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How do students use digital technology to manage their university-based data: strategies, accumulation difficulties and feelings of overload?

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ABSTRACT

Technology to enable and support learning and teaching is widespread in university settings. One consequence of such technology use is the accumulation of large volumes of digital data. The acquisition of, and failure to, discard digital content can lead to digital clutter. The potential negative consequences of digital clutter have been examined mainly within a workplace context. Far less is known about how university students manage their academic digital data and whether they have strategies to deal with excessive digital clutter. Eighteen undergraduate students took part in a one-to-one or group-based interview to discuss their digital data management strategies including accumulation and deletion behaviours. Thematic analysis led to three themes: (1) Digital data accumulation across the student journey, (2) Reactive and evolving digital data management strategies and (3) Data overload: Anxiety, loss of productivity and feeling overwhelmed. The findings capture the complexity of feelings students have about different types of digital technology and the strategies they use to manage increasingly large volumes of digital data. Findings are discussed in relation to the need for better support and guidance for students around the use of digital technology to manage their data during their time at university.

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1. Introduction

Increasingly, everyday engagement with university-related information is digitally managed including access to lecture materials, communication and assessment processes. This situation has intensified during the COVID-19 pandemic with many aspects of teaching and learning as well as support and administrative services going online. Daily interaction with technologies inevitably leads to the generation and storage of large volumes of digital data and in some cases digital clutter.

Digital hoarding has been defined as ‘... the acquisition of and failure to discard digital content, leading to the accumulation of digital clutter’ (Sedera and Lokuge 2018) and recently, a small number of studies have highlighted the negative consequences of digital clutter, including feelings of anxiety and loss of productivity in relation to the accumulation of data (van Bennekom et al. 2015; Sedera and Lokuge 2018; Vitale, Janzen, and McGrenere 2018; Sweeten, Sillence, and Neave 2018).

Many people have a strong relationship with their data (Vitale, Janzen, and McGrenere 2018). For example, a study designed to understand the archiving strategies of academics (both physical and digital)

found that people kept and curated material to build a legacy, share information, preserve important possessions, and construct an identity (Kaye et al. 2006). More recently, studies have indicated a number of different individual and organisational factors affecting the extent to which people hoard digital data in the workplace (Oravec 2018; McKellar et al. 2020).

While the implications of excessive clutter for employees and organisations in terms of reduced productivity, cybersecurity and data protection are becoming better understood (Neave et al. 2019), far less is known about the ways other groups accumulate and manage their digital data and the role of different technologies in this process. Students, in particular those moving away from home, have new systems to navigate and new data management responsibilities. We know that technology, especially social media, plays an important role in both the social and educational identity of students and is important at key transition points (Dyer 2020; McLaughlin and Sillence 2018; Thomas et al. 2017) but how students accumulate digital data, how they feel about their data and the extent to which these feelings alter over the course of their degree is less well understood.

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Managing digital data can be seen as a challenge by students who find the process frustrating in the face of overloaded information spaces (Trace and Karadkar 2017) and we know from survey studies that students often perceive a gap between their actual Personal Information Management (PIM) practices and their ideal practices (Alon, Forkosh-Baruch, and Nachmias 2020). Digital data management also varies according to individual differences and variability in PIM practices is pronounced. In students, as with employees, we see a range of practices around the storage of email, the utilisation of online resources and the organisation and storage of documents (Park 2011). More conscientious individuals exhibit better organisation and more neurotic individuals keep greater amounts of information to hand on their desktop (Massey et al. 2014) and there is heterogeneity in student behaviour in terms of coping with the range of information from official university emails (Ha et al. 2018).

