SPS students stream more television than ICE students. 70 % of the participants stream over watching live television. • ESPN and ABC were the most popular channels watched live by students. |
| | | Complementarity | <ul style="list-style-type: none"> • Students with computers spend more time on Facebook. |
| | Patterns of consumption | <ul style="list-style-type: none"> • Participants prefer texting to calling (64 % SPS and 77 % ICE). • Students who spend more time on Facebook read fewer books. | |
| Segmentation | Urban vs. Prep-school | <ul style="list-style-type: none"> • SPS students on average have more Facebook friends than ICE students, however their percentage of real friends is less. • SPS students in general use Facebook more than ICE students. | |
| | Males vs. females | <ul style="list-style-type: none"> • Females read more than males (12.9 compared to 6.3 within the ICE community). • On average females spend more time on Facebook than males. | |
| | Socio-economic | <ul style="list-style-type: none"> • The socio economics of an individual doesn't allow or refuse access to technology. • Technology is considered a necessity and is therefore widely distributed throughout with the exception of the lowest socio-economic demographic segments | |

Second, contrary to prevalent notions indicating a substitution between information technologies (e.g. print by digital products, linear TV by over the top video streaming), consumption of information goods appears to be guided by a principle of complementarity. If teens are intense users of digital technology, they will remain frequent book readers. However, substitution between technologies should not be discarded. Boys tend to spend much more time watching television and playing videogames than they do using PCs. Girls exhibit exactly the inverse pattern, supporting both traditional and contemporary findings. In this context, a school culture that a) incorporates technology into its curriculum, and b) defines rules that encourage rather than prevent technology usage—particularly in an urban context—might create a stimulating environment for knowledge acquisition in all its manifestations. On the other hand, technology adoption without controls could negatively impact the teaching experience (negative impact of text in classroom).

Third, while social networks tend to address social needs (or so-called “failures”), their usage, even within highly segmented socio-demographic categories, tends to be highly group specific. Teenagers appear less prone than the general population to view pages of strangers or people to whom they are not close. We recognize that a bias could exist in self-reporting an activity that is not socially acceptable. As a result, the concept of “network as covers,” or the idea that social networks provide a cover allowing actors to engage in activities other than “keeping up with friends,” might not apply to teenagers. This finding is consistent with research on university students that indicates that their primary behavior is focused on searching for people with whom they have an offline connection rather than “browse” for strangers. Teenagers are more prone to rely on the social network for communication purposes. This trend reveals a shift in both attitudes and the positioning of social networks from conventional networking sites to communications utilities.

Finally, it is critical to mention that while results are interesting and directionally valid, they still cannot be considered representative. It is important that, going forward they are validated by statistical analyses, combined by qualitative case studies.

Acknowledgments The authors would like to acknowledge the support provided by Mr. Peter J. Karp, Principal at the Institute for Collaborative Education in New York, and Mr. Thomas Bazos, Dean of Students at the St. Paul’s School. in Concord, NH. Additionally, the authors would like to acknowledge research support by Taylor Berry, from the Columbia Institute for Tele-Information, as well as the feedback of three anonymous reviewers.

Appendices

Table 17 Survey responses by gender

| Gender | SPS | | ICE | | Total | |
|--------|-------|------------|-------|------------|-------|------------|
| | Total | Percentage | Total | Percentage | Total | Percentage |
| Male | 36 | 37.11 % | 21 | 36.21 % | 57 | 36.77 % |
| Female | 61 | 62.89 % | 37 | 63.79 % | 98 | 63.23 % |
| Total | 97 | | 58 | | 155 | |

Table 18 Survey responses by grade

| Grade | SPS | | ICE | | Total | |
|-------|-------|------------|-------|------------|-------|------------|
| | Total | Percentage | Total | Percentage | Total | Percentage |
| 7–8 | – | – | 10 | 20.83 % | 10 | 6.4 % |
| 9 | 27 | 27.84 % | 19 | 39.58 % | 46 | 29.7 % |
| 10 | 21 | 21.65 % | 19 | 39.58 % | 40 | 25.8 % |
| 11 | 25 | 25.77 % | 10 | 20.83 % | 35 | 22.6 % |
| 12 | 24 | 24.74 % | – | – | 24 | 15.5 % |
| Total | 97 | | 58 | | 155 | |

Table 19 Survey responses by age (High school only)

| Age | SPS | | ICE | | Total | |
|-------|-------|------------|-------|------------|-------|------------|
| | Total | Percentage | Total | Percentage | Total | Percentage |
| 13 | 1 | 1.08 % | | | 1 | 0.7 % |
| 14 | 5 | 5.38 % | 12 | 26.09 % | 17 | 12.1 % |
| 15 | 22 | 23.66 % | 19 | 36.96 % | 41 | 29.1 % |
| 16 | 26 | 27.96 % | 11 | 23.91 % | 37 | 26.2 % |
| 17 | 22 | 23.66 % | 6 | 13.04 % | 28 | 19.9 % |
| 18 | 13 | 13.98 % | – | – | 1313 | 9.2 % |
| 19 | 4 | 4.30 % | – | – | 44 | 2.8 % |
| Total | 93 | | 48 | | 141 | |

Table 20 Minutes spent using technology devices (Week-ends)

| Device | SPS | | | ICE | | | Total | | |
|-----------------------|-------|-------|---------|-------|-------|---------|-------|-------|---------|
| | Boys | Girls | Average | Boys | Girls | Average | Boys | Girls | Average |
| PC | 307 | 336.6 | 325.8 | 363.3 | 364.7 | 364.3 | 321.1 | 344.7 | 336.4 |
| Television | 103.2 | 100.7 | 101.1 | 205.0 | 270.0 | 251.9 | 139.8 | 161.9 | 154.3 |
| Facebook ^a | 80.3 | 89.0 | 85.97 | 90.33 | 92.06 | 91.51 | 83.9 | 90.1 | 88 |

^a No difference was made in the survey for weekday and weekend access to Facebook

References

- Chen, M. (1990). Gender and computers: The beneficial effects of experience on attitudes. *Journal of Educational Computing Research*, 2(3), 1–1. Web. April 4, 2013.
- Children and parents: Media use and attitudes report (2011). Rep. OFCOM. Web. 3 Apr. 2013.

