Media Use in Higher Education from a Cross-National Perspective

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Abstract: The web 2.0 has already penetrated the learning environment of students ubiquitously. This dissemination of online services into tertiary education has led to constant changes in students' learning and study behaviour. Students use services such as Google and Wikipedia most often not only during free time but also for learning. At the same time, traditional information media such as textbooks or printed hand-outs still form basic pillars in their learning environment. To measure the media usage for learning and how it changes an international long term media survey in tertiary education was set up by the author and other cooperation partners. Until February 2013, 12,000 students from five countries were asked 143 questions about their media use for learning and close-by topics. The results of the survey include an acceptance ranking of 53 media services, a comparison of media acceptance in five countries, data on possession of IT devices and a comparison of students and teachers media acceptance.

Keywords: media, higher education, students, e-learning, web 2.0, internationalisation

1. Introduction

The rapid and ubiquitous diffusion of digital media into higher education leads to constant changes of the students' learning environment and also influences their learning behaviour. This urges universities to understand and analyse the media usage patterns of the students comprehensively. Media usage for learning not only includes e-learning, but also the use of text-based and other media, electronic as well as print. It not only implies media provided by teachers, but also media which are used by the students for self-controlled and informal learning.

Media play a key role in the globalization of education as they give educational institutions a chance to reach students around the globe. This process fosters the establishment of an international market in higher education. Universities are increasingly offering open education courses to get at people who are not enrolled as regular students. These processes constitute new challenges, but also chances. Furthermore, media allow mobility for students and teachers and assist in linking individuals on an international level, for example by using social networks. If institutions of higher education understand the media usage patterns of their students, they are able to reach them effectively, e.g. by creating customized offers to recruit new students or by providing a user-oriented attractive media environment that really fits the individual needs of the students. This survey aims to explore where these potentials are to be found.

Students generally tend to be early adopters of media and information technology, as they possess above-average media access and skills. They strongly use external web 2.0 services, such as Google, Wikipedia, and Facebook, during their free time as well as for their studies (Grosch, 2012, Dahlstrom, 2012, Smith et al., 2009). Current development of web 2.0 is often characterized by an increase of direct interactions between users (O'Reilly, 2005). Although there have been speculations claiming a high potential of the web 2.0 for tertiary education (Johnson et al., 2012), the actual use of these services turned out to be chastening. Students generally refrain from technologies that require active participation or much effort and tend to easy-to-use services such as Google web search (Grosch, 2011). They also prefer a modest instead of an intense use of e-learning during their study activities (Kvavik & Caruso 2005, p. 93; Sharpe et al., 2009). However, students are not only passive users, but also designers and developers of technology. The most famous example is Facebook: created in 2004 by Harvard University students, it has become one of the most successful Internet services worldwide. Mobile broadband Internet access and the use of corresponding equipment, such as netbooks or smartphones, have fuelled the use of the social web by students in higher education. Yet still the benefits of these technologies for the learning outcome are not clear.

The acceptance of e-learning by students has increased in recent years, but not all services are accepted similarly. It has also become obvious that using media and e-learning does not automatically improve the learning success. A meta-analysis of Russell (2001) compared about 350 research projects and found out that the use of e-learning doesn't lead to a significant difference in the learning outcome. Another issue is the acceptance of e-learning and other media by the teachers. Even if students accept certain services, implementation in higher education could fail anyway if the teachers refrain from these media.

One key success factor for e-learning is the quality of the services (Ehlers, 2004a, 2004b). This quality is not to be (mis)understood as "product quality" but as the quality from the students' perspective. This goes along with the theoretical position of moderate constructivism and assumes that learning quality and learning success – with or without the use of media – are created by the learning individual as well as the learning environment. Hence, quality has to be measured by taking the students perspective and also by including possible influence factors. This position constitutes a difference to other research about media in Higher education, where the product quality stands in the focus.

