Learning and Living Technologies: A Longitudinal Study of First-Year Students' Expectations and Experiences in the Use of ICT

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Abstract

This paper presents results from a longitudinal study on first-year students' expectations and actual reported use of information and communication technologies (ICT) at university. The study was interested in firstly, knowing if students from the Net Generation (≤ 25 years) would appropriate more ICT time for both social life and leisure, and study purposes than older students, as this forms the basis for many Net Generation and Digital Natives claims about young people use of technology. Secondly, the impact of university type (place-based or distance-learning) on ICT use was explored.

Data were analysed from two surveys that were part of the Economic Social Research Council (ESRC) funded project: The Net Generation Encountering eLearning at University. The first survey which asked for expected ICT time was sent at the beginning of the academic year. The second survey was sent towards the end of the academic year and asked for the actual time spent on using ICTs. Students studying 14 different courses in five different universities (four place-based and one distance-learning) in England took part in the study.

The results showed that students underestimated their total ICT time (combined time for social life and leisure, and study purposes) by at least 1 hour per day. The Net Generation students were found to spend more time per day using ICT for social life and leisure purposes than the non-Net Generation students (2.2 vs 1.7 hrs). In contrast, the non-Net Generation students spent more ICT time on study than the Net Generation students (2.3 vs 1.9 hrs. It appears that younger generation students used ICT for social life and leisure more frequently and older students were more likely to use it for study.

University mode of study also influenced how students appropriated their ICT time. Place-based university students spent at least one hour more per day on ICT than distance-learning university students. The results found differences across the two age groups were more noticeable at the place-based university than at the distance-learning university.

Keywords

Net Generation, Learning Technologies, Living Technologies, Gender, Distance-Learning

Introduction

In recent years a body of empirical studies on student experiences of e-learning has started to emerge (e.g. Brown & Czerniewicz, 2008; Jones, Ramanau, Cross, & Healing, 2009; Kennedy, Judd, Churchward, Gray, & Krause, 2008; Kennedy et al., 2006; Salaway, Caruso, & Nelson, 2008). Much of this work was intended to find out more about how Digital Natives (Prensky, 2001a; 2001b) or the Net Generation students (Tapscott, 1998) use various e-learning tools and technologies in their studies and in their lives more generally. The Net Generation students are generally described as being born during the early to mid 1980s and are exposed to the ubiquitous use of information and communication technologies (ICT) both at school and home (Oblinger & Oblinger, 2005; Prensky, 2001a; 2001b). Research studies suggest that the age differences concerning perceptions and experiences of technology-mediated learning are quite salient, but other demographic characteristics, such as gender (Selwyn, 2008) and academic discipline (Kennedy et al., 2008) may also be important.

Qualitative work in this and related areas stresses the importance of accounting for the broader social milieu, lifestage (Dutton, Helsper, & Gerber, 2009; Ito et al., 2008) and the diversity of types of media uses across cohorts of young people (Green & Hannon, 2007). To account for this broader social milieu, an emerging discussion in the literature has been to distinguish between "learning" and "living" technologies (Kennedy et al., 2008). This discussion suggests that although today's university entrants come to university with a wide repertoire of skills in using digital media (Nicholson, Macleod, & Haywood, 2005), the use of these tools for study might be quite different and the transfer of these skills for studies is not automatic (Kennedy et al., 2008; Kirkwood & Price, 2005). However, the range of empirical evidence that underpins the distinction between these two types of technology uses is rather limited. This might be partly due to the fact that previous studies are largely based on using cross-sectional designs which allow for investigating student experiences only at a certain stage in their studies (e.g. typically during or at the end of the academic year). Given the effect that the university experience might have on student views and uses of digital technologies, more longitudinal research on student experiences of using these technologies and their variations across different demographic groups (e.g. by age, gender, type of university, nationality etc.) is necessary.

