



## **Adoption of web and mobility technologies in a multicultural population of hospitality and leisure students: search for empirical evidence**

**Claudette John**

Glion Institute of Higher Education, Switzerland

**Ian Jenkins**

STAR Les Roches Gruyères University of Applied Science, Switzerland

The aim of the research is to gather empirical evidence on the current use of Web 2.0 and mobile technology in the population of first semester international students. The evolution of usage over time is analyzed. A quantitative analysis, comparing the results at an institute of higher education in Switzerland with those of three Australian universities was performed. The results from the research demonstrate that on average, 2010 students use computers more than their Australian counterparts in 2006. Significantly fewer students in 2010 did not use Web 2.0 technologies and mobile devices compared to 2006, which is important for learning styles and delivery of blended learning practices. The results of the first stage of this research support the notion that this cohort of students uses Web 2.0 and mobile technologies to communicate and consume content.

Keywords: millennials, learning styles, higher education, web 2.0, mobility

### **Introduction**

On one hand the debate (Bennett et al., 2008) is still raging about whether the “Net Generation” (Tapscott, 1998, 2008), or “Digital natives” (Prensky, 2001), or “Generation Y” (McCrindle, 2002), (AKA “Echo boomers”, “Millennial Generation”) are really tech savvy and their brains are ‘wired’ differently from that of previous generations. This implies that educators and educational institutions need to adapt their teaching practices and learning environments (Oblinger and Oblinger, 2005). According to Kennedy, Dalgarno, Gray, Judd, Waycott, Bennett, et al. (2006, 2007, 2008, 2009), the reality of millennials’ adoption of leading-edge Information and Communication Technologies (ICT) has not been evidenced scientifically and higher education institutions need to do further research before changing their ways.

On the other hand the Internet and especially Web 2.0 (Anderson, 2007) and mobile (Mellow, 2005) technologies with their multimedia, interactivity, user-generated content and social networking offer promising new ways of engaging (Tosh et al. 2005) the Net Generation in the classroom (Lorenzo and Dziuban, 2006).

At our institute, the technology used by students in and out of the classroom has evolved considerably in the last 5 years. Students are required to have their own laptop; they have wireless broadband access to the Internet on campus and in their residences. A vast majority favors the new generation of “smart” phones which they use to access their university-provided email account. Today, faculties observe students using their laptops and smartphones constantly in the classroom; where tablet computers started appearing in the fall semester of 2010. For the last four semesters of 2009 and 2010, in one course, students have been designing and building web 2.0 applications as part of a class project.

## **Literature debate**

The Internet has empowered young people to challenge knowledge and grow into critical thinkers (Tapscott, 1998, p. 88). The opportunity to inform and express themselves through, for example, chat groups has an influence on each element of self-esteem: social, academic and physical (Tapscott, 1998, p. 91-92). Seely Brown (2002) also identifies a need to consider the Net generation’s altered aptitude to absorb and create information. Generations considered as ‘information literate’ can be frustrated by traditional learning and their attention can be difficult to capture (Seely Brown, 2002). They are no longer simply absorbing information; they blend skills to consume and create information with varying degrees of “information fluency” (Lorenzo and Dziuban, 2006, p. 3).

With less optimism, Prensky purports that physiological changes in the digital native brain have altered learners’ capacity for reflection and critical thinking (Prensky, 2001, p. 3). Prensky’s initial paper “Digital Natives, Digital Immigrants” (2001) was presented with little or no empirical evidence to back his claims regarding the digital natives’ characteristics and their implications for higher education.

Subsequent surveys and interviews were used to fill the gap of evidence. A “Study of Students and Information Technology” survey was carried out by the EDUCAUSE Center for Applied Research (ECAR) in 2004. Their findings concluded that students’ experience with technology is primarily about convenience and communication. Students clearly stated a preference for moderate use of IT in the classroom. The most common technologies mentioned in the survey were word processing (99.5%), emailing (99.5%) and surfing the internet (99.5%) for pleasure (Kvavik, Caruso, & Morgan, 2004).

