Survey of Students' Technology Use for Time Management

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Abstract: We present the results of a survey conducted at the University of Southampton in September 2009. All students in the School of Electronics and Computer Science (ECS) were asked to fill in an on-line questionnaire comprising 11 items about (mobile) devices, technologies, calendaring applications and their features, and strategies they use for managing their study time. The questionnaire was answered by 137 students. The results show that all participants own at least one mobile device and that about 76% carry a web-enabled device on campus. The most used calendaring applications for study planning are mobile phone calendaring software, Google Calendar, and Microsoft Outlook. Feature-wise, appointments and reminders are preferred over tasks. Students' time management practices are very diverse, and a wide range of different technologies is used. Those who reported poor time management use more calendaring software features with a higher frequency. They also think that existing calendaring software lacks features for study planning. Furthermore, students using software for time management make less use of guessing for time-on-task estimation. It is hoped that the survey results can be used as the basis for a system addressing the special requirements of time management for learning.

1 Introduction

Tertiary education environments require students to learn independently, so that every learner is responsible for their own learning. Apart from timetabled activities such as lectures, this also includes the organisation and planning of learning activities outside the formal teaching timetable (Payne & Whittaker 2000). Contemporary study advice literature emphasises the importance of good time management skills for successful learning. It is claimed that the development of such "soft skills" leads to increased employability (Cottrell & Nash 2003, Payne & Whittaker 2000), less stress and less feelings of guilt, more self-confidence (Payne & Whittaker 2000) and more control over both study and leisure time (Cottrell & Nash 2003, Payne & Whittaker 2000, Saunders 1994). Good time management is also supposed to yield more and higher-quality output, resulting in increased productivity and higher performance (Drew & Bingham 2001). This claim is supported by Britton and Tesser (1991) who tested the time management skills of 90 psychology students by using a questionnaire and compared the results with their college grades. It was found that the time management components "time attitude" and "short-range planning" correlated positively and significantly ($p < 0.001$ and $p < 0.02$, respectively) with academic performance, while long-range study time planning did not make a significant difference ($p > 0.05$). Similar results were reported by Macan (1990) who tested the relationship between time management behaviour and stress as well as academic performance. Her findings suggest that those who apply time management practices also report better performance and higher perceived control over time, resulting in less stress. There seems to be consensus that good time management is proactive and characterised by the following practices: categorisation, prioritisation, and division of tasks into smaller chunks, planning time for unforeseen events, defining a time to target, start time, and deadline, and taking into account all resources needed to finish a task. Furthermore, students are expected to reflect on their use of time and revise their study plan regularly. Ideally, this should enable them to build up an individual time management strategy (Price & Maier 2007).

Having painted this picture of an ideal student, there is evidence that many students struggle to implement these guidelines. Main (1980) found that the most common "complaint of students of all ages, levels of study and disciplines, is difficulty in organising and timetabling their work".

Our study is aimed at evaluating students' current use of time management practices, devices, technologies, applications, and their features. We are also interested in time management for collaborative learning. Many applications address this problem by providing groupware features. However, most of them are designed for

workplace use, which is a much more structured environment compared to tertiary education. Furthermore, time management for learning is mostly individual, so that it typically involves less collaboration than professional work, needs to consider social aspects of learning, and is highly diverse. Therefore, the second purpose of our study was to gather requirements for a time management system prototype we are currently developing at the University of Southampton, and which builds on our previous work in this area (Rebenich & Gravell 2008). Our aim is to improve the existing application and address its shortcomings. Unlike traditional calendaring and groupware applications, our system also incorporates technologies we believe will complement time management for learning and make it more effective, such as enhanced presence (Eisenstadt & Dzbor 2002), project-based learning and task collaboration (Mochizuki et al. 2008), location awareness, and social networking features. The results of the survey also helped us design the integration of our system into existing applications.

