The Life of a 'Digital Native'

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Abstract: There have been many claims about the characteristics of the new generation of 'digital native' students participating in higher education. The lack of empirical evidence upon which many of these early claims were based has been highlighted in a number of studies investigating students' technology ownership. However, very few studies to date have explored in detail students' day-to-day interactions with technology and the impact on their academic studies. In the current project multiple case studies were compiled to provide an in-depth exploration of technology use across university students' everyday life and academic study contexts. This paper reports on one of these case studies as a profile of a 'digital native' student who, whilst considering themselves advanced users of technology, still demonstrated a wide variance in adoption and appropriation of technology challenging the notion of a homogeneous generation who share common technology-related characteristics.

Introduction

When the notions of digital natives (Prensky, 2001) and the net generation (Tapscott, 1998) first prompted discussion around the characteristics of students entering higher education these students were said to have a high digital aptitude, a preference for multitasking, literacy across multiple media, a culture for sharing information, a need for speed of information delivery, and a desire to be constantly connected (Barnes et. al., 2007; Prensky, 2004; Oblinger & Oblinger, 2005; Dede, 2005). Early literature in this area tended to rely on anecdotal evidence to support the development of these generalisations which resulted in numerous calls for radical changes to higher education in order to best 'cope' with this new generation of learners. Over time more empirical evidence has been added to the discussion which demonstrated a more diverse picture of the digital native generation and their adoption and aptitude towards technology.

Whilst these studies have provided insight into the range and frequency of technology-based activities they have not provided an in-depth analysis of the influences and motivations that have led students to adopt and use particular technologies. The current study aims to delve further into the stories behind students' use of technology employing multiple methods of data collection to provide a holistic picture of students' interactions with technology across their everyday life and academic study contexts. In particular it explores some the technological assumptions that have been made about this generation in relation to their access, preferences, frequency of use, self-efficacy and attitude towards technology. Assumptions that, to date, have been primarily based on inadequate data from non-empirical sources. These cases provide educators with a more in-depth understanding of the diversity of the technological practices among this generation of learners. This understanding can help educators make more informed choices about the integration of technology into teaching and learning in higher education.

This paper presents one of the fourteen case studies compiled as part of a larger study. Jessica, a first-year education student, demonstrated a high level of technological literacy and a wide variety of technology adoption. An exploration of Jessica's motivations and identity in relation to technology adoption and use is presented.

Literature Review

The evolution of the discussion around the digital native generation has seen a move from bold anecdotal claims about homogenous technology adoption and literacy among young people to a more considered examination of the diverse nature of technology use supported by empirical evidence. The digital native generation has been identified in the literature as young people born in or after 1980 (Oblinger & Oblinger, 2005, Palfrey & Gasser, 2008). It was suggested that because this generation of young people

have grown up surrounded by technology they have developed an innate ability and dependence on technology across all contexts of their lives (Prensky, 2001, Tapscott, 1998, Howe & Strauss, 2000). These assumptions originally lead to the development of characteristics said to be consistent across the members of the digital native generation referring to their ability, literacy, multitasking, connectivity and attitude towards technology. Whilst some used these claims to call for radical changes to the delivery of teaching using technology in higher education, others cautioned against the reliance on non-empirical rhetoric as the basis for such decisions (Bennett, Maton & Kervin, 2008; Helsper & Eynon, 2009).

To address the empirical research gap, several survey and interview-based studies emerged which showed that, whilst technology ownership and usage rates have increased, the technological characteristics of digital native students showed a significant level of diversity (Kennedy et. al., 2007, Oliver & Goerke, 2007; Margaryan, Littlejohn & Vojt, 2011). These studies surveyed ownership and use of technologies of university students including an exploration of the differences between technology use in students' everyday lives and how these technologies are used by students as part of their academic studies.

As Kennedy et. al. (2007) suggested, research in this area needs to explore how the technologies students use as part of their everyday life can be adapted to become 'learning technologies'. Whilst these recent studies have gone some way to addressing this issue, there is still a lack of research that goes beyond ownership and pre-categorised uses of technology to examine this transference to academic contexts. Questions have also been raised about the reliability of these types of surveys to measure technology use due to the lack of a shared technological language and understanding of context (Corrin, Lockyer & Bennett, 2010). Helsper and Eynon (2009) submit that research around the concept of digital natives often ignores the complexity and diversity of how students are using technology. Some studies have attempted to collect a broader range of data through multiple methods to address this issue (Jones & Healing, 2010; Czerniewicz & Brown, 2010). Whilst these studies have collected more in-depth data about students' motivations for technological adoption, they still primarily rely on self-reported data from students in the form of surveys and interviews.