Most of the research about the critical success factors of e-learning focuses on formal and university-internal e-learning services, such as learning platforms (Papp, 2000; Selim, 2007; Soong et al. 2001; Volery & Lord, 2000). However, students don't use only internal but also external media services. Hence, both of these types need to be observed to get a comprehensive understanding of students' media use. Beyond, also the variety of media-enriched informal learning processes and media which are used for informal or self-controlled learning are relevant. This perspective on the whole spectrum of media (print, e-learning, web 2.0 and IT) requires a certain empirical research approach and a theoretical framework that is able to cover such a broad variety of media services.

A precedent literature review, using Ebsco and Web of Science databases, analysed a total of 60 empirical studies. Among them were 25 studies on media use in general, ten studies on media use by children, adolescents, and post-adolescents, and 20 studies and statistics dealing explicitly with students, universities, and the use of media in the context of tertiary education. Several international research projects were considered, such as the long-term ECAR study from the United States (Dahlstrom, 2012, Kvavik & Caruso, 2005; Kvavik, Caruso & Morgan 2004). Another essential project that was analysed closely is the British Google Generation Project (British Library & JISC, 2008; JISC, 2008). Regarding future prognosis, the US long-term study "Horizon Project" (Johnson et al., 2012), was examined as it is one of the most absorbed sources regarding future technologies in higher education. Accordingly, future trends in the next years will include grassroots video, collaboration webs, mobile broadband, collective intelligence and social operating systems. Though the Horizon Report had a strong impact on the scientific community, a closer look at it results reveals that its reliability has to be questioned. A significant share of the prognosis (around 50 per cent) that were made in the Horizon Reports of the last years didn't come true. This leads to the conclusion that additional research with alternative methodology is needed to reliably predict the media usage of students in the future.

2. Objectives

To make reliable future predictions and to create a fundamental knowledge base for university administrators and teachers regarding the media usage of students first of all the current media use needs to be measured. Proceeding from this comprehensive and detailed empirical coverage over a period of time, certain usage patterns can be identified and hence, reliable predictions can be made about future trends. In that context, students are considered being active individuals who use media by own decisions and motivations, but also are influenced by external factors, e.g. the existing media

and learning environment or the faculty culture. Having this in mind, especially the following objectives are in the focus:

- A detailed evaluation of media usage for studying, including media usage frequency, satisfaction and acceptance of university internal and external services: print media, electronic text, social media, information and communication media, e-learning-services and IT hardware
- A comparison of the acceptance of media for studying between the surveyed countries
- A comparison of the acceptance of media for studying between students and their teachers
- Changes in the media acceptance of students over time
- Students' possession of media devices

Proceeding from these research objectives, the results will be used to give recommendations for university media strategy. In the long run it is aimed to establish a long-term international survey of media use in tertiary education that constantly covers the media usage of students and other stakeholders (teachers, administrators) of higher education. Hence, an adequate and applicable theory model has to be chosen, which outlasts the dynamic changes in the media environment over several years and includes possible internal (individual) as well as external (environmental) influence factors.

3. Theory and Methods

As the commonly used theory models to explore media or technology acceptance (Davis, 1989, Venkatesh et al., 2003, DeLone & McLean, 1992, 2002, 2003) are aiming on the potentials of single technologies and hence are not applicable to compare the acceptance of a variety of different media services, a own model was developed and validated by the author (Grosch, 2012). In the sense of this model, media are understood as technologies supporting and extending human communication. The process of gathering and absorbing Information by using media is regarded as a (unidirectional) form of communication. Hence, information services are also understood as media services. The frame model that was developed and validated during the pilot survey at Karlsruhe Institute of Technology in 2009 contains five independent (left side) and one dependent (right side) dimension.
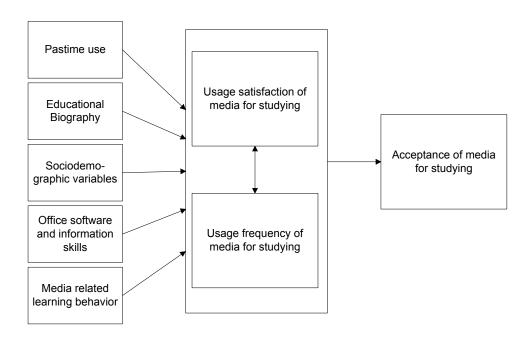