2 Methodology

Our study involved 137 out of approximately 1200 students studying on a degree in the School of Electronics and Computer Science (ECS) at the University of Southampton in September 2009. ECS offers a wide range of undergraduate and postgraduate courses in Electronics and Computer Science. Students were asked to fill in a 11-item on-line questionnaire which was divided into three sections (see Appendix for details). In the first third of the questionnaire, we asked for devices and frequency of use, while the second part was about students' current use of time management practices. In the third part, students were presented with a list of time management system features and asked to rate their usefulness for managing their study time. Eight questions required participants to choose one answer from an ordinal scale comprising between 4 and 5 different items, and three questions required them to provide a textual answer. However, we did not enforce that students answer all questions, resulting in from 1 up to 13 missing values dependent on the question. Similarly, only 87 participants (63.5%) provided a textual response to the question about time management practices.

In part one of the questionnaire, we provided a list of specific devices (PC/Mac, laptop/notebook, netbook, Windows smartphone or PDA, iPhone, iPod Touch, Android phone, other touch-phone, other PDA, other mobile phone) and asked students to indicate whether they own the device and if so how frequently (never, rarely, sometimes, or often) they use it. For each mobile device in the above list, we also wanted to know how frequently they carry it on campus.

Then, in part two of the questionnaire, we were interested in students' use of specific calendaring software (MS Outlook, MS Outlook Web Access, MS Calendar, Sunbird, Google Calendar, Apple iCal, mobile phone calendar) and features (appointments, tasks, collaborative event planning, reminders, contacts, and email) provided by these applications. There were 5 possible answers ranging from “never” to “daily”. We also asked students to indicate which one of the applications they used most for study planning. Finally, participants rated the helpfulness of the above calendaring software features for the same purpose on a scale from 1 (not at all helpful) to 5 (extremely helpful).

The third part of the questionnaire dealt with personal time management strategies for study planning. Students were asked to provide a textual summary of their current way of planning their studies. Answers to this question were analysed in the following way: First, we created three categories, namely time management technologies, features, and strategies, based on students' responses. Each category consists of several items as shown in Table 1.

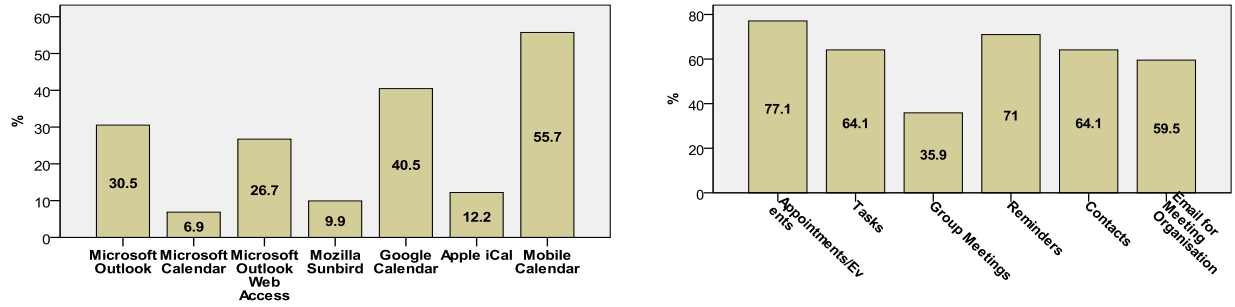
Category	Items
Technologies $j \in [1,3]$	(1) Pen and paper, (2) software, (3) without any tools
Features $j \in [4,10]$	(4) Diary, (5) calendar, (6) log book, (7) Gantt charts, (8) spread sheets, (9) to-do lists, (10) timetable
Strategies $j \in [11,24]$	(11) Considering deadlines, (12) course credit (number of achievable marks), (13) task size, (14) subject; (15) time guessing/estimation, (16) FIFO (performing tasks in the order they were created), (17) prioritisation, (18) work plan, (19) plan review and re-adjustment, (20) sub-tasking; (21) leaving everything till the end, (22) applying a strategy found in literature, (23) constant work, (24) fixed working times and quotas (per day/week)

Table 1: Time management response categories

We then created a binary matrix A with each $a_{ij} \in [0,1]$ where i denotes the case number (1 to 87) and j the category item (1 to 24); $a_{ij} = 1$ indicates that the ith participant mentioned the corresponding item j in their answer, and $a_{ij} = 0$ the absence of that item.