Study Context and Sample Characteristics

This paper reports on some of the quantitative results from the second stage of a two-year study funded by the Economic and Social Research Council (ESRC) in the UK and aimed at investigating first year students' experiences of digital and networked technologies studying on 14 courses in different subject areas at five different universities in the UK. One of the universities was a purely distance teaching institution, while the other four were place-based institutions. The findings of the first stage of the study are reported elsewhere (see Jones & Ramanau, 2009a; 2009b; Jones et al., 2010). During the second phase of the study, two standardised self-report questionnaires were administered to a selected sample of students in the beginning (autumn 2008, referred to as survey 1 in this paper) and the end (spring 2009, survey 2) of the academic year in either online or in a paper format. Each questionnaire included several sections that looked at different facets of student experiences of digital and networked technologies including demographic information about the participants, their access to technology, frequency of media use, competence with ICT and attitudes to e-learning at university. The results of the first phase of the study showed (see Jones et al., 2010) that gender, age and institutional differences proved to be important determinants of student ICT use, therefore differences across participant groups by gender (male vs female) and type of university (distance vs place-based) were analysed in the second phase of research. To explore age differences two age groups were created – those aged 25 years of age and under (i.e. those born in 1983 or later) who are referred to as the Net Generation and those aged 26 years of age and older who are referred to as the Non-Net Generation.

The distribution of students by age group, gender, university type and nationality for both Surveys 1 and 2 are presented in Table 1. Nationality was included as a main effect since the survey from phase one (see Jones et al., 2010), showed that there was a nationality effect in students' use of technology although this finding was not reported in that paper. The distribution indicates that in both Surveys 1 and 2, there were more students who were from the Net Generation group, females, from place-based universities and UK students. There were 369 students who we can reliably identify having answered both Survey 1 and 2 and their demographic characteristics are also reported in the table.

This paper mainly focuses on the analysis of student responses on two items in the third section of both questionnaires – "How much time do you expect to spend using ICT for leisure and/or social purposes on an average week day?" and "How much time do you expect to spend using ICT for study on an average week day?" (Survey 1); "How much time do you spend using ICT for leisure and/or social purposes in an average week day?" and "How much time do you spend using ICT for study in an average week day?" (Survey 2). Survey 1 thus measured self-reported expected daily time and Survey 2 measured self-reported actual daily time for the usage of ICT. Since the results reported below are based on student responses to two questionnaire items at two points in the year they should be treated with caution, as this may be insufficient evidence for making any broad-brush conclusions. Also because the study was conducted only in the context of five English universities, the transferability of its findings outside this national educational context might be limited.

Students were asked to choose from a pre-selected list of a range times. The pre-selected time ranges for Survey 1 and Survey 2 did not correspond exactly and were recoded to match. The times for Survey 2 is underestimated as additional time periods of 4 to 7 hrs and more than 7 hrs were included to investigate extreme ICT usage times as it was previously noted in Survey 1 that a minority of students showed a high ICT usage of more than 3

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hrs. The new recoded ranges for both Survey 1 and 2 were less than 1 hour (hr), 1 to 2 hrs, 2 to 3 hrs and more than 3 hrs. Using these categories, an estimated average time was determined for each student by using the mid-point of the range. To calculate the mid-point range for the upper category (> 3 hrs) a reasonable upper value had to be chosen. As the preceding ranges were < 1 hr, 1 to 2 hrs and 2 to 3 hrs, the upper range limit was taken to be 4 hrs. This meant for either social life and leisure or study purposes the maximum average time a student can use ICT was estimated as 3.5 hours.

Table 1: Student Characteristics in Surveys 1 and 2.

	Survey 1 (Start of 1st Year)	Survey 2 (End of 1st Year)	Matched Surveys 1 & 2
Age Group			
Net Generation (≤ 25 yrs)	959 (88%)	613 (86%)	340 (92%)
Non-Net Generation (≥ 26 yrs)	130 (12%)	99 (14%)	29 (8%)
Gender			
Males	435 (40%)	261 (37%)	144 (39%)
Females	654 (60%)	449 (63%)	225 (61%)
University Type			
Place-Based	946 (87%)	579 (81%)	355 (96%)
Distance-Learning	147 (13%)	134 (19%)	14 (4%)
Student Nationality			
UK or Home	874 (80%)	576 (81%)	287 (78%)
International	213 (19%)	132 (19%)	81 (22%)
Total	**1093**	**713**	**369**

Results

Repeated measures analysis of variance (ANOVA) tests were used to analyse the expected and actual time spent on leisure and study on a daily basis by students. A customised model rather than a full factorial design was used to account for the skewed distribution of Age Groups, Gender, University Type and student Nationality. Skewed distributions were determined by chi-square analysis. The main effects of Age Groups, Gender, University Type and student Nationality were included. For Surveys 1 and 2, two-way interactions of the main effects with University Type were also included along with the two-way interaction of Age Group and Nationality. Survey 2 also had an additional interaction term of Gender and Age Group. For the students matched from Surveys 1 and 2, a repeated measures ANOVA was used to determine if there were any differences between Surveys 1 and 2 for students' ICT time spent on social life and leisure, and study purposes. In this model, only the main effects were included because of insufficient participants to effectively calculate the interaction means.