Figure 1: Theory model of media use for studying (Grosch, 2012)

The dimensions were designed by using theoretical and conceptional considerations, evaluating empirical research on critical success factors of media acceptance and by analysing close-by existing theory models such as the Ecological Model of Bronfenbrenner (1979, 1998), its modification for media-related research by Johnsson-Smaragdi (1994) and the Information Systems Success Model by DeLone & McLean (1992). A central concept of the theoretical framework is that media acceptance from the users' perspective is represented by usage frequency and satisfaction. Media acceptance from this point of view differs from the other theoretical approaches mentioned above as these mainly focus on the technical quality of the media. Hence, media acceptance is an indicator of the quality of media use from the students' perspective and this quality can be evaluated by measuring the usage frequency and satisfaction of the media services which are used by the students. To evaluate media acceptance the usage frequency and satisfaction of 53 services was measured and later on merged into 53 media acceptance variables by computing the mean values of these items ($(value_{usage\ frequency} + value_{usage\ satisfaction})/2$). Beyond this dependent dimension also the independent dimensions of the theory model (figure 1) are represented by a sufficient amount of variables in the measure model to be reliably represented (main criteria: Cronbach's alpha >0.8).

The survey questionnaire contains 146 items. It measures the usage frequency and satisfaction of 53 media and IT services, among them information services (Google, Google Books, library catalogues, printed books, e-books, printed journals, e-journals, Wikipedia, open educational resources bibliographic software) communication services (internal and external e-mail, Twitter, Facebook) and e-learning-services (wikis, faculty e-learning services). In addition, 40 items were operationalized to measure the independent dimensions (educational biography, learning behaviour, sociodemographic properties, leisure use of media, media skills).

Table 1: Measure model, dimensions, variables and scales

Dimension	No. of items	Scale	Character
Usage satisfaction of media for studying	53	Five-point: very satisfied – very unsatisfied	Dependent
Usage frequency of media for studying	53	Five-point: very often – never	Dependent
Pastime media use	9	Five-point: Very often - never	Independent
Educational biography	4	Nominal (e.g. major subject)	Independent
Sociodemographic variables	4	Nominal (e.g. gender) and metric (age)	Independent
Office software and information skills	6	Five-point: very good – no skills	Independent
Media related learning behaviour (a) and learning conceptions (b)	17	Five-point: very often – never and (a) strongly agree – strongly disagree (b)	Independent

Beyond these variables, which were identical in all surveys (though translated into different languages), also several extra dimension were included in single surveys to explore additional objectives and to revalidate the theory model, e.g. the computer device possession in the surveys at the University of Barcelona, the KIT 2009 student survey and the KIT 2011 student and teacher surveys.

After carrying out the pilot survey at KIT in 2009, a second survey was conducted at Mahidol University International College (MUIC) in Bangkok, Thailand. Thailand was chosen as a second country, due to its high cultural contrast to Germany, its different educational system and its

relatively good IT infrastructure which leads to a significant amount of media usage in all areas. Thus, the survey instrument was validated, translated into other languages, back-translated and generalized, so it finally can be used by any institution in higher education around the globe. Based on the results of these two pilot surveys, since 2010 the project expanded to other universities and countries. Currently (March 2, 2013) 15 surveys in five countries (Canada, Germany, Philippines, Spain and Thailand) were carried out, collecting a total of 12,000 samples. Around ten more universities in Germany, the United Kingdom, China, Russia and Thailand are expected to participate until the end of 2013. The surveyed students come from all faculties and levels (undergraduate to Ph.D.) in higher education. In addition, two teachers and one administrators surveys were carried out. This paper uses the data of all 15 student surveys and one teacher survey at KIT 2011.