The current study delves even further into students' technological activities by incorporating a wider range of data collection methods including the experience sampling method and online observation. The combination of these multiple data sources should provide a more detailed insight into the factors that influence students' adoption and use of technology. This examination of how technologies fit into students' whole lives from this cross-section of the so-called digital native population will allow for further testing of the assumptions that form the basis of the digital natives notion. A deeper understanding of the diversity in students' approaches to technology can provide alternative perspectives on the possibilities for the use of technology in learning and teaching in higher education.

Methodology

This study employed a mixed methods approach that comprised a quantitative sampling survey and multiple case studies to explore the adoption and use of technology of fourteen first-year students at an Australian university. The design of the study was informed by models of technology appropriation (Carroll, Howard, Vetere, Peck & Murphy, 2002) and theories of identity (Benson & Makolichick, 2007). This theoretical basis was used to provide different perspectives through which to view students' technology use and the choices they make in adopting and adapting technologies to their personal and academic needs.

Participants for the study were identified via the use of a sampling survey which was administered to 470 students across seven of the nine faculties of the University in the second session of the 2008 academic year. The sampling survey collected demographic data including age, gender, degree, enrolment-specific data (ie. domestic/international, full/part-time, year in program) and living arrangements. This demographic data was then used to determine if the respondents met the participant group criteria which were applied to ensure the participants were reflective of the average first-year student as identified through the University's enrolment data (ie. domestic, full-time students). In order to test the assumptions about digital natives an age limit was applied. This was a deliberate strategy to ensure the sample contained only students born in 1980 or after corresponding with the age ranges suggested in the digital natives literature (Tapscott, 1998; Palfrey & Gasser, 2008).

Students were next asked to rate themselves in terms of their level of ability with technology and indicate their ownership and/or access to certain of technologies including desktop/laptop computers, media devices, electronic personal organisers, game consoles, GPS devices, digital cameras, and Broadband/dial-up Internet. The students were then presented with two lists of technology-related activities, one relating to the context of everyday life and the other relating to the context of academic study and asked to indicate the frequency which they undertake these activities. To allow for comparative analysis similar activities were included in both lists where possible. The sampling survey was a useful tool in characterising the nature of the student population (Corrin, Lockyer & Bennett, 2010). This then allowed participants to be identified for the main part of the study which represented a cross-section of technology adoption, ability and experience ranging from those who rarely use technology to those who engage heavily with technology.

Case studies were then developed for each student employing both quantitative and qualitative methods to explore in detail their experience with technology as part of their everyday life as well as how they use technology to support their academic studies. Students who were identified for the main study were first invited to a semi-structured interview designed to collect more detailed data about students' adoption and use of technology as well as their learning goals and strategies. This interview was also used to delve further into students' technology use for academic purposes examining technologies that students use because it is a requirement of their program of study (ie. Learning Management Systems, presentation software, etc.) in contrast to technologies they have personally adopted to facilitate their own study (ie. online calendars, RSS feeds, social networking, etc.).

Students then took part in an experience sampling period of three weeks. The Experience Sampling Method (ESM) originated as a methodology in psychology research designed to explore experiences in the context of everyday life (Hektner, Schmidt & Csikszentmihalyi, 2007). During this time the students were prompted at three random times throughout the day and required to fill in a short survey about where they were, what they were doing, who they were with and whether they were using technology. As all participants had indicated that they owned a mobile phone in the sampling survey, text messages were used to prompt the students to fill in each survey. In addition to the experience sampling surveys, students were also asked to fill in an end of day summary that provided information about their overall technological activities of the day (ie. how many emails/text messages they had sent, whether they had logged into their social networking sites, etc.).

