The Actual Adoption and Use of Mobile Apps: The Case of a Higher Education Context

Completed Research

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Abstract

Mobile applications have gained wide acceptance in several sectors, including eCommerce and education. In higher education, mobile apps are being used not only for mobile learning but also for creating smart campus environments in which physical campuses are augmented with digital services. Mobile apps for smart campus initiatives usually have several features that students and educators are expected to adopt and use. However, although prior studies have investigated the adoption of mobile apps, most of such studies are on the user's intention to use or continue using mobile apps, leaving gaps in our understanding of how actual use occurs. Drawing on a case study of a mobile app for a smart campus in a university in Finland, this study unravels the factors that influence actual adoption and post-adoption use of mobile apps in higher education context, and how the influence occurs. The implications for research and practice are discussed.

Keywords

IT adoption, mobile app adoption, post-adoption, IT continuance, IT use, smart campus, Higher education

Introduction

Mobile applications (or mobile apps) have gained acceptance in recent years. The use for hedonic reasons set aside, mobile apps have been taken into utilitarian use in several sectors including e-commerce (Chopdar et al. 2018), banking (Munoz-Leiva et al. 2017), healthcare (Luxton et al. 2011) and education (FernáNdez-LóPez et al. 2013; Vázquez-Cano 2014). Not surprising, researchers have recognized the importance of mobile apps and have researched factors; for example, that influence their adoption (Chhonker et al. 2017; Harris et al. 2016) and users' continuance behavior (Chen et al. 2012). Several such prior research employed the Technology Acceptance Model (TAM) and its derivatives, expectation confirmation model, a combination of adoption theories, and the IS continuance model, just to name a few. Factors such as perceived usefulness, perceived ease of use, trust, perceived risk, self-efficacy, mobile application customizability, and attitude of the user influence the adoption of mobile apps (Chhonker et al. 2017; Harris et al. 2016; McLean 2018). However, prior literature has mostly focused on user intentions, e.g., to use and continue using mobile apps, leaving gaps in our understanding of how actual use and continuous use of mobile apps occur.

Further, the application of mobile app in higher education is on the increase. Higher education institutions invest in mobile apps to provide mobile learning services connecting students to learning resources within and without university campuses. With the surge and the advancement in mobile devices, some higher education institutions are beginning to move beyond providing mobile learning services to developing a smart campus. A smart campus provides a learning environment in which physical campuses with their resources are augmented with digital services (Atif et al. 2015; Muhamad et al. 2017). Mostly, smart campuses are built on already existing digital infrastructure, including wireless connectivity, learning management platforms, and mobile apps. For instance, there are emerging initiatives that provide university students access to counseling and advisory services on academic issues, over mobile apps (e.g.,

Huda et al. 2017; Shambour et al. 2018). This study is motivated by one of such initiatives in a university in Finland.

Although there are few studies on the adoption of mobile apps in mobile learning (e.g., Krotov 2015), and recommendations for the components of a smart campus (e.g., Atif et al. 2015; Muhamad et al. 2017), there is lack of studies on the adoption of mobile apps designed for smart campus initiatives. Unlike traditional mobile apps that have limited features, mobile apps designed for smart campus tend to have several features with which users can access and use university resources, and other digital and social services. Thus, a study of such a mobile app requires investigating the detail of how users adopt and use the diverse features. To guide our inquiry, we ask the research question: Which factors influence the adoption and post-adoption use of a multi-feature mobile app in a higher education context, and how does this influence occur?

To answer this question, we conducted a case study of how users adopt and use a mobile app designed for the smart campus at a university in Finland. Drawing on an in-depth semi-structured interview with 23 users, we found that mobile app attributes, user attributes, support structures, and task attributes influence the initial adoption and post-adoption use of the mobile app. We present a model that illustrates the findings of the study and discusses how the various factors influence the initial adoption and post-adoption use. We also discuss how the influence happen. This research contributes generally to the adoption of mobile apps, and specifically to the adoption of a multi-feature mobile app in a higher education context.

Literature Review

Mobile App and Mobile App Use

Mobile apps are "a type of application software designed to run on a mobile device such as a smartphone or tablet computer" (Techopedia 2018). Mobile apps were initially designed as usually small software units with limited and isolated function which provide users with services like those accessed on personal computers (Techopedia 2018). However, mobile apps have grown in complexity offering several functions (Gibbs et al. 2016; Ho and Syu 2010) probably because of the advanced resources of recent models of mobile devices, which allow users to, for example, communicate and engage in transactions (Nickerson et al. 2013). Recently, mobile apps have gained popularity in almost every aspect of life. Aside from manifesting as games, mobile apps have been used in different areas including e-commerce (Chopdar et al. 2018), tourism (Gibbs et al. 2016), banking (Munoz-Leiva et al. 2017), and education (FernáNdez-LóPez et al. 2013; Vázquez-Cano 2014).

There is a rich and emerging academic literature on the adoption of mobile apps. Scholars have studied the adoption of mobile apps from different theoretical perspectives; for example, TAM and its extensions including (Hew et al. 2015; Munoz-Leiva et al. 2017; Yu 2012), expectation confirmation model (Hung et al. 2012), a combination of adoption theories (Oliveira et al. 2014; Thakur and Srivastava 2014), and IS continuance model (Chen et al. 2012). However, by virtue of the theoretical perspectives and research methods they employ, several prior research on mobile app adoption focus on user intention to; for example, buy a mobile app (e.g., Kim et al. 2016), install a mobile app (e.g., Harris et al. 2016), use a mobile app (e.g., Munoz-Leiva et al. 2017) and continue using a mobile app (Chen et al. 2012). Though research has shown that intention may not necessarily result in actual behavior (Tao 2009) and that initial use may not guarantee continuous use (Hung et al. 2012), there are few studies on mobile app adoption that have investigated actual use and actual continuous use of mobile apps (e.g., Groß 2015; McLean 2018).