4. Results

A comparison of the data from different universities and countries hints to an overall global media usage culture in higher education, that is overlaid by several national and local characteristics. To evaluate the overall acceptance of the different media services, an acceptance ranking (table 2) was generated. This ranking reveals, that especially information and text related media, internet connections and mobile computing devices are highly accepted in all countries. Google web search, the university external e-mail-service, the Internet at home and on campus and the notebook are among the most accepted media services as well as learning materials provided by the teachers. Also the classical print-based textbook still forms a basic pillar of learning, but is gradually being replaced by electronic textbooks.
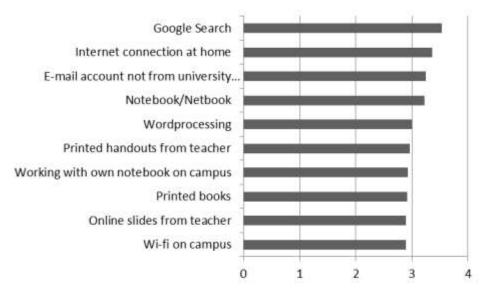

Figure 2: The overall top-ten accepted media services of students (0=very low – 4=very high acceptance

The figure above shows, that students overall seem to prefer external online media services to university internal media. The external e-mail is ranked second, while the acceptance of university internal e-mail is only ranked 27 (see table below). However, especially class attendant university internal media like print hand-outs and slides from the teachers are highly accepted, along with university IT infrastructure. Especially working on campus, using the own notebook or netbook together with the campus Wi-Fi seems to be a rampant pattern among students from all surveyed countries.

The social web and its protagonists YouTube and Facebook are increasingly being used in students' everyday learning in the different countries, although the extent of the dissemination of the web 2.0 strongly varies by country and also by the specific service. While Facebook and YouTube are used a lot, at the same time services like Twitter and other web 2.0-services that are discussed intensely

regarding their potential for higher education are accepted only on a low level. The following table lists the acceptance of the 53 surveyed media and IT services. All of them show a highly significant difference in the acceptance by country (ANOVA, all p<0.01):

Table 2: Acceptance ranking of 53 media services; second column: overall ranking; third column: overall mean values (means of the means of the countries); column 4-8: mean values by country; scale: 0=very low acceptance – 4=very high acceptance. The acceptance values were created by computing the mean value of usage frequency and satisfaction (see methods).

	Over-all Rank	Overall mean value	Canada	Germany	Philip pines	Spain	Thai land
Google Search	1	3.53	3.47	3.41	3.62	3.74	3.43
Internet connection at home	2	3.36	3.39	3.44	3.53	-	3.09
E-mail account not from university	3	3.25	3.22	3.37	3.08	3.74	2.84
Notebook/Netbook	4	3.22	3.03	3.21	3.27	-	3.37
Word-processing	5	3.01	3.00	2.84	2.96	3.53	2.69
Printed hand-outs from teacher	6	2.97	2.76	2.71	3.26	3.12	2.99
Working with own notebook on campus	7	2.92	3.49	2.51	3.17	-	2.52
Printed books	8	2.91	2.71	2.80	3.04	3.25	2.75
Online slides from teacher	9	2.89	3.21	2.66	3.02	-	2.68
Wireless connection on campus	10	2.89	3.36	2.54	3.11	2.67	2.79
Online dictionary	11	2.81	2.61	2.82	3.00	2.89	2.70
Mobile Internet connection (with notebook, tablet or mobile phone)	12	2.77	2.74	2.67	2.56	-	3.10
Video sharing websites (YouTube)	13	2.74	2.75	2.28	2.76	2.80	3.11
Wikipedia	14	2.73	2.50	2.91	2.88	2.72	2.63
Presentation software	15	2.71	2.68	2.52	2.73	3.13	2.47
Facebook	16	2.70	2.13	2.42	2.94	-	3.32
E-Books (files, pdf or other format)	17	2.69	2.61	2.40	3.05	2.83	2.56
Online lecture notes and journals from teacher	18	2.65	3.17	2.33	2.72	-	2.40
E-learning platform (Moodle, Blackboard)	19	2.56	3.27	2.77	2.48	2.11	2.17
Instant messengers (MSN Messenger, Yahoo Messenger, Skype)	20	2.52	2.26	2.40	2.39	2.71	2.86
Desktop PC	21	2.48	2.24	2.49	2.56	-	2.62
Mobile phones (smartphone, iPhone)	22	2.42	2.33	2.79	2.00	-	2.58
Online services of the university/faculty library	23	2.41	2.40	2.22	2.67	2.14	2.60
E-version journals	24	2.39	2.23	2.07	2.65	2.70	2.28
Print-version journals	25	2.38	2.07	2.17	2.63	2.59	2.42
University website	26	2.37	2.38	2.43	2.07	2.61	2.36
University e-mail account	27	2.36	3.09	2.36	2.04	2.46	1.83
Dictionary software installed on your computer	28	2.35	2.27	1.71	2.93	2.54	2.29
Computer labs on campus	29	2.35	2.27	2.18	2.83	2.25	2.20
Online materials from other	30	2.34	2.00	1.97	2.34	3.32	2.08