In 2006, the Australian Learning and Teaching Council started a collaborative longitudinal research project entitled “Educating the Net Generation” (Kennedy G. , 2009). In a 2007 paper, they found that new technologies were not commonly used. These findings were surprising in the context of our institution where simple observation seems to disprove them. Whereas we cannot ignore the fact that most of our students are regularly using social networking websites and smartphones, we agree with the Australian team, that “more research is needed to determine the specific circumstances under which students would like their ‘living technologies’ to be adapted as ‘learning technologies’” (Kennedy, et al., 2008)

This is the first part of a research aiming to evidence that Web 2.0 and mobile technology usages are increasing with each new wave of students entering higher education and to verify the hypothesis that Web 2.0 and mobile technology influence students’ learning. It is expected that the results of the research will impact the institution’s blended learning policy and practices.

## **Web 2.0 and mobility technology**

Although the term Web 2.0 seems to indicate the existence of a ‘second generation’ of web technology, there is no ‘date of birth’ of Web 2.0 merely an evolution of features and usage over the years since Tim Berners-Lee invented the World Wide Web (www) in 1989. The term Web 2.0 is associated with O’Reilly media and the year 2004.

In his paper, Tim O’Reilly argued that Web 2.0 technologies leverage the network (i.e. the Internet) effects and the collective intelligence of its users (O’Reilly, 2005). The paradigm shift concerns two other aspects: user-generated content – web 2.0 users are both producers and consumers of content – and convergence – web 2.0 services are available on multiple computing platforms increasingly mobile.

Technologies commonly associated with Web 2.0 are: social networking, blogs, podcasts, RSS, ratings, wikis, digital content sharing and web services. All of them have been ported from the computer to the new generation of smartphones and tablets.

## Methodology

The first phase of the research investigates students' actual use of Web 2.0 and mobile technologies and uses a quantitative methodology, collecting primary data from a student population of first semester students at an international institute of higher education located in Switzerland. The research is based upon the questionnaire designed by the Australian team, made available through 'Creative Commons' licence. Some questions were completed with extra propositions to reflect the evolution of technology, for example: "Use the computer to watch a film".

The population consisted of all (318) first semester students in Hospitality or Leisure at an international Institute of Higher Education located in Switzerland. Data was collected through online questionnaires feeding a relational database system. The questionnaires were created using the Survey Monkey web service<sup>18</sup>. The security and privacy of the web service is ensured through an institutional subscription. The web service sent each student a unique survey link through a message delivered by their mail server. The system then tracked who had responded, who had not responded, who opted out. The system managed responses and automatically selected non respondents to send researcher-initiated reminders. In the first phase, the survey was restricted to one campus only. The survey was conducted according to the institute's code of ethics. Participation was voluntary and students could elect to remain anonymous. The survey was not answered during any class. To guarantee full anonymity, respondents' email and IP addresses were not stored in the survey.

97 students (30.5%) filled the survey but only 55 filled it completely. Of the respondents, 54.6% were female and 45.4% male. 98% were between the ages of 17 and 24 with 88.6% between 18 and 21. 40% of respondents come from Western Europe, 26.3% from Asia, 16.3% from Eastern Europe, the rest, 16.9% come from all other regions of the world except Central America. Though the survey generated a lot more data than analyzed in this paper, only the data that matched that published by the Australian team was retained. The data was summarized in exactly the same way as that used by the Australian team:

- A percentage of respondents was calculated for each technology (e.g. Use a computer to play games) and regularity of usage (e.g. Once per week).
- A 'mean regularity' was calculated by allocating a value to each of the usage frequency, from 0 "not used" to 7 "several times a day" and averaging it across the relevant usage.
- The mean regularity was used as a proxy measure to compare the two surveys.