There are very few studies that provide a more in-depth account of students' experiences with their data. In a notable exception, Forkosh-Baruch and Alon (2020), examined 32 students' written narratives on their digital data personal as well as academic and identified several conflicts and dilemmas regarding PIM practices including concerns over loss of data, privacy and information overload. This study provides some insights into student PIM practices but does not permit an in-depth focus on academic digital data. In our study, we extend this work to focus on academic digital data. We take a qualitative approach to look in more depth at how university students manage and respond to their academic digital data. We specifically focus on first-year and final-year students to understand more about the development of these behaviours and look to see how feelings towards digital data, the technologies used and the consequences of excessive digital clutter change over the course of the student's degree. The transition into university is a key time for the development of student identity, with students using both familiar and novel technologies to support their social and educational goals (Thomas, Orme, and Kerrigan 2020). For final-year students, decisions about data retention and deletion are also important and arguably more urgent as they navigate the transition into graduate employment or onto further, postgraduate study. In this study, we examine university students' experiences of managing their academic digital data, to understand how they feel about their data and the consequences of data accumulation. Our research question, therefore, is 'How do first year and final year undergraduate university students experience the management of their academic digital data?'

2. Methods

2.1. Participants

In total, 18 undergraduate students (16 women, 2 men) at a university in the UK were recruited through email and word of mouth. Nine first-year or Level 4 (L4) undergraduate students and nine final-year or Level 6 (L6) undergraduate students took part in either a group discussion ($N = 13$) or an individual interview ($N = 5$). All students were aged 18–22 except for one mature student who was aged 40. All participants were studying Psychology except for one student who was studying Design.

The majority of data collection took place prior to March 2020 meaning that these students had not experienced the COVID-19 pandemic at the point of participation. Six students (two L6 and four L4) were interviewed in late 2020 and therefore had experienced at least one semester of their undergraduate degree during the pandemic.

2.2. Materials and procedure

The discussion schedule was based on the questions devised by Sweeten, Silience, and Neave (2018) and then extended to include different types of digital data and to ensure the focus remained on the participants' student identity and their academic data. The questions explored how individuals managed their student-related digital files and focussed on the following areas: (i) the volume of different types of digital data students have, (ii) their approach to storing and organising their digital data, (iii) how they decide what's important to keep and what can be deleted and (iv) how they feel about their data and the value they place on it. Finally, students were asked to reflect on any guidance they'd been given regarding their management of their data during their time at university and to reflect on their planning for transition to employment or postgraduate study.

All the discussions were audio recorded and transcribed verbatim for analysis. For ethical reasons, all participants were assigned a unique number, and any identifying information was removed from the transcripts before analysis. Two members of the research team (Blank for review) conducted the discussions staying in close contact before and afterwards to check understanding of the questions and to debrief around each session. All the interviews and three of the focus groups (Guest, Namey, and McKenna 2017) took place in a quiet location at the University campus. Two focus groups ($N =$ took place during the COVID-19 pandemic and thus were carried out online due to

the restrictions). All participants were provided with an information sheet, signed an informed consent form, and were fully debriefed at the end of the session. Data collection sessions lasted between 40 min and 1 h.

2.3. Analysis

Following thematic analysis (Braun and Clarke 2006), the transcripts were read and re-read for meaning and initial comments and thoughts were noted under four key headings relating to the interview schedule. After reviewing these notes, the decision was made to analyse the data from the L4 and L6 students together rather than to treat them as separate data sets as there was considerable overlap between the two. Any key differences are discussed below.

The transcripts were examined in relation to how individuals managed their student-related digital files and analysis focussed on the following areas: (i) the volume of different types of digital data students have (ii) approaches to storing and organising digital data, (iii) retention and deletion activity (iv) feelings towards digital data. These extracts were reviewed and summarised independently by two of the researchers (Blank for review) and this was followed by a period of close discussion as the data were grouped into meaningful codes and then three overarching themes. The themes were then discussed across the wider research team and named appropriately.