In parallel with the experience sampling period, participants' online social networking activities were observed giving further insight into the students' technology activities and any cross between the contexts of their lives. During the initial interview the online activities of students were explored and permission sought to observe activities on social networking and/or communication websites for the three weeks of the ESM. A peripheral-member-researcher role (Alder & Alder, 1994) was adopted and a separate research persona profile was set up on a number of websites including Facebook, MySpace, the World of Warcraft forum and the Xbox 360 forum. This avoided the researcher's personal social networking interactions impacting the participants. The participants' online activity was monitored each night between 11pm and 1am. Screen shots of participants' social networking/communication sites were taken to capture their online activities. These screen shots were then analysed and inputted into an observation template which classified the types of activities students were undertaking online into three categories: Consume, Communicate, Create.

At the end of the experience sampling period the participants were asked to participate in a second interview. This interview was designed to review the experiences recorded by the students during the experience sampling period. A copy of data collected was presented to each student and they were given the opportunity to comment on how much they thought this data was representative of their average technology experiences including any trends, irregularities or abnormal situations. Further exploration was also undertaken of the students' technology aptitude in the form of a technology self-efficacy survey.

Each individual case in this study demonstrated a wide diversity of technological experience. One of the fourteen case studies has been chosen to be presented in this paper as an example of a student – Jessica - who demonstrated a high level of technology adoption and use. Whilst a broad look at Jessica's technological characteristics would place her in the 'digital natives' generation in line with the claims of the original literature in this area (Prensky, 2001; Tapscott, 1998), a number of exceptions and inconsistencies become apparent when exploring her motivations and activities in more detail. The level of detail in this case allows for a greater understanding of the true nature of technology use for this particular student across all aspects of her life.

Jessica

Jessica was an 18-year-old Bachelor of Primary Education student in her first year of study. She lived at home with her family and had a daily two-hour commute to university by train. Education wasn't necessarily Jessica's first choice of degree, she had also considered and been accepted into a journalism degree. In the end she chose Education as the university offering the journalism degree was too far away to commute and Jessica felt she wasn't ready to leave home. Jessica said that since deciding she wanted to become a teacher she felt that a higher education degree would equip her with the knowledge, both practical and theoretical, to do well in her job.

Jessica said that she was generally a good student who regularly attended classes, was an active participant in class activities, and was quite organised when it comes to preparing for assessments and examinations. She explained that she chose her elective subjects within her degree to capitalise on her interests and strengths. In terms of studying, Jessica said that she makes handwritten notes from lecture and tutorial slides as she finds the process of writing out the material helps her to remember it. She also would make audio recordings of key terms and descriptions of important concepts which she would listen to repetitively in preparation for exams.

Everyday life interactions with technology

Jessica considered herself an advanced user of technology and owned or had access at any time to a laptop computer, a desktop computer, an iPod, a digital camera (still), a mobile phone (not-3G enabled), a USB memory drive, a games console and broadband Internet at home. Jessica said that she mainly used her laptop, which is not connected to the Internet at home, for using Photoshop and playing games. Whenever Jessica needed to do anything online at home she used the family desktop computer.

In relation to her use of Photoshop, Jessica referred to herself as a "Photoshop-aholic". She claimed to be an avid photographer and liked to share photos online of events such as birthdays and parties with her friends. She explained that prior to uploading photos (to Facebook) Jessica used Photoshop to edit and add effects to the photos.

Playing games both on computer and game consoles is something that Jessica did on an almost daily basis, in particular adventure games and racing games. Jessica showed a preference for games of skill and strategy over "button mashing" games such as first person shooter games. The portability of her Nintendo DS allowed Jessica to play games in multiple locations which was evident during the experience sampling period when Jessica reported that she was playing games at home, at her boyfriend's house, and on the train. In total she played games on 19 of the 21 days surveyed (90.5%). Jessica explained in the interview that the Nintendo DS was a technology that Jessica had purchased just before the experience sampling period began. She had purchased this with her boyfriend and they would take it in turns to have the console on alternate days. She identified the large number of games the Nintendo DS provides as a benefit of this technology as she was able to find and play games at particular times that would suit her mood. She also liked the ability for her friends and her to connect up their Nintendo DSs wirelessly so they could play games together on the train.