In addition, students could rate their agreement with 5 statements: whether they considered themselves good time managers (1), whether they struggled to meet deadlines (2) or had missed them in the past (3), if they were good in estimating a time to task (4), and if they thought that contemporary software does not provide enough features supporting their time management (5). In the next question, they were provided with 13 software features we are planning to implement in our on-line time management platform prototype, and they could rate how helpful they expected them to be on a scale from 1 (not at all helpful) to 5 (extremely helpful). Besides these pre-defined features, some participants also provided textual feedback on other features they would like to see in such a system.

Furthermore, we defined three separate scores on category matrix A, referring to the categories extracted from students' textual responses (see Table 1). The technology score is defined as $S_T = \sum_{j=1}^{3} a_{ij}$, the feature score as $S_F = \sum_{j=4}^{10} a_{ij}$, and the strategy score as $S_S = \sum_{j=11}^{24} a_{ij}$. Similarly, we can create a calendaring software feature use score $S_C = \sum_{j=1}^{6} c_{ij}$ with each j referring to one of the software features shown in Figure 1b and $c_{ij} \in [0,4]$ being the frequency of use. We then analysed the data using appropriate inferential techniques and correlation tests such as the Chi-Square, Mann-Whitney U, and Spearman Correlation test.



(a) Use of calendaring software (at least every couple of weeks)

(b) Use of calendaring software features

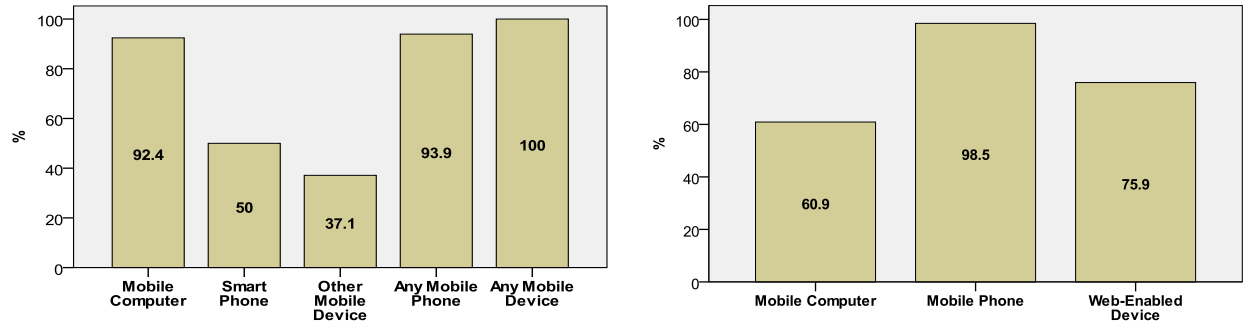
Figure 1: Use of calendaring software and their features

3 Results

The analysis of part one of the questionnaire showed that all participants (100%) own at least one mobile device. More specifically, 93.9% own a smartphone and/or ordinary mobile phone, 92.4% a laptop and/or netbook, 50% a smartphone, and 37.1% an iPod Touch and/or any other PDA (see Figure 2a). Of all participants, 98.5% carry a mobile phone, 75.9% a web-enabled mobile device (laptop, netbook, or web-enabled smartphone), and 60.9% a laptop and/or netbook on campus at least sometimes, which is the third of a 4-item scale ranging from "never" to "often" (see Figure 2b).