3. Results

The findings from both the Level 4 (L4) and Level 6 (L6) students show a diverse and evolving set of strategies around digital data management and a complex set of feelings towards the different types of technology they use and the digital data they have stored. The findings are captured in three themes: (1) Digital data accumulation across the student journey, (2) Reactive and evolving digital data management strategies and (3) Data overload: anxiety, loss of productivity and feeling overwhelmed. The themes are described below supported by illustrative quotes.

3.1. Digital data accumulation across the student journey

This theme captures the digital data students accumulate during their time at university and explores the reasons why this data builds up. Students are surrounded by a number of different types of academic digital data including notes, assignments, drafts and planning documents, research data and analysis output,

lecture slides and journal articles. All students acknowledged they had a lot of digital data and that some of it was not necessarily of value but that they were often afraid of deleting data. Data was usually kept 'just in case' as it might be useful later and one student described the data they retained as providing a kind of 'security blanket', even though the participants were not always able to identify its future practical value.

Yeah, I don't really delete anything. I even think that, I think after each assignment I go back through and think "Will I ever need this in the future?" If not, then maybe I do delete it, but then I feel really bad about deleting anything because I just, I honestly just don't know what I'm going to need in the next few years. (P10, L6)

I always feel like people can just delete stuff easily and I'm always like "Erm, what if I need this?" and "Oh, am I gonna need this later?", what happens if I delete it and then I'm gonna need it like after and I'll be like "Why did I delete this?". (P1, L4)

For some, data was retained simply because the cost of sorting and extracting the valuable data was too high. Keeping everything was a less time-consuming approach. This was particularly the case for email. Students accumulated a large number of emails yet this form of data was rarely seen as valuable. In fact, most students thought that emails were often personally irrelevant and frequently irritating and unnecessary. As one L6 student explained 'I don't get any valuable information through my emails'. However, the large volume of daily emails, often from central university services or automated notifications from the Electronic Learning Portal (eLP or 'Blackboard') meant many people simply kept them all and did not have the time or the inclination to sort through, select and delete appropriately. This task was not seen as valuable in comparison to other tasks.

I think I've just kind of put it off until now and I think it's a bit too late now, to start organizing now, but if I did, I would just be sacrificing my university work and getting that done. (P17, L6)

Certain pieces of digital data were seen as potentially more valuable and were often kept because they had a clear future academic purpose, e.g. as a template or guide for an essay. This is illustrated in the L4 and L6 student comments below.

The labs for me as well, because obviously, we're gonna always be doing that. So I'm going to always refer back to them and like how it can improve and that kind of thing. (P6, L4)

I still refer back to what I wrote up at first year because sometimes, sometimes I've like forgotten how I actually wrote up all the details, so I just look at one of my old

papers and think “Ok that’s how you do it” so I’d not like to delete those. (P12, L6)

Sometimes, data was kept because it represented the effort and hard work that students had put into their studies and their assessments. This was already noticeable for L4 students who expressed attachment to their own work separate from its potential use in the future. Students at L6 expressed the same sense of attachment to their own work and explained that they kept the data because it symbolised their effort.

I know I won’t need them but like, it’s nice like you know when you’ve done a lot of work for something you don’t want to then, even though you know you weren’t ever gonna look at it again, you don’t want to delete it cos’ you know how much work you’ve done on it. (P2, L4)

If I’ve actually made notes on that lecture regardless of whether its relevant or not if I’ve actually done like a full word document and I’ve actually spent my time doing it I can’t bring myself to delete it cos like I’ve spent time on it and I think I’ve done that there so I might need it even though I probably never would but because I’ve actually done it myself I don’t want to get rid of it. (P17, L6)

Overall, it was clear that data that the students had generated themselves was seen as most important and this was the data that often accumulated and was retained. The effort and time taken to create notes and assignments was valued by students and was a key reason for retaining data. Students also accumulated other types of data, for example, slides, journal articles and lecture recordings but did not retain this data for long periods. Participants were happy to delete these data when they were finished with them knowing that they could simply go and fetch them again from Blackboard or online repositories if they were needed.