Survey 1: Reported Expected ICT Time Spent

This section first looks at the total expected ICT time (that is time used for social life and leisure plus study purposes) for different groups of students. This is followed by looking at the expected ICT time for social life and leisure, and study purposes separately. This analysis can indicate students' beliefs on how much ICT they expect to use ICT in their university studies and lives in general.

Total Reported Expected Daily ICT Time Spent

From Survey 1, the mean total ICT time that students were expected to spend was 3.1 hrs per day (combined time for social life and leisure plus study purposes). There were no significant differences in overall expected ICT time for the Age Groups, Gender and Nationality. However, students in place-based universities expected to spend more total time on ICT ($F(1,1058) = 14.10$, $p < 0.01$, $\eta_p^2 = 0.01$) than the students at the distance-learning university (3.5 vs 2.7 hrs). In particular, male students at the place-based universities were expecting to use one hour more on total ICT per day ($F(1,1058) = 5.44$, $p = 0.02$, $\eta_p^2 = 0.01$) than the male students at distance-university (2.5 vs 3.6 hrs). The female students at the distance-learning university and the place-based universities expected to use almost similar total ICT time per day (3.0 vs 3.3 hrs).

The average times that the students expected to spend on social life and leisure, and on study purposes were similar (1.5 and 1.6 hrs respectively) and for all the main effects (Age Group, Gender, Nationality and University Type). ICT time for study purposes was also similar for Age Group, Gender and Nationality but differed across University Type. Students in the place-based universities expected to spend more ICT study time ($F(1,1058) = 10.55$, $p < 0.01$, $\eta_p^2 = 0.01$) than students at the distance learning university (1.9 vs 1.3 hrs). In particular, the those aged 26 years of age and older thought they would spend significantly more ICT time ($F(1,1058) = 3.72$, $p = 0.05$, $\eta_p^2 < 0.01$) on their study than the younger place-based students university students (2.1 vs 1.7 hrs). Figure 1 illustrates these results for Age Groups and University Type.

Further, it was noted that whilst the expected ICT time spent for social life and leisure or study purposes were similar for three categories of the Age Group and University Type (Net Generation Place-Based, Net Generation Distance-Learning, Non-Net Generation Distance-Learning, see Figure 1 for more details), it was significantly different for the non-Net Generation place-based students.
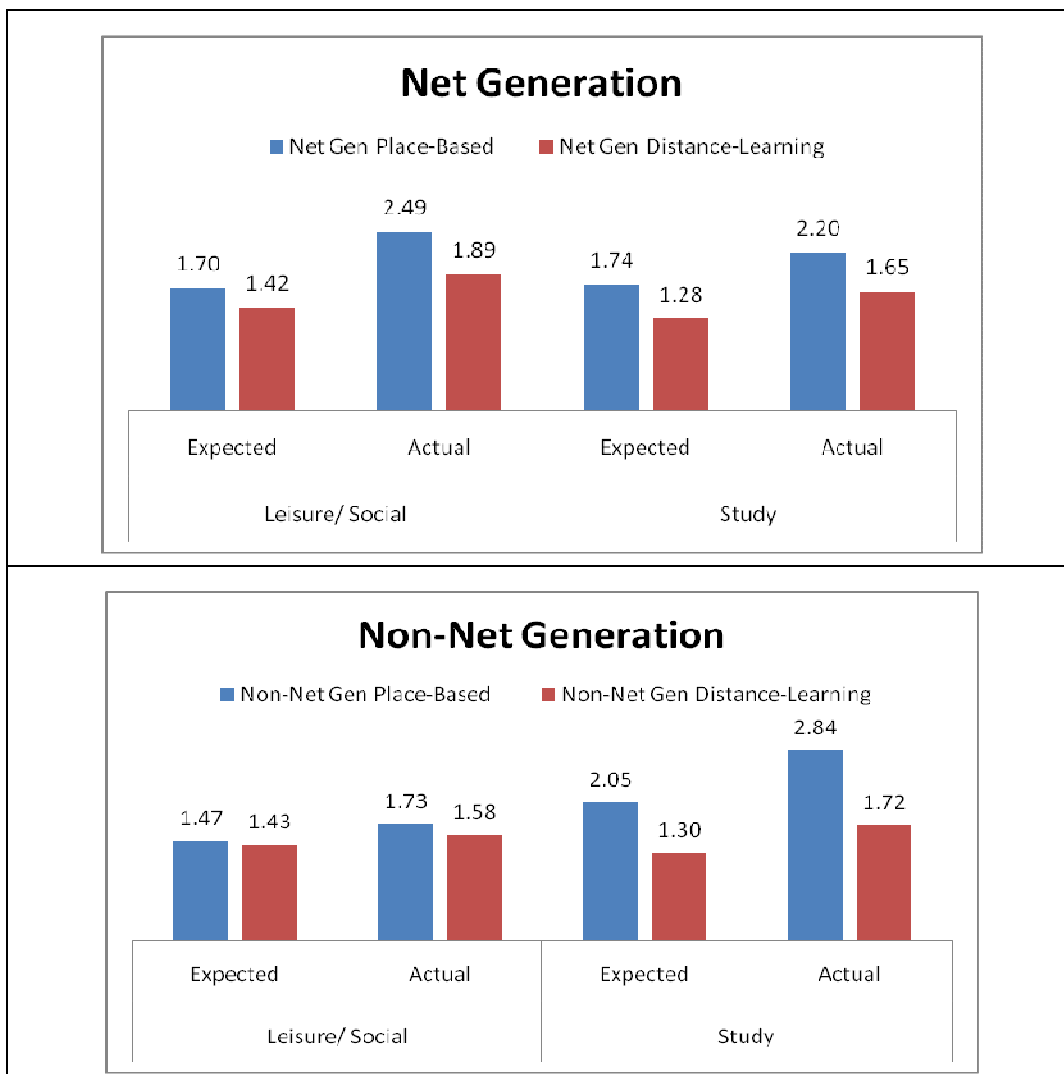
Figure 1: Expected and Actual Leisure and/or Social purposes and Study ICT time by University Type and Age Group