	Over-all Rank	Overall mean value	Canada	Germany	Philip pines	Spain	Thai land
universities							
Web portal for online student web services	31	2.33	2.38	2.32	2.23	2.83	1.90
Online exams	32	2.33	2.78	1.76	2.20	2.71	2.20
Google Books	33	2.29	1.94	2.23	2.59	-	2.39
Interactive online tests / self-tests	34	2.25	2.93	1.73	2.31		2.00
Recorded lectures (audio, video)	35	2.13	1.83	2.14	2.29	2.14	2.27
E-learning as part of the class	36	2.09	1.97	1.94	1.96	2.31	2.30
Online services of other libraries (not own university)	37	2.07	2.14	1.87	2.17	2.29	1.89
Newsgroups, Internet forums	38	2.03	1.91	1.75	2.14	1.97	2.38
Gesture computing (Xbox Kinect, iPhone interface)	39	2.01	2.39	1.21	2.37	-	2.05
Learning software	40	1.99	2.19	1.50	2.12	2.11	2.05
Bibliographic software (Endnote, Zotero)	41	1.98	1.73	1.64	2.24	2.39	1.89
Wikis with active participation as part of the class	42	1.98	1.98	1.46	2.27	1.84	2.35
Social bookmarking (Delicious)	43	1.96	2.00	1.52	2.09	2.26	1.95
Twitter	44	1.94	2.20	1.09	2.51	-	1.98
Other social networks than Facebook	45	1.94	1.68	1.46	2.02	-	2.62
Game-based learning (stock simulation)	46	1.93	2.26	1.16	2.28	-	2.02
Augmented Reality applications (Geotagging in Google Earth)	47	1.88	2.07	1.36	2.03	-	2.08
Google+	48	1.88	1.15	2.07	1.59	-	2.71
Virtual class in realtime (virtual lectures, webconferences)	49	1.86	1.82	1.00	2.09	2.02	2.36
Virtual class in non-realtime (web seminars)	50	1.86	2.00	1.17	2.18	2.01	1.93
Tablet computer (iPad, Galaxy Tab, Zoom)	51	1.83	1.77	1.58	1.98	-	2.00
Mobile apps for learning	52	1.82	1.49	1.71	1.84	-	2.26
E-book reader (Kindle, Nook, Sony Reader)	53	1.33	1.00	1.18	1.50	-	1.63

*: several items in the Spanish questionnaire were slightly changed and therefore removed in the comparison.

Electronic texts, such as e-books or electronic journals have penetrated the students' learning environment to a significant degree. Social media, such as Facebook or YouTube are not only used during free time but also for studying on a high level. In contrast, classic e-learning-services such as learning platforms or wikis are only accepted below average. The same goes for media which are not easy to use and require a certain effort to start with. The mobile Internet also has reached the learning environment of students in all countries, while new devices such as tablet computers are already used for studying, though still on a low level.

The most striking difference between the surveyed countries is, that students from Asian countries significantly use more social media for studying than students from western countries. This

difference occurs among the media usage during free time as well as during media usage for studying.