I think it varies for me sometimes with like lectures or suggested reading because I know they are all on Blackboard if I forget to save one I know it’s not the end of the world I know I can also go back and get it cos I do a lot with lectures actually like I’ll save some and other ones where I just want to go back and check something ... I know is going to stay on Blackboard I don’t worry about it as much its more my stuff that I want to make sure is definitely saved. (P18, L6)

3.2. Reactive and evolving digital data management strategies

The previous theme indicated the extent to which students accumulated digital data over time. This second theme illustrates how the students attempted to manage that data. Here we see shifting and developing strategies

applied differentially to certain types of data. Students’ digital data management strategies varied enormously both between L4 and L6 and within each year group. Some students were able to detail meticulous management strategies that often included a complex hierarchical folder system based around year, semester and module code, naming conventions, colour coding and short cuts to current work. Other students had less well-defined strategies, or no strategy at all e.g. all individual documents were simply saved on the desktop.

I don’t organise it. It’s everywhere. I don’t have any filing to anything. When I save something, I save it to my desktop. And then I’ll do something else. Save it. I’ll do it again and save it as number two ... Number four ... I have no filing. (P14, L6)

Definitely maintaining the system. I have that problem anyway, it’s, it’s a case of “I can’t be bothered”. I can’t be bothered to find this one file this piece of work is supposed to go in, I’m just gonna stick it on the desktop and deal with it later. That later never comes. (P3, L4)

Strategies were more noticeable for L6 students and the final year project for these students was clearly a driver for further data management. During this time, students saw a large uptick in the volume of digital data they were having to manage. L6 students, in particular, described how their strategies had changed and evolved during their time at university and identified the key triggers for change.

I think I’ve changed like, I used to like, write, and then I type it now, but now in third year, I like store all of my lecture notes in one whole document. So I just keep going back at it, instead of like, creating another file. (P16, L6)

I think the workload between first year and second year was really really different so I think yeah it got really really confusing quite quickly so I knew that if I didn’t start organizing it I was going to get very overwhelmed and I think a lot of the second year stuff went on from first year some of the core modules I think and when I was trying to look back at some old notes I literally had no idea where to start looking and I think it got to the point where I was I don’t want to do this in third year if I need to go back to work that I’ve already done so I organised it into years, semesters, modules it definitely made it much easier. (P18, L6)

Many students still thought that their strategies needed improvement although they weren’t always sure where to start or what precisely needed to change. L4 students recognised that they had to make more of an effort to develop an effective strategy now they were at university compared to school or college. Many L4 students presumed that they would be having to deal with

more data as their degree progressed and so acknowledged that their strategies would have to change to accommodate this increase.

I usually try to file it away straight away cos like I lose documents quite easily like I used to be quite disorganised especially in secondary school and stuff so I've just made the conscious effort to, now that I'm at uni, to try and make sure that I know where everything is. (P1, L4)

It will probably get more organised. Coming into second and third year I'll probably get more data just because there's a lot more stuff to do. It'll be a case of I'm gonna have to put in a more strict system. (P3, L4)

There was also a sense that any large changes to their strategies needed to take place during periods away from university, e.g. during the Summer or Christmas breaks as this provided the time and space to tackle the restructuring. Some students proposed these time periods prospectively while others recalled how they had succeeded previously in using these breaks to good effect.

Yeah cos' I didn't used to do it before erm, I only like, put that in place around Christmas time and before it was just a complete mess and like things that I'd saved I didn't know what was where and I had like a CV and stuff, but I just couldn't find it or anything really so I just, was like, this should probably be organised. And that's why I've done that, and it has definitely helped. (P2, L4)

The majority of students did not have a strategy for managing their email data. At L4, students typically let their emails accumulate in the inbox. Emails were simply 'checked or triaged' and then left unsorted and usually undeleted. Most people were happy to scroll through their inboxes to find the information or to use the search function to locate a specific email. However, as emails accumulated this scrolling strategy became less fruitful and some students discussed bypassing the email system by screenshotting important emails and sharing with friends or asking 'more organised' friends to forward them the information. Only three students, all L6 students, discussed any form of sorting, storing or deletion strategy for email, these students also had fairly elaborate strategies for dealing with their other digital data and talked about constantly seeking ways to improve their approaches. For these students, archiving or at least sending on 'important' or 'potentially important' emails to another email inbox was a strategy to help manage large volumes of email data.