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These students had expected to use 2.1 hrs of ICT for study purposes but only 1.5 hrs of ICT time for social life and leisure purposes. Whilst one may suspect that this group of students are probably engaged mainly in a computer-oriented course, investigating their course showed that these students were drawn from a variety of courses with a considerable proportion of them taking a Social Work course (42%).

Survey 2: Actual Reported ICT Time Spent

This section follows the same format as the previous section. The total actual ICT time spent (combined time for social life and leisure plus study purposes) is first discussed followed by looking at ICT time spent for social life and leisure, and study purposes separately. The actual reported ICT time spent allows a snap-shot of how often students were using living and learning technologies.

Total Actual Reported ICT Time Spent

From Survey 2, the actual total ICT time (social life and leisure plus study) that students spent was 4.0 hrs. This is almost 1 hour more than the students expected to use when compared to Survey 1. Although Survey 2 contains 369 students from Survey 1, the comparison results are given based on Survey 1 cohort versus Survey 2 cohort but it is not an exact comparison. An exact comparison will be done when looking at the matched students from Surveys 1 and 2.

The actual usage for universities followed that of the expected usage, where students in place-based universities were using at least one hour more on ICT ($F(1,691) = 28.69$, $p < 0.01$, $\eta_p^2 = 0.04$) than those in the distance-learning university (4.6 vs 3.4 hrs).. While in Survey 1 differences between male students in their expectations of ICT use were reported, in this survey, differences across the two gender groups were identified ($F(1,691) = 8.89$, $p < 0.01$, $\eta_p^2 = 0.01$) - male students reported
more frequent ICT use than female students (4.4 vs 3.7 hrs per day).

Actual Daily Reported ICT Time for Social Life and Leisure and Study

The actual average daily times spent on ICT for social life and leisure, and study purposes ($F(1,691) = 3.22$, $p = 0.07$, $\eta_p^2 = 0.01$) were statistically similar (1.9 vs 2.1 hrs). Further, place-based students were spending more time on ICT ($F(1,691) = 7.29$, $p = 0.01$, $\eta_p^2 = 0.01$) for study than for social life and leisure purposes (2.5 vs 2.1 hrs), but distance-learning students were using similar amount of time for these same purposes (1.7 hrs for both types of uses).

The ICT time spent on social life and leisure or study purposes differed by Age Group ($F(1,691) = 25.41$, $p < 0.01$, $\eta_p^2 = 0.04$). Net Generation students were spending more ICT time for leisure than non-Net Generation students (2.2 vs 1.7). However, this significant difference was noted particularly between Net Generation and non-Net Generation students at place-based universities (2.5 hrs vs 1.7 hrs), but not between the age groups at distance-learning universities (1.9 vs 1.6 hrs). Figure 1 illustrates these results.