## Results

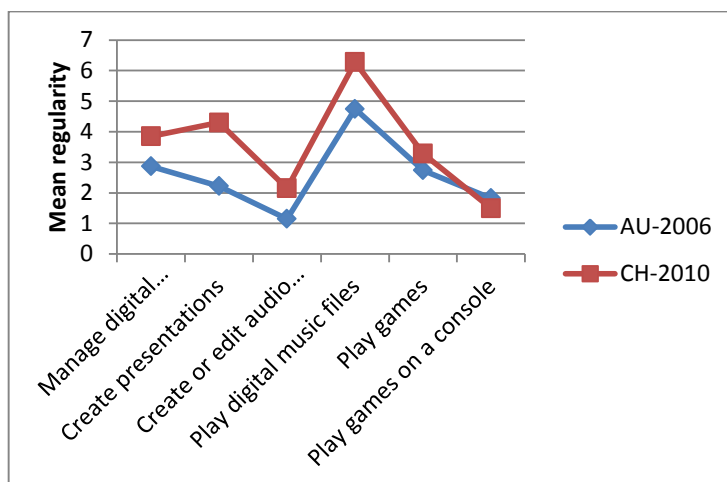
The data tables for the Australian and this research are in Appendix 1. We shall use *usage* to mean a habitual or customary continued practice and *regularity* to describe the frequency with which respondents use technology.

**Table 1** shows the percentage of responses for a series of technologies linked to media manipulation and electronic games. The percentage of students in Switzerland who do not 'use a computer for creating or editing audio and video' is almost 50% lower and the percentage of students who 'use a computer to play digital music files (e.g. iTunes) several times a day' is almost 50 % higher.

The chart in **figure 1** compares the mean regularity of the two surveys. Except for 'playing games on a console', the students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap is wider for 'creating presentations' and 'play digital music files'. The contours of the curves are similar except for the dip in using a console to play games.

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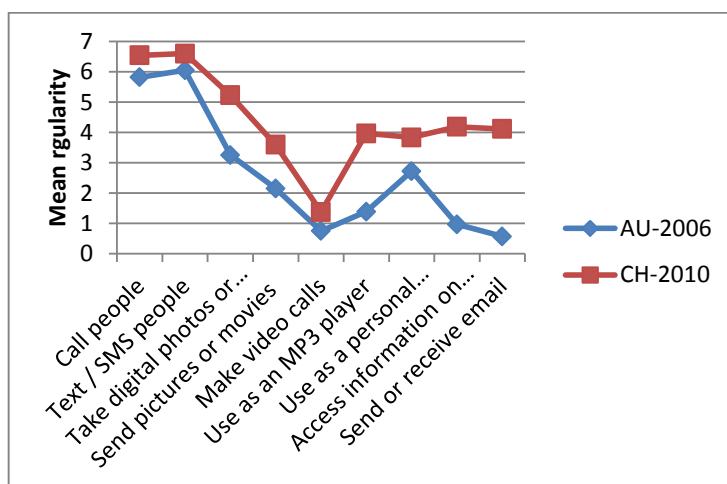
<sup>18</sup> <http://www.surveymonkey.com>



**Figure 1: Comparison for media and games usage**

**Table 2** shows the percentage of responses for a series of usage of mobile phones. The regularity of usage has increased across all mobile phone usage. The classic usages of mobile phones to make calls, send text messages and take photographs or films have increased less rapidly than other usages. For new usages linked to ‘smartphones’ like ‘Use a mobile phone to access information / services on the web’ or ‘Use a mobile phone to send or receive email’ several times a day, the percentage of students is multiplied by 10 and 20 respectively.

The chart in **figure 2** compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap widens for ‘use as a MP3 player’: ‘Use a mobile phone to access information / services on the web’ and ‘Use a mobile phone to send or receive email’. The contours of the curves are divergent over the last four usages linked to the new generation of smartphones whose ownership is unsurprisingly more widespread in 2010 than in 2006.



**Figure 2: Comparison for mobile phone usage**

**Table 3** shows the percentage of responses for a series of usage of traditional web technologies. Very low percentages and zeros for lower regularities (not or seldom used) emerge across all usages except e-commerce, e-banking and web site creation and maintenance. The percentages of multiple daily usages linked to education like accessing a portal or researching information have doubled. The percentages of multiple daily usages for communication have more than doubled.

**Figure 3** compares the mean regularity of the two surveys. For e-commerce, e-banking and web site creation and maintenance the students in Switzerland in 2010 display the same regularity of usage as the Australian students in 2006. For all other usages, their regularity is higher. The contours of the curves are similar except for

streaming audio files over the web. This increase verifies the demise of the traditional music industry and the rise of YouTube-like services.