Like I always wanted to have some way to organise the emails like the uni emails, but I just didn't know what to

do. Like, because I hadn't used Outlook before I had no idea how it worked like. And I think in first year I tried to have some other system of like labelling them but then I realised that it was way too complicated. And it wasn't until like six months ago that I realised you can archive emails and like that's how people normally deal with it. And I was like, "This is game changing!" why haven't I been doing this all along? (P13, L6)

For some students, part of their management strategy involved additional storage and making backup copies as accidental loss through the failure of a personal device, for example, was a key concern. Students predominantly used their personal laptops for storing their data, but some students also used cloud storage, USB drives and external hard drives. There was more discussion of backups and automatic synching of data in L6 students compared to L4 but this was not universal. Students reported that hadn't received any guidance from the University or at a departmental level regarding the management of their digital data. They felt that they were somehow expected to know how to manage their data and to access digital data stored on systems such as Blackboard. Many L6 students felt their management strategies had improved over the course of their degree but this had taken time and guidance at the start of their student journey would have been useful.

3.3. Data overload: anxiety, loss of productivity and feeling overwhelmed

This theme illustrates the complex relationship participants had with digital data. This varied between students and in relation to different forms of data. There was evidence of anxiety provoked by the accumulation and retention of large quantities of digital data and students noted the negative impact on productivity caused by unorganised data.

The 'visibility' of large quantities of digital data was stressful for many students. This was most noticeable with emails. Unread emails felt stressful as did constant notifications. Despite students recognising that many emails were not personally relevant they were still difficult to ignore, and students found them disruptive and distracting.

And so it gets so annoying because they [emails] don't come all at once it's just throughout the day every 10 minutes you have a new email like oh what's that, maybe check, and it's the same thing every 5 minutes. (P11, L6)

I look at the email and if it's not something that is related to my course, or is related to something that I know I need to read, or something, because it's actually relevant to my life, I just kind of open it. So I don't have any more unread emails. I've had the little number at like 500 before and that worried me. And it just stressed

me out cos' I'm not gonna ever have enough time to go through that. And then it's obviously there's so much stuff that is just sent to everybody. (P10, L6)

This reaction to large volumes of email data was more prominent at Level 6 but even at L4 the accumulation of large quantities of email data was overwhelming and students weren't always sure what was valuable and what should be kept or what could be deleted.

It's just that you see every now and again when you do get a Blackboard, or an outlook thing where your emails just ping all the time. By the end I'm thinking: do I need to care? Do I not need to care? Should I be paying attention? Should I look at these in case it's given us some information for next year? Or can you just not? (P4, L4)

Aside from emails, large quantities of unorganised digital data led to feelings of stress usually through its negative impact on productivity. Searching for files was time consuming although students with more coherent filing systems found navigation easier and were able to locate information quickly. Others had to rely on a less reliable search strategy or even 'opening up likely looking documents' to find the correct piece of information. For many students, the feeling of being unorganised was stressful in itself.