On the other hand, non-Net Generation students were found to spend more ICT time for study purposes than the Net Generation students (2.3 vs 1.9 hrs). As was the case with Survey 1 the difference in the frequency of ICT use for study purposes by Net Generation students was occurring at place-based universities but not at distance-learning universities (see Figure 1). The result for ICT study time when analysed by Age Groups and University Type followed the same pattern as Survey 1.

Net Generation placed-based students generally spent more ICT time ($F(1,691) = 10.63$, $p < 0.01$, $\eta_p^2 = 0.02$) on social life and leisure or study purposes compared to Net Generation students in a distance-learning university (leisure: 2.5 hrs vs 1.9 hrs; study: 2.2 vs 1.6 hrs). However, non-Net Generation students spent similar time on ICT for leisure purposes regardless of institution (place-based: 1.7 hrs and distance-learning: 1.6 hrs). However, the non-Net Generation students at place-based institutions spent more time using ICT for study than the non-Net Generation distance-learning students (2.8 hrs vs 1.7 hrs).

Matched Sample: Surveys 1 and 2

The matched sample consists of students who responded to both Surveys 1 and 2. It is in this analysis that an accurate longitudinal comparison of the time spent on ICT purposes is looked at. The limited number of students who were matched from Surveys 1 and 2 meant that looking at any interaction (for example with University Type or Age Groups) was not possible unlike in Surveys 1 and 2. Instead only the main effects (Gender,

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Nationality, University Type, Age Groups) were investigated. Further, through the longitudinal analysis of this matched sample, any differences in the replies made in Survey 1 to that of Survey 2 can be detected.

In line with previously reported data for Survey 1 and Survey 2 samples the actual total ICT time (social life and leisure plus study purposes) was 1 hour more ($F(1,355) = 8.18$, $p < 0.01$, $\eta_p^2 = 0.02$) than the expected total ICT time (4.0 vs 3.0 hrs). The actual ICT times for social life and leisure (1.8 vs 1.4 hrs) and for study (2.2 vs 1.6 hrs) purposes were thus higher than the expected ICT times for these two activities although only the latter was significantly higher. Table 2 presents the means from the repeated-measures ANOVA for differences between expected and actual social life and leisure, and study ICT usage time across the four demographic groups.

Total ICT time (social life and leisure plus study) was different from Survey 1 and Survey 2 for the Net Generation students ($F(1,355) = 4.52$, $p = 0.03$, $\eta_p^2 = 0.01$). These students were spending more time using ICT than they thought they would (4.2 vs 2.9 hrs). Non-Net Generation students although they were spending more time using ICT when comparing Survey 2 with Survey 1 (3.7 vs 3.1 hrs), this was not statistically significant. The Net Generation students were spending more time using ICT than they expected for social life and leisure (2.2 vs 1.5 hrs) and study (2.0 vs 1.4 hrs) purposes. However, the non-Net Generation students were using more ICT time than they expected for study purposes (2.4 vs 1.8 hrs) but their actual ICT time on social life and leisure was quite similar to their predicted ICT time (1.4 vs 1.3 hrs).

Table 2: The expected (Survey 1) and the actual (Survey 2) ICT time (5-point Likert Scale)[a]

	Social Life and Leisure		Study	
	Expected	Actual	Expected	Actual
Age Group				
Net Generation	1.5	2.2[**]	1.4	2.0[**]
Non Net Generation	1.3	1.4	1.8	2.4[*]
Gender				
Males	1.6	2.0	1.6	2.2[**]
Females	1.2	1.5	1.6	2.2[*]
University Type				
Place-Based	1.5	2.1[**]	1.9	2.4[**]
Distance-Learning	1.3	1.4	1.3	2.0
Nationality				
UK or Home	1.4	1.8	1.7	2.2[**]
International	1.4	1.7	1.5	2.2[**]
All Students	**1.4**	**1.8**	**1.6**	**2.2**[**]

[a] p-values represent pair comparisons of expected and actual means for social life and leisure or study purposes

[*] $p < 0.05$

[**] $p < 0.01$

Discussion

The results of this study shed more light on patterns of student use of living and learning technologies and how these varied across different age, gender groups and types of university. The longitudinal nature of data collection helped to identify the differences between student expectations and experiences in the beginning and at the end of the academic year.