Another important aspect of the research project are the changes of media acceptance over time. In 2011, the first repetition survey at the Karlsruhe Institute of Technology (KIT) was carried out. A comparison of the results of the KIT 2009 and 2011 surveys revealed that the usage patterns and media acceptance values of students are basically stable as most of the media services only show a little or no significant change of the acceptance values. Though, in particular areas, significant changes in the acceptance values occur that are traced back to changes in the usage frequency and not in satisfaction. Hence, the following table shows the significant changes in the usage frequencies of KIT students from 2009 to 2011:

Table 3: Significant differences (by ANOVA, all $p<0.05$) of the mean values ($M_{\text{KIT survey 2009}}-M_{\text{KIT survey 2011}}$) of the usage frequency and rankings; scale: 0 = no usage; 4 = very high usage

Service	Usage frequency		
	Rank 2011	Rank 2009	Mean value difference 2011-2009
Raise			
KIT internal e-mail account	17	28	+0.46
Student web portal	7	10	+0.35
Bibliographic software	39	42	+0.24
Social bookmarking services	40	43	+0.34
E-learning platform "Ilias"	16	19	+0.16
Electronic journals	28	29	+0.13
Decline			
External e-mail (not KIT)	2	2	-0.21
Google Search	1	1	-0.26
University website	11	7	-0.33
Learning software	33	30	-0.22
KIT library catalogue	18	11	-0.26
Computer workstations on campus	21	15	-0.27
E-learning platform "Moodle"	41	41	-0.11
Wikis	35	33	-0.20
Printed journals	29	27	-0.23
Printed class attendant materials	9	5	-0.40
Wikipedia	3	3	-0.41
E-learning as part of the class	27	13	-0.64
Instant messengers	22	9	-0.71

The table hints to a shift from external to internal e-mail, from printed to electronic text media and from the e-learning platform Moodle to 1. Ilias (a learning platform that was created by the university of Cologne and is used by many German universities) and 2. the student web portal that was developed by KIT. The usage of e-learning as part of the class strongly declined as well as the usage frequency of Instant Messengers. The latter can be explained by the students increasingly using the Facebook chat functionality instead of stand-alone Instant Messenger software.

During the KIT 2011 survey also the media usage of teachers from all faculties and levels (lecturer to full professor) was examined by a questionnaire that was derived from the students' survey. It emerged that teachers also use online media to a considerable degree. Like their students they tend to refrain from e-learning and are more attracted to information media. Though teachers often are critical about students' intense use of services as Google or Wikipedia, they are using these services by themselves also quite often. However, in contrast to the students, they refrain from social media such as Facebook, instant messengers or video platforms. This difference occurs when using media for teaching and learning, but is getting even stronger when it comes to using media during free time:

Table 4: Media usage of students and teachers during free time (0=no use – 4=very often)

	Students			Teachers		
	N	**M**	**SD**	**N**	**M**	**SD**
Video platforms	1,360	2.79	1.11	132	1.17	1.13
Instant messengers	1,346	2.57	1.35	131	0.80	1.15
Facebook	1,350	2.46	1.52	131	0.35	0.82
Other social networks	1,299	1.03	1.18	132	0.47	0.81
Computer games	1,321	1.36	1.33	132	0.42	0.81
Books	1,344	2.36	1.19	132	2.87	1.20

Overall, students seem to be well-equipped with media and IT devices in all surveyed countries. They seem to possess a high level of "e-readiness" as the biggest share of them got one or more computer devices that can be used to access online and digital media services. As for example, an average student from the University of Barcelona possesses 4.5 out of ten media devices listed below. Overall, these rates are similar to the values of other surveyed countries, such as Germany or Thailand. Especially in the area of mobile handheld devices (smartphones, music players, mobile Internet, tablet computers and e-readers) the rates are very close.