With regard to calendaring applications, the majority of students (55.7%) use calendaring software on their mobile phone, followed by Google Calendar (40.5%), MS Outlook (30.5%), and MS Outlook Web Access (26.7%). The latter is provided by default to every student of the University of Southampton. Less popular are Apple iCal (12.2%), Mozilla Sunbird (9.9%), and Microsoft Calendar on Windows Vista (6.9%). Amongst all calendaring features, students prefer appointments (77.1%) over reminders (71%), followed by tasks (64.1%), contacts (64.1%), email for meeting organisation (59.5%), and group meeting features (35.9%). The latter feature is not provided by all of the above calendaring applications. Furthermore, 71% use reminders attached to tasks or appointments. Percentages quoted here refer to software or features used with any frequency other than "never" (see Figure 2).

When it comes to study planning, 35.5% of all participants indicated that they did not use any software, while the majority (64.7% in total) use Google Calendar (15.4%), MS Outlook (14.7%), their mobile phone calendaring application (11.8%), Apple iCal (7.4%), Mozilla Sunbird (3.7%), or another application not provided in the list (8.1%). Only 1.5% chose MS Outlook Web Access provided by the university. Of all software features, appointments (70.7%) and reminders (64.7%) are perceived most helpful for study planning, that is, they were rated helpful or extremely helpful.



(a) Devices owned by students

(b) Devices used on campus (at least sometimes)

Figure 2: Mobile devices owned by students and their use on campus

Regarding students' agreement with time management statements, 61.5% of all participants consider themselves good time managers, 25.2% are not sure, and only 13.3% admit that they are poor in managing their time.

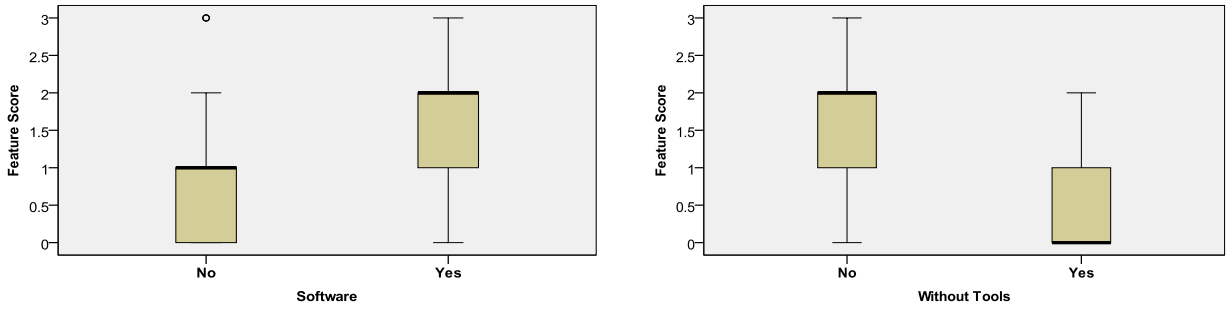
The analysis of the time management strategy part of the questionnaire is based on 87 textual responses. As described in section 2, we had to categorise these responses. This means that only time management practices explicitly mentioned were considered. However, the absence of an item in a participant's response does not necessarily imply that they do not apply it in practice. All results obtained from this question should therefore be treated with caution. Most mentioned technologies were software (43.7%) as well as pen and paper (35.6%), while 29.9% indicated they do all time management without the help of any tools. Some people also use a combination of technologies, such as "software" and "pen & paper" (11.5%), "pen & paper" and "no tools" as well as "software" and "no tools" (6.9% each). Most used features are diaries and calendars (49.4%), to-do lists (32.2%), and timetables (23%). When it comes to actual time management strategies, considering deadlines (64.4%), guessing task duration (24.1%), considering task size (12.6%), and prioritisation (11.5%) are most prevalent.

Technology score S_T, feature score S_F, and strategy score S_S are all negatively skewed with median 1 and interquartile range (IQR) 0, 2, and 2, respectively. In contrast, the calendaring software feature score S_C is normally distributed ($p = 0.634$, Kolmogorov-Smirnov $Z = 0.746$) with mean 16.22 and $\sigma = 6.566$.