The first important conclusion is that patterns in student uses of digital technologies do vary across groups of respondents both at the level of expectations and actual reported frequencies of use, although the extent of this variation depends on the particular demographic group. Students thus came to university with certain views on their prospective experiences of digital and networked experiences and these views seemed to contribute to their uses of digital technologies in the future. For example, students in place-based universities in general, and male students in particular, expected to use more ICTs in first year of their studies and generally did report more frequent use of these technologies towards the end of the academic year. At the same time students of all Age, Gender Groups and University Type tended *to underestimate* their frequency of ICT use whilst at university both for social life and leisure, and study purposes. This finding contrasts with the literature about Net

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Generation students which suggests that students have higher expectations than universities can satisfy. Tapscott for example speaks about Net Generation students 'forcing' a change in education (Tapscott, 2009, p.11). This suggests that further work in the field should examine the nature of students' expectations of the uses digital and networked technologies as they enter university in more detail, possibly based on both qualitative and quantitative evidence.

Second, the study confirmed that patterns of student ICT use do vary across age groups, but the degree and the nature of these differences were highly dependent on the type of university that students attended. For example, distance students in both age groups expected to spend similar amount of time on ICT for social life and leisure, and study purposes. However, towards the end of the academic year social and leisure, and study uses of ICT showed different patterns for the two age groups. In contrast to initial expectations, it is students, age 26 years and older (non-Net Generation), who expected and reported more frequent use of ICTs for study. In other words, despite the fact that older students might have been exposed to less digital technology use previously (e.g. in ICT classes at school), they were more likely to be involved in some types of uses than younger learners. On the other hand, younger students in place-based universities tended to use technology for social life and leisure purposes more frequently. It appears that the non-Net Generation students were more likely to see and experience ICT as a study tool or a learning resource, whilst the Net Generation students in the place-based universities - as a recreational tool. This may point to other contextual factors acting as intervening variables because older students may be exposed to certain kinds of technology use at work. It may also suggest the influence of different life stage of older students who might have more settled social lives and require less social contact than their younger peers. In either case it would indicate a need for further work to examine the nature of different types of technology uses. This finding may provide some caution to educational providers who try to reutilise social and networking technologies to engage students in course materials. Younger students may see this as an encroachment into their recreational tool and may resent the educational provider for taking over their space unless the technology can seamlessly be integrated and be seen by the students as a hybrid of a recreational and study tool. On the other hand, older students might think that any social and networking technologies that has been reutilised as a waste of their time as it may not reflect what they perceive as a study tool or a learning resource.

Third, the salience of institutional factors in shaping student expectations and experiences with ICTs was particularly strong. For example, in the four place-based institutions students, aged 26 years and older, were expecting to spend more time on ICT for study than the Net Generation students, whilst it was not the case with the distance-learning institution. Interestingly, younger students at place-based universities reported quite a significant change from expected to the actual usage of ICT for leisure and the frequency of this type of use exceeded the results for other types of uses or other age groups or types of university. This seems to highlight the extent to which the culture of recreational ICT use is integrated into university experience, particularly for younger students. Good connectivity levels and relative ease of access to a wide range of online resources help to create a social milieu that fosters and encourages social and leisure uses of ICTs. At the same time, it appears as if something in the circumstances affecting students at the distance-learning university that inclined them to spend less time using ICT for both social life and leisure, and for study purposes. As the distance-learning students are usually part-time (over 95%), these students may have other commitments during the week (e.g. child-caring duties or work) and may use more ICTs during the weekend. Thus the nature of ICT use among distance learners, particularly those of the Net Generation studying in a part-time context, merits further investigation.

It is clear that the results presented here are in accordance with results from the first phase of our research and research conducted by other authors (Jones et al., 2010; Kennedy et al., 2008). Whilst age is a significant factor affecting technology use it is one factor amongst several others. Furthermore it is clear that age is not a simple predictor of technology use and that in some cases age does not affect particular occurrences of technology use in the ways the Net Generation and Digital Natives theses would suggest. More research into social and educational uses of technology, the importance of social and institutional contexts and prior experiences is necessary. Self-report questionnaire data on learning experiences particularly in terms of ICT use do not always yield reliable results (Douwes, de Krakera, & Blattera, 2007), so data from other qualitative (interviews, observations etc.) and quantitative (e.g. activity logs) methods would be useful in combination with surveys to establish a more reliable evidence base.

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