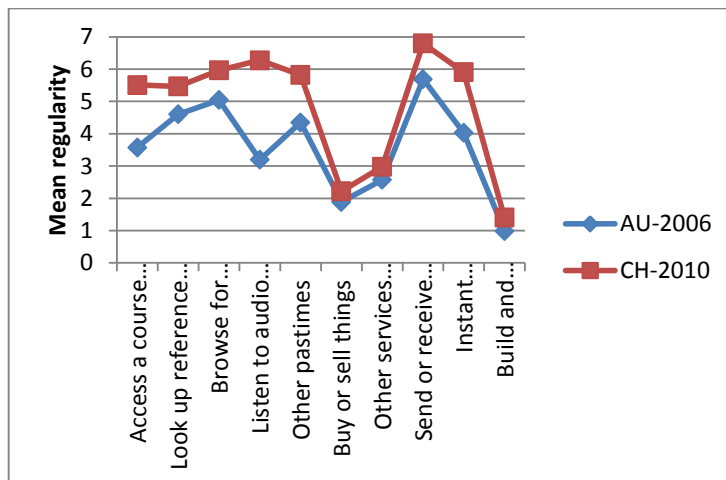


Figure 3: Comparison for traditional web technology usage

Table 4 shows the percentage of responses for a series of usage of web 2.0 technologies. More than 75% of students in Switzerland use social networking several times per day. This was less than 10% in Australia in 2006. The percentage of students who have never used the web to make a phone call was divided by ten between 2006 and 2010 and that of students who have never used web conferencing or used the web to read a RSS feed by four. The percentages of students who have never published a podcast (64.8%), kept their own blog (64.8%), contributed to a wiki (58.2%) remain high in 2010 and have not decreased as fast as other usages (they were 85.2%, 72.6%, and 84.9% respectively in 2006).

The chart in figure 4 compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; except for keeping a blog and to a lesser extent publishing a podcast. The gap is particularly wide for social networking, sharing digital content, making phone calls, web conferencing and reading blogs. The contours of the curves are quite different which demonstrates that some web 2.0 technologies have been adopted exponentially since 2006; social networking in particular.

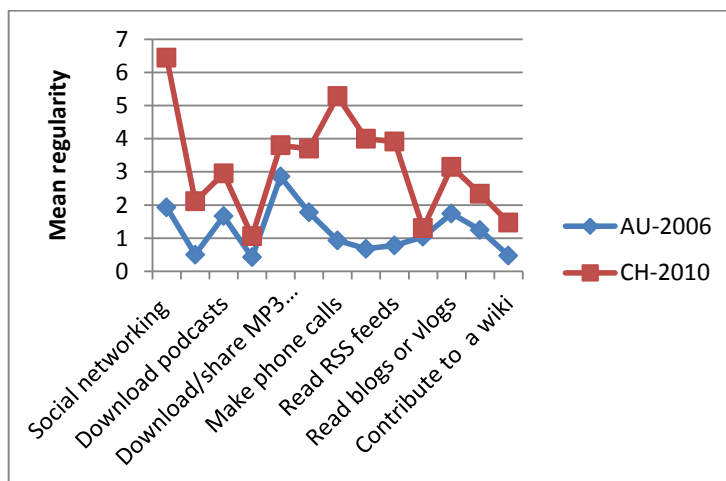


Figure 4: Comparison for Web 2.0 technology usage

## Discussion

From the above comparisons we can infer that students at our institute have developed their usage of technology in two main areas: communication and information consumption.