[For] uni, I like having it all organised because like, it's, like annoying when like, you need to go find something and you don't know where it is. And then it stresses you out more than it would if you just kept it all like organised inside. (P8, L4)

There's a few YouTube channels that I follow now that are kind of like study skills experience and they like tell you "this is a good way to organise your files and set up these systems" and that's like, helped me sort myself out. Because I just feel very stressed out when things aren't organised and like, I don't know what I'm doing and I got really behind on my work. So it's quite important to me. I think. (P13, L6)

Digital data accumulated over time for students and accordingly L6 students felt that had more data than level 4 students, although even L4 students felt that they had a lot more digital data to deal with than before they started University. All students felt anxious at the thought of losing or accidentally deleting their data. This was particularly the case for L6 students as they contemplated their dissertations. They exhibited a strong attachment to their data but this relationship was not straightforward and as one student stated it was more of a 'stress attachment'. Overall, L6 students felt that their digital data had become increasingly important to them as they had progressed through their student journey and their data felt more valuable and more stressful at the same time.

With my uni stuff, I feel more of a stress attachment to it. So, like, I save it, every time I write five new words, I save it, and then I save it and then halfway through I'll save on to a different thing. And I think just because like there's so much riding on those documents, like my dissertation document, like I've saved on to so many different things, and then I email it to myself, so I have on another platform like every now and then. And the feelings I have towards it is definitely just that it's so important that like, I need to, like, know exactly where it's at. And I usually don't close it down. I just have it still open on my laptop all the time and stuff. (P10, L6)

All students felt some uncertainty regarding the data they should keep as they moved through university. L4 students felt that they would need to keep some of their data, particularly their assignments as they moved through their degree but for L6 the value of the data beyond graduation was less clear. For students with a clearer idea of their career plans, the need to keep assignments, 'how to sheets' and certain lecture slides were apparent, and these decisions were more straightforward for students planning to undertake postgraduate study. However, for students without a clear idea of what they would be doing post-degree, the decisions about what data to keep and assessments of the future value of data were less straightforward with the exception of email which was felt to be tied solely to their time at university.

I feel like once the year is over, and we have graduated, I feel like most of the emails, if not all the emails will not be relevant to us next year, definitely would not be as concerned with emails and the rest of the e-documents that I have. (P18, L6)

4. Discussion

This study contributes to the small existing body of work on students' data management practices (Forkosh-Baruch and Alon 2020) by advancing our understanding of how students feel about their digital data and how these feelings relate to their data management behaviours. By taking an in-depth qualitative approach, the study captures the complexity of feelings students have about different types of digital data and highlights how this relates to their data management practices. Not all digital data is perceived or treated equally, and students can often find it difficult to make decisions about what should be kept and what can be discarded. We note that data can feel overwhelming, especially if not carefully organised and that data students have generated themselves is seen as most important and emails often seen as least valuable. We found that student

management strategies vary considerably both within year groups and across the university journey and strategies adapt in response to changing academic pressures.

Students generate and accumulate a lot of digital data over their time at university. They are reluctant to delete data even when it no longer appears valuable, but the consequences of poor management strategies and a large volume of data can lead to feelings of stress and anxiety. Students discussed two main types of data. First, the data they generated themselves around assignments, drafts and notes; and second, the data they were either sent via email or were able to retrieve via search engines, online repositories or using the electronic learning portal (eLP). The reasons for keeping these two different types of data were often different and the consequences of having data types accumulate also varied. The significance of self-generated data was recognised by the students early on in their degree. Students in L4 took a more practical approach to data retention at this stage, envisaging a practical use for the data in the future; while L6 students saw the data, especially their dissertation, as a fundamental element of their student identity, and as the culmination of three years of hard work. This resonates with the work on academic identity (Kaye et al. 2006) and digital collection (McKellar et al. 2020) in which academics generate and build up their academic identity through digital and paper-based collections. There was also evidence of ambivalence towards digital data with students indicating that some digital data types could be deleted without cause for concern. Although some data was clearly more valuable both in a practical and in an emotional sense, for many students its significance beyond graduation was less clear and students were uncertain as to what should be retained after the end of L6. This is interesting given that in workplace settings at least employees may be likely to hoard digital data during times of organisational change or uncertainty (Holten et al. 2016). While L6 students were mindful of the transition out of university to employment or further study, they had not connected that process explicitly to digital data management.