4 Correlations

The helpfulness rating of software features for study planning correlates strongly and positively ($0.511 \leq r_s \leq 0.712$, $p < 0.01$) with their frequency of use (see Figure 1b).

Regarding students' agreement with time management statements, we found the following correlations: agreement with being a good time manager correlates ($p < 0.01$) negatively with struggling to meet deadlines ($r_s = 0.528$) and missed deadlines ($r_s = -0.407$), while a positive correlation ($r_s = 0.388$) was found with being a good time estimator.



(a) Relationship between software and feature score with 3 outliers scoring 3.0

(b) Relationship between "no tools" and feature score

Figure 3: Time management practice relationships

Those who admitted to struggle with deadlines also found that they were poor time managers ($r_s = -0.528$, $p < 0.01$), poor time estimators ($r_s = -0.309$, $p < 0.01$), and that there was not enough software support for study time management ($r_s = 0.184$, $p < 0.05$). Furthermore, a positive correlation was found between S_C and the agreement with time management statements "struggle with deadlines" ($r_s = 0.185$, $p < 0.05$) and "missed deadlines in the past" ($r_s = 0.345$, $p < 0.01$).

As for textual responses to time management practices, use of software for time management correlates positively with the two features "calendar" ($r_s = 0.443$, $p = 0.000$, $\chi^2 = 17.08$, $d_f = 1$) and "timetable" ($r_s = 0.345$, $p = 0.001$, $\chi^2 = 10.357$, $d_f = 1$), and also with the overall feature score S_F ($r_s = 0.427$, $p = 0.000$, Mann-Whitney $U = 478.0$, $Z = 4.042$, $r = 0.433$), while it is negatively correlated with guessing as a method of time-on-task estimation ($r_s = -0.280$, $p = 0.009$, $\chi^2 = 6.827$, $d_f = 1$). It was also found that those who indicated that they did time management without any tools use fewer features, resulting in a lower feature score S_F ($r_s = -0.506$, $p = 0.000$, Mann-Whitney $U = 296.0$, $Z = 4.805$, $r = 0.515$). The relationships between feature score and the technologies "software" and "no tools" are shown in Figure 3.

Feature	Very Helpful	Helpful	Not So Helpful
Task/event synchronisation	74.3%	12.5%	13.3%
Schedule meetings with supervisor	74.8%	18.9%	6.3%
Schedule group meetings	76.3%	14.2%	9.4%
Division of work in group assignments	58.3%	26.8%	15.0%
Observing group progress	58.7%	24.6%	16.7%
Time-on-task estimation	57.5%	18.9%	23.6%
Critical task warnings	77.0%	15.1%	8.0%
Locating friends on a campus map	36.2%	18.9%	44.8%
Finding experts	41.3%	27.0%	31.8%
Location-based reminders	45.6%	23.2%	31.2%
Finding learning resources	48.4%	31.0%	20.6%
Geo-location and sharing of resources	38.7%	29.8%	31.5%
Resource rating and annotation	48.0%	30.4%	19.7%

Table 2: Feature ratings

5 Discussion

The results of the survey presented here show that all participants (100%) own a mobile device, and around 96% of them own and nearly 76% of them carry at least one web-enabled mobile device on campus. These numbers are fairly high and could be explained by such devices becoming more affordable and powerful, smaller, and more and more features being combined in one device. It is also likely that Computer Science and Electronics students are slightly ahead of students in other disciplines. An extended, cross-disciplinary survey could shed more light on this issue. However, we believe that this development will enable more connected and complex mobile learning applications and facilitate their adoption in the future. In particular, these results suggest that future mobile learning environments or applications should be web-based rather than tailored to a particular platform or device type.