Jessica was a heavy user of her mobile phone for text messaging but didn't make as many voice calls. During the three weeks of the experience sampling period she sent 328 text messages which is an average of 15.6 messages a day. In the second interview Jessica confirmed that this high level of text messages was normal for her although it can fluctuate with Jessica having sent 50 messages the day before the interview. She explained that she uses text messages to keep up with what is happening, so on days where she is not at university she will often send a large number of messages to friends who are at university so she can keep up with what's going on. When she does make voice calls these tend to be in order to locate people or if she has a question for which she requires an immediate answer.

Whilst Jessica has access to a mobile phone with many multimedia features she didn't regularly make use of all of these, instead seeing her mobile more as just a communication device:

"my mobile phone has Internet and photographs and video recording, but I never actually use any of that because the quality is pretty shoddy, so when I have, you know, my actual camera that I love I use that instead. So usually it's just to communicate."

Jessica regularly used her iPod to listen to music, podcasts and to watch television shows. Due to her long commute to university, Jessica used her iPod on the train and also watched television shows on her iPod in bed before going to sleep. The podcasts she listened to are mainly repeats of radio shows that she didn't always get to listen to live due to her travel schedule.

From an online perspective Jessica had a blog but admitted that she didn't update it very often. Jessica was convinced by her friends to set up a Facebook account which she claimed to only check "every now and then". This was confirmed by her experience sampling data which showed her usage of social networking sites on only 43% of days. Online observation showed that Jessica would actively participate on Facebook 55% of the time whilst just logging in and reading the news feed the other 45% of the time. Jessica indicated that she only tended to visit Facebook when she had received an email alert informing her that she had a message or had been tagged. She also noted that her usage of Facebook reduced when assessment pressures at university increased.

On her Facebook profile page Jessica provided information about herself including her favourite books, movies, TV shows and quotations. To describe herself Jessica posted the following:

Activities:	*hmm… I'm a bit of a video game nerd. And I read a lot. I also like to photoshop… and pretend I'm hardcore and creative. Cuz it's what the cool kids do.*
Interests:	*Myself. And others. But mostly myself :P*
About Me:	*I am awesome. And that's all you've gotta know *winks**

In the interview Jessica indicated that she didn't portray herself or act any differently online than she did face-to-face. When asked if she censors the information she makes available about herself online she said that whilst she is generally an open person, she wouldn't put anything online that she wouldn't be happy to show people face-to-face.

Jessica's Facebook activity during the three weeks showed she had accepted 3 friend requests, updated her status 6 times, changed her profile picture 3 times, written on friends walls 7 times, added a photo album of 60 photos, and commented on 5 photos from friends' albums. Her conversations with friends via wall postings were generally of a social nature with the main mention of university being arranging social meetings with friends on campus. One conversation between Jessica and some of her university friends indicated that they were all getting involved in playing a new version of a computer game (SIMS) which her friends felt would have a negative impact on their studies due to the time they would like spend playing the game.

Accessing information on the Internet is something that Jessica did on a regular basis. She didn't tend to generally browse the Internet, instead she went to the Internet when she had a specific question for which she needs to look up information to provide an answer. This is something she said that she often did with her family when questions arose in general conversation, Jessica would often go to the family computer and look up the answer.

Jessica indicated that she had previously been a frequent user of instant messaging services to chat with her boyfriend and friends when at high school. However, once she got to university she saw her boyfriend and friends on a regular basis and therefore only used instant messaging occasionally. This was also impacted by the fact that Jessica could only connect to MSN Instant Messenger when using the family desktop computer which had broadband Internet access which wasn't as accessible as her laptop.

Whilst Jessica was generally a heavy user of technology in her everyday life, there are tools and services that she did not use regularly. Jessica indicated that she didn't often buy things online which was mostly attributed to the fact that she didn't have her own credit card. Sometimes she would borrow her mother's credit card to make a purchase but she said that she didn't like using her mother's credit card for security reasons. The same security fears deterred her from doing her banking and paying bills online. She also did not make use of RSS feeds.

Academic Studies

From an academic perspective Jessica said she engaged with a number of technologies as part of her studies. She was a regular user of the University's learning management system to access course resources and to participate in online discussion forums. Jessica said she made use of podcasts of lectures to catch up on any material missed if she was unable to attend the lecture but also to review material she didn't understand the first time. She also made use of presentation software such as PowerPoint to create presentations for assessments.

When searching for information for study purposes, Jessica said that she first used library catalogue searches with the aim of finding more relevant and scholarly results. Only when she could not find relevant resources through the library would she resort to a general Internet search which she generally avoided due to the large number of irrelevant results.