Table 5: device possession of Spanish students from University of Barcelona (the latest survey where possession of media devices was asked for)

Information Technology/Device	Rate
Internet connection at home	94.6
Notebook	78.9
MP3/MP4/MP5-Player/iPod	67.7
Desktop computer (PC, Mac)	64.6
Smartphone/iPhone/Blackberry	59.0
Mobile Internet connection	35.8
E-book, e-reader	17.8
Netbook	17.5
Electronic dictionary (TalkingDict)	13.9
IPad/Galaxy	9.3

However, there are also several significant differences between the media device ownership of the Spanish students in the sample and the surveyed students of other countries. Spanish students for example seem to have a higher possession rate of Internet connections at home (94.6 vs. 85 - 90 per cent in other countries), a higher rate of desktop computer ownership (64.4 vs. 40 - 50 per cent in the surveyed other countries) and a lower rate of notebook ownership (78.9 vs. 80 - 90 per cent in other countries). This leads to the overall impression, that Spanish students still rely more on stationary computing than students of other countries. There, stationary desktop computers and Internet connections are already more often replaced by mobile devices. However, this trend only seems to occur among bigger computer devices (notebook or bigger) and not among smaller mobile devices such as smartphones and tablet computers.

Beyond the differences in the usage of social media (table 4), there are also commonalities as well as significant differences in the possession of IT devices between teachers and students. The data show an overall high level of media device ownership in both groups, especially regarding notebooks and smartphones. A comparison of the KIT 2009 and 2011 surveys reveals changes over time and differences between students and teachers in the device ownership. There, mobile Internet flat rates (based on SIM cards) are disseminating rapidly among the students, from below three per cent in 2009 to 27.5 per cent in 2011. Teachers show an even higher ownership rate of 37.9 per cent in 2011. From 2009 until 2011 a significant decrease in students' possession of stationary Internet connections at home took place. This leads to an overall impression of a shift from stationary to mobile computing:

Table 6: Changes in device ownership at KIT

	Students 2009	Students 2011	Difference 2009-2011	Teachers 2011
Desktop computer	48.2 %	42.1 %	-6.10 %	57.6 %
Notebook/Notebook/ Ipad	84.9 %	84.8 %	-0.10 %	81.1 %
Smartphone	47.2 %	48.6 %	+1.40 %	47.7 %
Internet access at home	87.2 %	79.1 %	-8.10 %	78.8 %
Mobile Internet flat rate	<3 %	27.7 %	+24.7 %	37.9 %
N	1.372	1.394		127

Looking at possible influence factors on the media use for studying, especially the general learning behaviour seems to play a key role as there are several significant and positive regression relationships (all p<0.05) with variables of learning behaviour and specific media services. The surveys revealed, that students who use media intensely with a special focus on text and information media are the ones that are especially successful during their study. This was measured by multivariate regression analysis of the variable learning performance (independent variable) and acceptance of the surveyed media services (dependent variables), that showed significant (p<0.05) positive regression relationships (regression coefficients from 0.3 to 0.5) between the self-assessment of the study performance (grades, GPA) and the acceptance of text related media (books, journals, library catalogues etc.). At the same time, students who are generally averted to media and also students who use media intensely but not self-controlled and selectively seem to be less successful. Hence, the usage of text media, printed as well as electronic, can be regarded as an indicator of study success: students who use text media intensely are more successful. Furthermore, other dimensions, such as sociodemographic factors, the educational biography and the access to media show significant regression relationships (p<0.05) with the acceptance of media services for learning, though with lower coefficients.

5. Conclusion

The survey draws a detailed picture of an ubiquitous media usage for learning by the students. The results go along with other up-to-date empirical research (e.g. Dahlstrom 2012). But they also refute predictions that were being made by strongly absorbed research projects, such as the Horizon Project (Johnson, 2004, Johnson & Smith, 2005, 2006, Johnson et al. 2007-2012). Referring to this, it was revealed that the predicted establishment of certain technologies in higher education didn't take place. One example is game-based learning, a technology that was reported to be established already several times, but still remains one of the least accepted media services in the ranking, from the perspective of the students (see table 2) as well as the teachers. Therefore the methodology of the Horizon Project that bases upon experts' interviews has to be questioned.

Generally, students seem to use media in a responsible and self-controlled way. Students who tend to use text media (print and digital) seem to be especially successful during their study. The described changes and usage patterns, together with secondary results from other research projects, can be clustered to three meta trends. Some of them are new, some of them already started more than twenty years ago and now are expanding into new areas:

Concentration:
The usage patterns are consolidating: often used media services are used even more often and less used services are used even less. Some big trusts like Facebook and Google are drawing over the usage from other services, e.g. the usage of Instant Messenger software is replaced by the chat feature of Facebook and the usage of library catalogues is replaced by Google Books.