Although our participants had grown up with digital storage and instant access to digital information resources, they still relied heavily upon saving and storing information. For some types of data, students recognised that they could be accessing the resources as and when they needed from centrally held repositories. Other types of digital data, for example, emails, were kept 'just in case' they contained useful information or information that may be valuable in the future. Many students lacked the motivation to sort and manage their emails. This type of digital data was rarely seen

as valuable and students often reported limited engagement with their emails. This contrasts with studies of data accumulation and retention in workplace settings in which emails are the key focus of digital hoarding (Neave et al. 2019). Employees keep emails for a variety of reasons but predominantly as a source of evidence to prove that a certain communication has taken place or that work has been accomplished. This was simply not the case for students who saw emails as predominantly a one-way form of communication in which mostly generic information was pushed towards them.

While the vast majority of students retained a lot of data (not all of it valuable) they had different strategies to try and manage that data. These varied across the two sets of students and within the groups as well. There was evidence of complex and evolving strategies involving backups and synchronisation through to no strategies at all. This mirrors the work of Vitale, Janzen, and McGrenere (2018) who note a spectrum of digital data management tendencies with two extremes: hoarding and minimalism. For some, their strategies (or lack of them) appeared to cause them no concerns whatsoever but for others this was clearly not the case. Individual differences are clearly an important factor in how students as well as other groups approach their personal information management strategies (Massey et al. 2014) and we have seen that even the reasons for hoarding digital data are multifaceted (McKellar et al. 2020). While we know that physical hoarders tend to show high levels of indecisiveness (Thorpe, Bolster, and Neave 2019), understanding associated behaviours, for example, procrastination, in relation to digital hoarders would help build a more holistic picture of accumulation and deletion activities.

Interestingly, very few participants had strategies to manage their university email account and indeed there is research to suggest that complex strategies may offer little over and above a simple search and retrieve approach (Whittaker et al. 2011). Students felt that email communication was mass communication and contained generic rather than personally relevant information and as such rarely necessitated a response. The sense of hierarchical distance between the sender and the recipient in an academic setting can impact upon email management and attention. Kong, Zhu, and Konstan (2020) found emails sent by a university-level sender were less likely to be opened or read than emails sent by a departmental source. Our participants spent little time sorting, moving or deleting their email, a finding that resonates with work by Hanrahan, Pérez-Quiñones, and Martin (2016) but our findings indicated that students also failed to engage in reading and participating in email conversations. It may be

that this disengagement from email is compensated for through the use of more generic social media platforms such as Facebook (Osgerby 2013) and systems such as TEAMS that allow for more targeted and personalised communication between departmental staff and students. The strategy around emails contrasts with the more structured approach to self-generated data for many participants. Most participants were able to describe some form of strategy for managing their files. More complex data management strategies such as hierarchical folder and file structures allowed people to navigate to their data quickly and easily and this fits with the notion that the young search less for files (Bergman, Israeli, and Whittaker 2019) although there were still students who relied upon a more time-consuming search-based approach to their data.

The findings from the study also speak to the potentially negative consequences of accumulating and retaining large amounts of digital data. Having large amounts of often unorganised data left many students feeling stressed and anxious. Unorganised data led to feelings of lost productivity and time wasted searching for pieces of information. For students with clear data management strategies, the key concern was preventing accidental loss and ensuring that data was backed up. Having clearly articulated, refined strategies were a helpful way for some of managing anxiety around data, although nearly all students found the visible reminder of accumulating data e.g. emails marked as unread, overwhelming. Email volume has been linked to email stress in academics (Jerejian, Reid, and Rees 2013) and large numbers of unread emails have been linked to negative feelings around disorganisation (Grevet et al. 2014). The strategy of *marking* emails as read, even if in reality they remained unread, appeared to be a temporary way for our participants of rendering data accumulation invisible and eased anxiety.