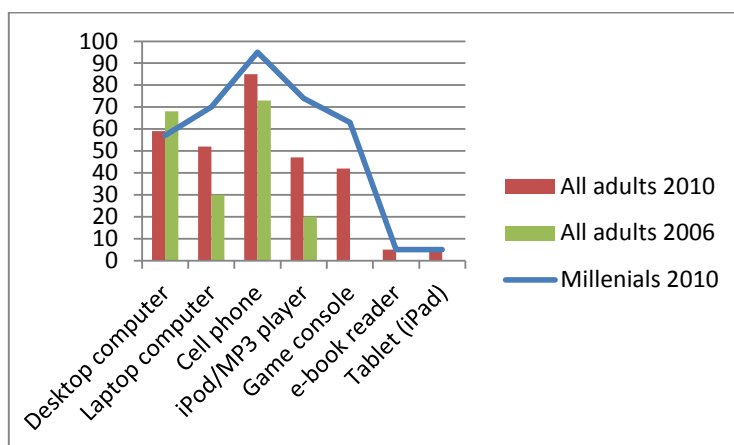
The development of communication is evidenced in mobile technology by the increase in usage to call, send text messages, but especially send/receive emails. In web technology, this is evidenced by increased usage of sending/receiving emails, chatting, social networking, web conferencing and phoning.

The development of information consumption is supported by the increased use of computers, mobile phones, together with the web to play and share digital content and access information.

The results of this research demonstrate a substantial increase in adoption of those Web 2.0 technologies used for communicating. We can say that, in 2010, when students leverage the network effects, it is predominantly for social usage and when they leverage the collective intelligence of the web, it is for their own consumption.

In this research, the concept of user-generated content is discretionary and regroups “Create presentations”, “Create or edits audio and video”, “Build and maintains a website”, “Publish podcasts”, “Keep/comment on a blog/Vlog” and “Contribute to a wiki”. User-generated content does not include submitting mandatory assignments to the course management system. Indeed, except for creating presentations, students in 2010 are not displaying practices of content generation which is a main feature of Web 2.0. On the other hand, their mobile phone usage for email, personal organizers and access to information, illustrate how they are taking full advantage of convergence.

To verify the assumption that a large part of the differences between the student populations in Switzerland and Australia can be explained by the evolution of usage over the 4 years since the first research was initiated, the data from the “Generations and their gadgets” report by the Pew Research Center’s Internet & American Life Project was compiled (Pew Research Center, 2011) to create table 5 and the chart in figure 5. **Figure 5** shows that except for desktop computers, the percentage of ownership has increased between 2006 and 2010. For all technologies except desktop computers, the millennial generation’s level of ownership is higher than the total adult population.



**Figure 5: Percentage of ownership of each technology**

**Table 5** shows that the millennial generation (18-34 years of age) has a larger percentage of ownership than the adult population (18+) in general; 95 % own a cell phone, 74% a MP3 player, 70% a laptop and 63% a game console. The millennial generation variation in ownership between 2006 and 2010 is twice that of the adult population for MP3 players and very close to twice as large for laptops and cell phones.

**Table 5: Percentage and variation of technology ownership**

	All adults 2006	All adults 2010	2006/2010 variation	Millenials 2010	2006/2010 variation
Desktop computer	68	59	-13%	57	-16%
Laptop computer	30	52	73%	70	133%
Cell phone	73	85	16%	95	30%
iPod/MP3 player	20	47	135%	74	270%
Game console	0	42	Not defined	63	Not defined
e-book reader	0	5	Not defined	5	Not defined
Tablet (iPad)	0	4	Not defined	5	Not defined

## Conclusion

The Australian team concluded that, in 2006, students from the “Net generation are not big users of Web 2.0 technologies” (Kennedy, et al., 2007), however in 2010, the empirical evidence demonstrates that they can be big users of some of the Web 2.0 technologies. Indeed when a large percentage of students use some of the technologies several times a day, it could be inferred that those technologies have become part the students’ life style.

N-geners have been known to associate fun with learning because of technology (Tapscott, 1998) and ubiquitous Internet and cell phones are influencing behavior, development and learning attitudes (Tapscott, 2009). The extensive use of Web 2.0 and smartphones evidenced by this research indicates that these have become embedded in the life styles as well as learning styles of the students and that educators need to adapt accordingly. If the results of the first survey are confirmed by subsequent surveys, concrete proposals will be made to the institute’s Blended Learning Steering Committee.

In 2002, Seely Brown said “Now, with incredible amounts of information available through the Web, we find a "new" kind of learning assuming pre-eminence-learning that's discovery based. (...)” Indeed, Web surfing fuses learning and entertainment, creating ‘infotainment’.” This research confirms that they are primarily information consumers, motivated by convenience and communication (Kvavik, Caruso, & Morgan, 2004). Although Lorenzo and Dziuban posit that Net-geners blend skills to create and consume information (2006, p.3), this research challenges the notion that they are creators of information.