We also found a fairly diverse use of calendaring software and their features, often in combination with more traditional approaches to time management, for example, paper diaries and others. This reflects the fact that study time management is an individual activity. The increased prevalence of mobile devices, however, requires appointment and task data to be synchronised, accommodating a wide range of different platforms. Google Calendar provides a central store for such data as well as suitable synchronisation tools, which might explain why so many participants (40.5%) make frequent use of it and why it leads the list of applications used for personal study planning. Whether collaboration and sharing features of Google Calender also contribute to its popularity is subject to future research. A very low percentage of participants use MS Outlook Web Access for study planning despite

this being university standard software. This might be due to the fact that students can only use it through a web interface, have no direct access to their Exchange account via MS Outlook, and hence cannot make use of synchronisation.

We were also surprised that the majority of participants (61.5%) claim to be good time managers. Unfortunately, we did not ask students to provide their year of study in the questionnaire, hence we cannot tell if there is a difference between freshmen and more experienced students. However, the findings of Trueman and Hartley (1996) suggest that reported student time management scores increase with student age, in other words, more experienced students are more likely to report good time management practices than freshmen. Also, in order to evaluate whether there is a difference between reported time management proficiency and missed hand-in deadlines, we are planning to analyse statistics of our electronic coursework hand-in system and compare the outcome to our results.

Furthermore, we could not find a relationship between time management proficiency and increased use of calendaring software or their features, meaning that time management is a personal skill supported by a range of different mediums or technologies, including software and traditional approaches. Our findings also confirm that short-range study planning is more prevalent because the majority of respondents indicated that they were primarily deadline-driven. We follow the interpretation of Britton and Tesser (1991) that this is due to the nature of the university learning environment.

Conversely, those participants who admitted they struggle with deadlines or missed them in the past made more frequent use of a higher number of calendaring software features. One possible explanation is that they attempt to compensate deficiencies in their personal time management by using software. Those students also found that software features did not sufficiently support them in planning their studies, implying that they would prefer time management software to be more tailored to students. Besides, those who use software for time management make less use of guessing as a way of estimating time on task. This might be due to the fact that the use of software makes it easier for them to keep track of the time they have spent on similar tasks in the past, or that they rely on automatic time estimation features provided by such software.

Our next step is the development of a time management system prototype accommodating the special needs of university students. The design of this system is driven by the outcomes of our survey. First, the high proportion of students carrying web-enabled devices on campus suggests that a web-based system is the best solution since it can be delivered using central facilities in a platform-independent manner. Second, due to the diversity of individual time management strategies, the system should not impose a specific strategy on its users. Instead, it could either adapt to learner personality aspects and suggest the most suitable strategy, or merely provide a set of tools along with some guidance as for how these tools could be used for individual study planning. Third, the system should be integrative, that is, provide course timetabling information, coursework deadlines and exam dates, collaborative features for group assignments and study groups, and integration with existing calendaring software. Some of that data might originate from third-party systems, for example, learning management systems. Furthermore, the prevalent use of mobile devices requires all system data to be available for synchronisation. Fourth and finally, the deficiencies of mainstream calendaring and time management software with regard to study planning should be addressed. In our survey, we asked participants to rate the helpfulness of certain features (see Table 2) we deemed beneficial to time management for learning. Based on these ratings, we are planning to enhance collaboration by using enhanced presence (Eisenstadt & Dzbor 2002) and awareness (Gutwin et al. 1995), and to provide features supporting student motivation adapted from project-based learning applications (Mochizuki et al. 2008).

The results of an experiment conducted using the prototype software will show whether these features provide any additional benefit compared to traditional calendaring software and in view of student performance, stress, and motivation.