- Couldry, N. (2008). Mediatization or mediation? Alternative understandings of the emergent space of digital storytelling. *New Media & Society*, 10(3), 373–391. Sage Publications. Web. 3 Apr. 2013.
- Coyle, C. L., & Vaughn, H. (2008). Social networking: Communication revolution or evolution? *Bell Labs Technical Journal*, 13, 13–17. Web. 1 Aug. 2012.
- Gilbert, E., Karahalios, K., Sandvig, C. (2008). The network in the garden: An empirical analysis of social media in rural life. *Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems*. 1603–1612. Web. 31 Jul. 2012.
- Goffman, E. (1959). *The presentation of self in everyday life*. Garden City: Doubleday. Print.
- Greenhow, C., Walker, J. D., & Kim, S. (2009). Millennial learners and net savvy teens? Examining internet use among low income students. *Journal of Computing in Teacher Education*, 26(2). Web. 1 Aug. 2012.
- Gross, E. F. (2004). Adolescent Internet use: What we expect, what teens report. *Applied Developmental Psychology*, 25, 633–649. Web. 30 Jul. 2012.
- Hampton, K., Goulet, L., Rainie, L., Purcell, K. (2011). *Social networking sites and our lives*. Rep. Pew Research Center. Web. 3 Apr. 2013.
- Hepp, A. (2011). Mediatization and the ‘molding force’ of the media. *The International Communications Association's 2011 Virtual Conference*. Web. 3 Apr. 2013
- Hjarvard, S. (2008). The mediatization of society. A theory of the media as agents of social and cultural change. *Nordicom Review*, 29.2, 105–134. Web. 3 Apr. 2013.
- Kaiser, H. J. (2010). *Daily media use among children and teens up dramatically from five years ago*. Menlo Park: Henry J Kaiser Foundation.
- Koprowski, G.J. (2006). Digital divide separates rural, urban Internet users. *Tech News World*. Web. 3 Apr. 2013.
- Krotz, F. (2007). *Mediatisierung: Fallstudien zum Wandel von Kommunikation*. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Lampe, C. (2009). Trends in the facebook use amongst college students. Presentation at Columbia Institute for Tele-Information conference. April 17, 2009.
- Lenhart, A., Smith, A., Macgill, A. R., & Arafeh, S. (2010a). *Writing, technology and teens*. Washington, DC: Pew Research Publications. Web. 2 Aug. 2012.
- Lenhart, A., Kling, R., Campbell, S. (2010b) *Teens and mobile use*. Pew Internet and American Life Project. Web. 2 Aug. 2012.
- Livingstone, S. (2003). Children's use of the internet: Reflections on the emerging research agenda. *New Media & Society*, 5(2), 147–166. LSE Research Online. Web. 3 Apr. 2013.
- Madden, M., Lenhart, A., Duggan, M., Gasser, U., Cortesi, S. (2013). *Teens & technology 2013*. Retrieved April 04, 2013, from <http://www.pewinternet.org/Reports/2013/Teens-and-Tech.aspx>.
- Mazman, Y. (2011). Gender differences in using social networks. *Hacettepe University* 10(2). Web. 31 Jul. 2012.
- McLuhan, M., & Fiore, Q. (1967). *The medium is the message*. New York: Random House. Print.
- Murphy, S. (2011). Minority, low-income teens likely to use phones to get online. *Tech News Daily*. Web. 31 Jul. 2012.
- Offerman, S. (2012) *2012 adobe digital video advertising report*. Web. 30 Jul. 2012.
- Piskorski, M. (2009). Networks as covers: Evidence from business and social on-line networks. Harvard Business School Working Paper OMT 10624
- Rideout, V., Saphir, M. (2012). Social media, social life: How teens view their digital lives. Common Sense Media Research Study Web. 30 Jul. 2012.
- Schiano, D.J., Chen, C.P., Ginsberg, J., Gretarsdottir, U., Isaacs, E., Huddleston, M. (2002). Teen use of messaging media. Web. 30 Jul. 2012.
- Schmidbauer, M., & Löhr, P. M. (1999). Young people online. In P. M. Löhr & M. Meyer (Eds.), *Children, television, and the new media: A reader of research and documentation in Germany*. Luton: University of Luton Press.
- Schulz, W. (2004). Reconstructing mediatization as an analytical concept. *European Journal of Communication*, 19(1), 87–101. Sage Journals. Web. 3 Apr. 2013.
- Seal-Wanner, C. (2007). Teens and technology: The perfect storm? Web. 1 Aug.
- Stanger, J. D., & Gridina, N. (1999). *Media in the home, 1999: The Fourth Annual Survey of Parents and Children*. Washington, D.C: Annenberg Public Policy Center. Web. 4 Apr. 2013.
- Thurlow, C., & McKay, S. (2003). Profiling “new” communication technologies in adolescence. *Journal of Language and Social Psychology*, 22(1), 94–103. Web. April 4, 2013.
- Vahlberg, V. (2012). A survey of three studies about youth media usage. Web. 30 Jul. 2012.
- Vann, M. (2012). Video games cut into teens' reading, studying. *ABC News*. Web. 31 Jul. 2012.