In the next stage of the research, the team will use statistical analysis to explore the link between technology usage and factors preventing students from becoming content generating users when, at the same time, they are adept at sharing digital content. Other factors like the specificity of the student population (international and affluent) and its homogeneity (studying only hospitality and leisure) will also be explored.

The survey was run again in the first semester of 2011 on another cohort of first semester students on one campus but we plan to revise the survey to achieve a much higher completion rate while maintaining data comparability. In the future, the same survey will be conducted at other campuses in sister schools and we propose to carry on observing the evolution of students usage as they move from semester to semester.

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## Appendix 1: summary data tables (in % of respondents)

### Media and games

Table 1

	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/not used		
	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	
Australia 2006 =A Switzerland 2010 = S																	
<b>Use a computer</b>	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	
To manage or manipulate digital photos/images	3,9	5,7	3,4	7,5	11,9	24,5	12,8	18,9	25,3	24,5	19,8	13,2	12,9	1,9	9,9	3,8	
to create presentations	1,5	0,0	1,4	7,1	5,0	35,7	6,3	41,1	26,1	12,5	26,4	3,6	22,2	0,0	11,2	0,0	
to create/edit audio and video	1,4	1,9	0,8	1,9	2,8	7,5	3,7	5,7	7,7	24,5	12,2	22,6	24,0	11,3	47,4	24,5	
to play digital music	35,8	68,5	13,3	7,4	16,4	14,8	8,6	7,4	6,2	0,0	3,2	0,0	2,7	0,0	13,8	1,9	
to play games	8,0	5,7	6,5	15,1	11,6	18,9	9,9	15,1	14,3	9,4	12,7	3,8	13,1	7,5	23,9	24,5	
Use a console to play games	4,1	3,8	2,6	1,9	6,5	3,8	7,0	7,7	12,2	3,8	12,9	23,1	15,5	3,8	39,2	51,9	

### Mobile devices

Table 2



Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/not used	
<b>Use a mobile phone</b>	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
to call people	54,6	74,1	15,2	13,0	14,9	9,3	5,8	1,9	2,5	0,0	1,2	1,9	0,5	0,0	5,4	0,0
to text / SMS people	67,0	83,3	10,5	5,6	10,3	7,4	3,2	0,0	1,9	1,9	0,9	0,0	0,5	0,0	5,6	1,9
to take digital photos or movies	15,0	22,2	5,9	27,8	14,2	25,9	14,6	11,1	14,2	7,4	4,7	1,9	3,5	0,0	27,9	3,7
to send pictures or movies to other people	7,8	14,8	3,7	7,4	8,0	22,2	9,3	5,6	12,9	14,8	8,5	14,8	5,1	3,7	44,7	16,7
to make video calls	3,1	7,5	1,0	0,0	2,3	5,7	2,8	7,5	3,7	3,8	3,9	5,7	5,4	3,8	77,9	66,0
as an MP3 player	7,1	25,9	2,5	11,1	5,2	14,8	5,5	13,0	4,6	3,7	3,7	5,6	4,4	0,0	66,9	25,9
as a personal organiser (e.g. diary, address book)	13,0	29,6	8,5	11,1	11,7	11,1	8,9	5,6	8,3	9,3	4,0	1,9	3,3	0,0	42,2	31,5
to access information / services on the web	3,2	35,2	1,9	9,3	3,1	14,8	4,2	5,6	4,5	5,6	5,1	1,9	6,7	0,0	71,4	27,8
to send or receive email	2,7	44,4	0,7	3,7	1,5	11,1	2,0	1,9	2,3	3,7	2,8	1,9	5,8	0,0	82,2	33,3