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Appendix

Time Management and Technology Survey Questionnaire

(1) Please indicate which of the following devices you own or have unrestricted access to, and how often you use them. Choose "N/A" for every device you do not own or have only limited access to. Options per item: N/A, never, rarely, sometimes, often.
   (a) Internet/network-enabled PC/Mac
   (b) Laptop/Netbook
   (c) Netbook
   (d) Windows-powered smartphone or PDA
   (e) Apple iPhone
   (f) Apple iPod Touch
   (g) Android-powered phone
   (h) Other internet/WiFi-enabled touch phone
   (i) Other internet/WiFi-enabled PDA
   (j) Other mobile phone

(2) How often do you carry the following devices with you when you are on the university campus? Options per item: N/A, never, rarely, sometimes, often.
   (a) Laptop/Notebook
   (b) Netbook
   (c) Smartphone, PDA, or touch phone
   (d) Mobile phone

(3) Which of the following calendaring software do you use and how frequently? Options per item: never, once every couple of weeks, once a week, 2-4 times a week, daily.
   (a) Microsoft Outlook
   (b) Microsoft Calendar (on Windows Vista)
   (c) Microsoft Outlook Web Access (as provided by the university)
   (d) Mozilla Sunbird
   (e) Google Calendar
   (f) Apple iCal (on Mac)
   (g) Calendaring software on mobile phone, smartphone, or PDA

(4) Which of the following calendaring software features do you use and how frequently? Options per item: never, once every couple of weeks, once a week, 2-4 times a week, daily.
   (a) Appointments/events
   (b) Tasks

(c) Collaborative scheduling of group meetings
(d) Reminders
(e) Contacts
(f) Email for organising meetings

(5) When planning and organising your studies, which one of the above applications do you use the most?
(a) I do not use any calendaring applications for planning my studies
(b) Microsoft Outlook
(c) Microsoft Calendar (on Windows Vista)
(d) Microsoft Outlook Web Access (as provided by the university)
(e) Mozilla Sunbird
(f) Google Calendar
(g) Apple iCal (on Mac)
(h) Calendaring software on mobile phone, smartphone, or PDA
(i) Other

(6) Please rate how helpful you find the following software features with regard to planning and organising your studies, keeping track of deadlines, personal time management, and so on. (1 = not at all helpful, ..., 5 = extremely helpful)
(a) Appointments/events
(b) Tasks
(c) Collaborative scheduling of group meetings
(d) Reminders
(e) Contacts
(f) Email for organising meetings

(7) Please rate your agreement with the following statements. (1 = strongly disagree, ..., 5 = strongly agree)
(a) I consider myself a good time manager.
(b) I often struggle to meet deadlines.
(c) I have missed deadlines in the past.
(d) I can estimate the time I need for studying a subject or performing a task fairly accurately.
(e) Contemporary calendaring software lacks features supporting learning and studying.

(8) Please explain briefly how you currently plan your studies or manage your time. (Textual response)
(9) On a scale from 1 to 5, how would you rate the helpfulness of the following features in student organiser software? (1 = not at all helpful, ..., 5 = extremely helpful)
(a) Importing and exporting tasks and appointments to your personal calendaring software (such as Outlook, Sunbird, and so on)
(b) Scheduling meetings with your tutor/supervisor
(c) Scheduling group meetings and organising study groups
(d) Organising who does what in group assignments
(e) Observing the progress of other group members when working on group assignments
(f) Automatically estimating the time to commit to a task based on your personal preferences and learning style
(g) Keeping track of your own progress and receiving warnings when tasks become critical
(h) Knowing where your friends and colleagues are on the campus (for instance, on a virtual map)
(i) Finding people who can help you based on their interests and experience and locating them on a virtual map
(j) Attaching geographical locations to tasks and meetings and being reminded when you are in the area
(k) Finding learning resources nearby which you can use for achieving a task
(l) Pinning resources you have discovered on a virtual map and sharing them with your group or everybody
(m) Rating and annotating such resources, for example, as for their usefulness

(10) Are there any other features you would like such as student organiser system to provide? If yes, please make suggestions. (Textual response)

(11) If the university/school provided coursework hand-in dates, deadlines, and timetabling information in a format which can easily be imported into your calendaring software, would you make use of them? Options per item: yes, no, don't know.