In terms of communication Jessica said she regularly used email to communicate with her lecturers and tutors to ask questions about content and procedures on which she is unclear, but did not use email to communicate with peers apart from to send files when working on group assignments. Jessica made extensive use of the online discussion boards to communicate with other students and lecturers/tutors both asking questions when she is unsure of something and helping out other students with their questions on assignments. However, she indicated that she didn't make use of social networking sites, text messages or instant messaging to communicate with peers for study purposes.

Jessica said she enjoyed being introduced to new technologies or methods using technologies as part of her studies. From using the Internet in new ways to research assignment topics to using animation capture software to create teaching resources for science education, Jessica is keen to experience new technologies to generate ideas for methods she will use in the classroom when she becomes a teacher. When asked if Jessica would like to see more technology used in learning and teaching in her university course she was satisfied with the current level of use. She recognised that technology is relevant in some subjects but not as relevant in others and was happy for some subjects not to incorporate technology at all.

Adoption and adaption of technology

Throughout the research process it became clear that Jessica was very willing to try new technologies. When faced with a new technology Jessica's approach to learning how to use it was to try and figure out how it works on her own, only seeking help from others or referring to a manual if she got stuck. Over time Jessica would explore the features of the technology and determine which ones she would continue to use. This method of adaption of technology was evident with Jessica's mobile phone, as mentioned above, where Jessica explored the photographic and video features of the phone but determined that the quality of these features was not sufficient and therefore continued to use her digital camera for photographic needs and her phone simply for communication purposes.

When asked what considerations Jessica would make when purchasing new technology she identified ease of use, relevance, appearance, price ("not super-duper expensive"), and durability. She qualified her criteria of appearance by saying:

> *"When I said "look good" I mean not a pretty package but be sort of atheistically pleasing and easy to see where I have to go. Like clear headings, clear labels, things like that."*

In investigating new technology to purchase Jessica would often consult with friends and see what types and models of technology they use. She also liked to research the features of technologies she was considering purchasing by visiting manufacturers' websites. However, Jessica said she only considered buying new technology when there is a need for it and does not simply upgrade because she can. In relation to her digital camera she said:

> *"Well it's just your basic camera. It takes photos. I bought it a few years ago now but it still does everything I want it to do. I don't need any of the new features that cameras have. It works fine, it's good… [I'll] wait until it breaks or I need it. Because I need it to do something else."*

Jessica indicated that occasionally she would cut herself off from her online communication and social networking channels as life and study pressures increased. During these times Jessica said she would

only check her Facebook or emails as a response to her friends sending a text to say they had sent a message.

> *"So I just like sort of cut myself off 'cause I had so many assignments, it's been crazy! So I just cut myself off from the online world".*

Only when things started to slow down would she then log into these systems and catch up with what is going on.

Discussion

Jessica and her technological preferences and habits are consistent with recent research that found a high level of diversity of technological experience of the digital native (Kennedy et. al., 2007, Oliver & Goerke, 2007; Margaryan, Littlejohn & Vojt, 2011). Born in 1990, Jessica fell within the age range of the so-called digital native generation. She also considered herself an advanced user of technology which is consistent with the characteristic of high technology literacy. However, she doesn't fit quite as neatly within the some of the other characteristics said to be common to all members of the digital native generation.

Jessica displayed literacy across a number of technological media and a high level of engagement in terms of game playing. She supported the culture of sharing by uploading photos to share with friends on Facebook and was the (infrequent) author of a personal blog. Whilst she did not specifically refer to a need for speed of information delivery, her use of the Internet to research answers to questions that arise in general conversation indicated that this is a characteristic to which Jessica subscribes.

However, in other aspects she varied from the generational generalisations. For example, throughout the data collection Jessica did not refer to an ability or preference for multitasking. Whilst she was always in contact with friends via text messages on her mobile phone, she indicated that she would often cut herself off from online services for weeks at a time if other life pressures became too great. This challenges to some extent the notion of digital natives' need for constant connectivity.