### Traditional web

**Table 3**

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/not used	
<b>Use the web</b>	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
to access a portal/CMS	14,2	29,1	17,9	25,5	19,8	21,8	7,7	14,5	4,1	9,1	2,3	0,0	3,7	0,0	30,3	0,0
to look up reference information for study	14,4	30,4	13,3	17,9	32,8	32,1	18,4	8,9	11,3	8,9	3,6	1,8	1,3	0,0	4,9	0,0
to browse for general information	23,0	47,4	20,2	17,5	27,7	24,6	12,8	7,0	8,7	1,8	2,7	1,8	1,2	0,0	3,9	0,0
to listen to sound recordings	10,8	65,5	8,3	10,9	16,7	18,2	13,1	1,8	12,9	1,8	7,6	0,0	4,2	0,0	26,3	1,8
for other pastimes	22,3	41,1	15,6	19,6	19,7	28,6	12,7	7,1	8,4	1,8	4,1	0,0	2,4	0,0	14,8	1,8
to buy or sell things	2,9	3,6	2,7	1,8	5,4	9,1	7,4	3,6	16,0	25,5	17,4	21,8	12,8	5,5	35,4	29,1
for other services	4,1	5,5	5,8	5,5	13,4	14,5	14,2	10,9	16,9	27,3	6,8	12,7	5,8	3,6	32,9	20,0
to send or receive email	38,0	88,9	26,9	7,4	20,6	1,9	7,2	0,0	2,4	0,0	1,1	1,9	0,4	0,0	3,4	0,0
for instant messaging/chat	26,8	62,3	12,7	13,2	14,4	5,7	8,8	9,4	6,6	1,9	4,2	0,0	3,7	3,8	22,8	3,8
to build and maintain a website	3,1	3,7	2,6	7,4	3,2	3,7	3,7	3,7	4,0	1,9	4,4	5,6	9,9	20,4	69,0	53,7

## Web 2.0

Table 4

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/not used	
	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
Use the web																
for social networking	9,0	76,4	7,0	5,5	6,9	10,9	6,1	3,6	5,4	1,8	3,8	0,0	5,3	1,8	56,5	0,0
for social bookmarking	1,3	13,0	0,9	1,9	1,2	9,3	2,2	5,6	2,8	11,1	2,7	1,9	7,2	3,7	81,7	53,7
to download podcasts	3,5	7,0	4,1	7,0	8,9	12,3	7,5	17,5	8,8	17,5	5,8	7,0	4,6	5,3	56,7	26,3
to publish podcasts	0,7	1,9	0,8	1,9	1,8	3,7	2,2	3,7	1,6	9,3	2,4	5,6	5,2	9,3	85,2	64,8
to download and/or share MP3 files	9,9	16,4	6,0	5,5	16,5	16,4	10,8	18,2	12,2	20,0	7,4	7,3	3,3	3,6	34,0	12,7
to share photographs or other digital material	3,7	13,2	3,6	3,8	8,6	24,5	8,4	17,0	11,8	17,0	6,8	5,7	4,4	1,9	52,7	17,0
to make phone calls	3,0	31,6	1,8	19,3	4,3	26,3	3,5	12,3	4,6	3,5	3,4	0,0	5,0	0,0	74,3	7,0
for web conferencing	2,3	26,8	1,5	5,4	2,7	19,6	2,4	12,5	3,4	5,4	2,2	5,4	4,8	5,4	80,6	19,6
to read RSS feeds	2,2	16,4	2,5	12,7	3,5	25,5	3,2	12,7	3,1	3,6	2,1	3,6	4,1	3,6	79,3	21,8
to keep your own blog	3,2	5,6	2,7	5,6	4,2	3,7	4,9	1,9	4,6	3,7	3,2	5,6	4,5	9,3	72,6	64,8
to read other people's blogs	4,9	11,3	4,4	9,4	7,3	17,0	8,1	9,4	9,2	15,1	6,0	3,8	5,1	3,8	55,1	30,2
to comment on blogs	3,6	11,3	3,3	1,9	4,9	15,1	5,8	1,9	5,7	11,3	5,2	11,3	4,7	3,8	66,8	43,4
to contribute to the development of a wiki	1,5	1,8	1,1	1,8	1,4	12,7	2,1	3,6	1,7	7,3	2,2	9,1	5,3	5,5	84,9	58,2

### Author contact details:

Claudette John [claudette.john@glion.edu](mailto:claudette.john@glion.edu)

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