4.1. Implications for universities and future research directions

Some participants were unhappy with their data management strategies, were fearful of data loss and also unclear as to how to better manage their data. Recent work by Alon and colleagues has suggested that individuals often feel that their PIMs are not ideal and wish they could manage their data in other ways (Alon and Nachmias 2020; Alon, Forkosh-Baruch, and Nachmias 2020). Indeed, academic staff also accumulate data (digital and paper based), for a variety of reasons (Kaye et al. 2006). Some feel anxious about all the data they have and often are unsure as to how to better manage their data (McKellar et al. 2020). All students,

whether they had clear and appropriate strategies or not, felt that guidance on how to manage their university data would be useful from the beginning of L4. Indeed, providing guidance to academic staff may be a useful way of ensuring that students can be supported should problems arise. While technological solutions for dealing with increasing volumes of data have been developed and evaluated (see, e.g. Vitale et al. 2020) these are solutions to tackle existing large volumes of data. A guidance strategy that grows and develops alongside students as they move through university might be a more appropriate way of tackling unnecessary data collection in the first instance. We saw that students adapted their strategies in the face of changing pressures or in response to a crisis point and any guidance developed for students regarding their digital data management will need to be mindful of their changing needs and priorities as they move through and beyond university. There has, and continues to be, a strong focus on supporting students' transition into university, with an emphasis on the interconnectedness of social and academic support. The need for a more integrated approach to the use of social media and digital technology more broadly within academic settings has been advocated, and this would appear to be a potentially key moment to engage students in relation to digital data management. More recently, there has been a call for universities to focus further on preparing their students for the transition out of university (Reino and Byrom 2017) or onto further postgraduate study. Our findings suggest that further work needs to focus on developing guidance around digital data management as students move into the workplace or onto further study. Recognising the ways in which data underpins a student's sense of identity alongside practical issues of data value should help guide transition support for students and future research should seek to understand how digital data relates to students' sense of identity depending on their next destination.

A potential limitation of this study is the almost exclusive focus on psychology students and the corresponding overrepresentation of female participants. Psychology students do generate, retrieve, and receive multiple types of digital data but patterns of interaction with digital data and systems may vary according to subject and institution, and this is something that warrants further attention. While the sample size for a qualitative study is satisfactory and the interviews produced rich data, it would be useful to expand the study to include a large sample of students covering a broader range of subjects. Students approach their data management differently and guidance on digital data management as with design solutions in this field

will need to be personalised and potentially customisable or at least flexible to the changing needs and preferences of students and the systems they use.

The majority of data collection took place prior to the COVID-19 pandemic. For those students interviewed during the pandemic, the situation had increased their reliance on technology, and it may be that for students experiencing the majority of their undergraduate degrees during COVID-19 that their relationship with their data would be quite different. In the wake of COVID-19, many more students have been working remotely and engaging more with technology to support the management of their digital data. Sudden changes to working arrangements, including increased reliance on e-learning systems (Qazi, Qazi, Raza & Khan 2021), reduced access to data and varying degrees of technological support and literacy will all impact on the ways in which students think about the safety and longevity of their data. Future work should continue to examine the impact of COVID-19 and other changes to working practices as well as specific adverse events in relation to data management including cyber incidents.

In summary, students have to deal with increasing volumes of digital data to manage. With little formal guidance, understanding how to manage that data can prove time consuming and difficult. Students have complex feelings towards their data and this differs from employees in workplace settings. While some of this data clearly forms part of their student identity other data is seen as overwhelming and distracting in equal measure. Future work should seek to improve guidance around digital data by taking a collaborative approach involving librarians, technology-enabled learning support staff, students and academics to identify key requirements for usable and useful resources. Such guidance for students could potentially relieve feelings of anxiety and improve a sense of productivity as students move through their undergraduate degrees.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Ethics

This study has received ethical approval from Northumbria University Health and Life Sciences Ethics Committee No: 12688.

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