Digitalization: There is a continuous shift from printed to electronic text that first started with scientific journals and later on moved to all relevant areas (textbooks, class attendant materials).

Mobilization:
A decrease of stationary computing is taking place (possession of desktop computers and stationary Internet connections), accompanied by an increase of mobile computing (possession of mobile Internet connections, smartphones, tablet computers, notebooks and netbooks). 24/7 online availability at all places will be a likely future scenario.

Heavy media usage by students is often discussed in a negative way, as it is assumed that spending too much time with media could distract students and foster procrastinative behaviour. Though, the results of the survey hint to the contrary, i.e. students, who use media very intense, but focused on learning, are more successful than students who generally refrain from media. This leads to the conclusion, that universities should encourage students in using media, especially text and information media and simultaneously should increase awareness on how to use media efficiently and self-controlled. When it comes to strategic development, universities should focus on promoting text and information media as they seem to be most beneficial for the study success. In that context, providing access to electronic text media (textbooks, reference books and journals) seems crucial for university media strategy. Beyond, the integration of external information services, for example Wikipedia and Google are recommended.

Based on the collected empirical data the project led to the wording of future trends of media in higher education, which differ from other reports, such as the Horizon Project which turned out to be of low reliability. In that context, the significant changes of media usage frequencies can be used for a future prognosis, assuming a linear regression relationship. By that, for example in about six years students at KIT will use library catalogues only very rarely, in 14 years the usage will drop to zero. However, the linearity of this process needs to be validated in the next KIT survey, that will be conducted in July 2013. By carrying out additional follow-up surveys, the project could lead to further and more reliable future predictions about changes in the students' media environment.

From the existing data it can be concluded that internal service providers need to constantly improve and develop their media services to keep up with the highly competitive external services provided by Google or other big players, as the significant decrease of the usage of the KIT library catalogue, together with the increasing use of Google Books and Google Scholar hint to an overall long term shift from library services to Google and Wikipedia during information search and the use of electronic text. The surveys which were carried out by the author all confirm this trend, especially regarding Google services. Google Scholar and Google Books seem to become more and more important for the students and are competing with university libraries and other internal media service providers. Hence, it seems crucial for the success of internal media services to be constantly improved and developed to keep up with the highly competitive external services provided by Google or other market leaders.

As there seems to be one be exceptionally successful student user type (high GPA, high concentration and motivation) that shows a particular preference for text and information media, the usage of these services should be considered as one indicator of study success. Students who are generally averted to media and students who roam around and use a lot of services are less successful. Though these results need more validation, they are in tune with the common doctrine, as for example the abilities to read and write form basic cultural techniques and also constitute a significant part of the concept of intelligence.

When it comes to improving internal services, universities should also focus on class attendant media, for example by supporting teachers in providing class attendant journals or recorded lectures, as these services seem of importance for the students. The KIT data showed, that teachers are spending a large amount of time to create these class attendant media (presentation software is the most often used media service among teachers) and universities should consider how they can support them. On the other hand, universities should refrain from spending too much effort in areas like traditional e-learning (learning platforms, virtual class etc.) and other less accepted services, such as wikis, weblogs or Twitter. However, also the integration of highly accepted social media by the students, such as Facebook or YouTube could fail, because teachers seem to be especially averted to them. The significant differences of the usage of social media between students and teachers hint to a gap in the online media usage culture of both groups that needs to be explored more in detail.

In the next years, especially mobile computing seems to be an essential trend that should be monitored by universities. New devices, especially the rapidly spreading tablet computer and maybe also the new generation of eBook-readers could additionally fuel the dissemination of mobile learning and the use of electronic text by students. Also mobile Internet flat rates and smartphones are spreading fast. At the same time the desktop computer seems to disappear slowly but constantly.

The next steps of the project are to expand the surveys to other universities and countries and to focus on new target groups, such as primary, secondary and vocational students and teachers and university administrators and technical staff. Universities who are interested in carrying out the survey are invited to contact the author.

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