In other ways Jessica demonstrated traits said to be common to the digital native generation, in particular a high level of self-confidence. On her Facebook profile page in her 'Interests' and 'About Me' section the persona which Jessica displays portrays a very self-confident bordering on self-obsessed person. This demonstration of high levels of self-liking and narcissistic traits is consistent with Twenge's (2009) study of generational changes which found an increase in these particular traits in current students. However, the outward persona Jessica demonstrated online was not born out in the rest of the data, especially in her interview data. Whilst Jessica claimed that she didn't act any differently online to in her face-to-face interactions with people, the high level of self-confidence was not evident in her interview conversations or her technology self-efficacy survey. This mismatch of online and offline self-confidence could be attributed to the fact that the online social networking medium, through profile pages and status updates, encourages and shapes users' self-portrayal in certain ways that would not always occur in face-to-face interactions.

Jessica's considerations around the adoption of new technologies appeared to be less driven by a need to keep up with the latest technological developments, and more by practical matters such as cost and utility of specific features. When Jessica purchased a new technology she adapted itto her personal needs within her context of everyday life. The understanding of this process of adaption is something that the current research can add to the digital natives' discussion as assumptions are still being made in the literature that equate ownership of certain technologies (ie. mobile phones) with extensive use and customisation (Traxler, 2010). However, as Jessica's case has shown, although Jessica was the owner of a mobile phone with multimedia capabilities, her adaption of the technology to her needs and priorities meant that she used her phone almost exclusively for communication purposes.

Throughout this case study it was not evident that Jessica used her adaption process in appropriating technologies into her studies. In terms of her use of technologies to support her academic study, Jessica tended to primarily use the technologies prescribed as part of her course and had not adopted new technologies to support her 'personal study'. This is consistent with Margaryan, Littlejohn and Vojt's (2009) study which found students mainly engaged with technologies prescribed as part of the degree and did not observe a significant shift in patterns of learning and the use of technology amongst students of the

digital natives generation. This was also supported by Selwyn's (2008) study which found that students were not as inclined to integrated use of the Internet to support their studies as had been assumed. In Jessica's case she did make use of the Internet on occasion to conduct research, but had indicated that she would check with people, including lecturers and tutors, to find answers to her questions prior to going online. She also favoured university-driven information seeking sites through the library over general Internet search engines.

Jessica indicated that she was happy with the amount of technology that was integrated into her course overall. Despite the fact she was keen to experience new technologies that might prompt ideas for delivery of teaching in the classroom for her future students, she acknowledged that technology is appropriate to some learning situations more than others. Again this is contrary to some of the earlier literature claims which called for radical change in education to meet the demands of the learners for more integration of technology into the classroom (Prensky, 2001).

This in-depth examination of the technology habits of a 'digital native' student has demonstrated the importance of considering students as whole people when looking at their interactions and choices regarding technology. Whilst Jessica appears on face value to fit into the digital native stereotype, closer observation shows a different and diverse story. The level of learner diversity identified in this and many other recent studies (Jones, Ramanau, Cross & Healing, 2010; Margaryan, Littlejohn & Vojt, 2011) serves as a warning to higher education educators not to base pedagogic design purely on unsupported assumptions.

Digital natives research appears to have reached a point where sufficient doubt has been cast on the supposed homogeneous generational characteristics. In observing the specific elements of technology diversity of higher educational students in this study further research opportunities have emerged that will help educators teach more effectively with technology. From an identity perspective, further study of the relationship between students' online persona in everyday and academic contexts may help to understand the barriers and enablers to students' transition from personal to academic technologies. From an academic perspective it would be helpful to educators to understand how the patterns of technological behaviour observed across both contexts of students' lives can help to interpret usage patterns in online learning environments.

Conclusions

Whilst the analysis of the case of a single digital native student does not present findings generalisable to all higher education students, it is effective in exploring the diversity of technological experience and demonstrates the importance of investigating the motivations and influences behind students' technology adoption and adaptation. This level of detail reminds us to question the generational assumptions so commonly used to justify technological changes in higher education. It has been frequently recommended in recent literature (Bennett & Maton, 2010; Jones, Ramanau, Cross & Healing, 2010) that we need to delve further into the stories behind the ownership and use of technologies by members of the digital native generation in order to inform decisions about technology integration into academic studies. This study's methodology facilitates a deeper exploration of technology adoption and use by students which can contribute to the continuing research agenda and discussions around strategy and pedagogy for learning and teaching with technology in higher education.

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