Mobile Apps in Higher Education

Mobile apps have been widely applied in education, especially in the area of mobile learning, to grant users access to learning materials and other resources irrespective of time and location (Motiwalla 2007; Teri et al. 2014). For instance, since the beginning of this year (i.e., year 2020), mobile learning has gained tremendous popularity because of the COVID-19 pandemic which mandates remote access to educational resources. In mobile learning environments, mobile apps are used to supplement in-class learning or to support the so-called blended learning environment (Teri et al. 2014). Apart from being used to access educational materials, mobile apps are also used to enrich student life in higher education. For instance, in digital or smart campus, i.e., learning environment in which physical learning resources are augmented with digital and social services (Atif et al. 2015; Muhamad et al. 2017), mobile apps are used to provide students access to university resources, and services. For instance, there are emerging initiatives to use mobile apps for counseling and advising students on academic issues, including the selection of university courses (e.g., Huda et al. 2017; Shambour et al. 2018).

Studies have identified what the constituents of a smart campus should be (e.g., Atif et al. 2015; Muhamad et al. 2017) and have proposed mobile app features and architectures for smart campus initiatives (e.g., Huda et al. 2017; Shambour et al. 2018). Some researchers have studied the critical success factors that influence the success of mobile learning (e.g., Krotov 2015), the adoption of mobile apps in mobile learning (e.g., Hao et al. 2017). However, there is a lack of studies on the adoption and use of mobile apps that enable students to view and access university resources (e.g., classrooms, computer labs) and social services (e.g., student advisory services, social events, and study calendar). Thus, to improve our understanding of the adoption of mobile apps meant for smart campuses, this study investigates one such mobile app at a university in Finland.

Research Method

We adopt case study as the research method for this study. The case study is a suitable research method when the phenomenon of interest is complex and embedded in its context (Lee 1989; Yin 1981, 2011). It provides the opportunity to uncover the nuances and understand the complex dynamics that underlie the phenomenon within its specific context (Eisenhardt 1989). For instance, Curry et al. (2009) assert that qualitative approach, which includes case study, "can be useful when researchers are interested in looking beyond identified variables that are statistically linked with a desired effect to understand why a given intervention has a specific impact, how the impact occurs, and in what organizational context" (2009, p. 1443). Thus, this study employs an in-depth case study to unravel what influence how students adopt and use a mobile app at a university in Finland, and how the influence occurs.

Case Description

A university in Finland as part of its digitalization strategy has three objectives: the digitalization of educational learning, the digitalization of research, and the creation of a smart campus. As part of the creation of a smart campus objective, the university has decided on several mobile services, including a mobile service to connect to and augment the physical campus resources. For the initial rollout of the mobile service, students were chosen as the primary users. Later, the mobile service will be gradually rolled out to other users, including visitors and university employees. The university's digital team collected suggestions and requirements for important digital services first from the students in a digital service innovation course, and then from other students across the university's campuses. Based on the requirements, a mobile app (hereafter *SmartCampus* – a pseudonym) was developed and was made available to students during the spring semester 2019. Students are under no obligation to use *SmartCampus,* making the use context voluntary. According to an online report of the university, *SmartCampus* had as of 19th December 2019 5028 users, which is roughly one-third of the almost 15 000 on-campus students of the university. The users include degree students (i.e., Finnish and international students) and exchange students.

SmartCampus has several features that derive data from various learning management platforms and services around the university. Students can check their study schedules on a calendar feature and use a map feature to locate classrooms and other university buildings around the campuses. Further, through *SmartCampus*, students can see all the various cafeterias scattered across the campuses, view events, see job vacancies, read campus news, and search for university staff. *SmartCampus* has features that provide students, especially first-year students, with the information needed to settle on campus. Against this backdrop, we refer to *SmartCampus* as a multi-feature mobile app because it has several features.

Data Collection

We collected data through semi-structured interviews with 23 students across the different faculties of the university. The first author visited the various faculties and randomly asked users for interviews about *SmartCampus*. The interviewees include degree students (i.e., Finnish and international students) and exchange students. We stopped conducting new interviews when additional interviews with users yielded no new insights. Our sample of interviewees consists of 11 female and 12 male users. Each of the interviewees belongs to one of these three main groups of users: 1. users who adopted and have used *SmartCampus* over time; 2. users who adopted but abandoned *SmartCampus* after initial use; and 3. users who heard of but did not install, or did install but did not use *SmartCampus*. The interviews lasted between 18 to 32 minutes and were all recorded and transcribed verbatim. Other stakeholders, including the digital director in charge of the initiative, was interviewed on the strategic intent of *SmartCampus*, as well as how the implementation has evolved over almost one year since its introduction. Online reports on *SmartCampus* were also gleaned for data.

Data Analysis

Interview transcripts were analyzed using Atlas.ti. An inductive approach was adopted to analyze and code the data. From the first round of coding (i.e., open coding), 388 of open codes were generated. Codes are labels for cataloging key concepts without disrupting the context in which these concepts occur (Curry et al. 2009). The transcripts were re-read to make sure that all relevant pieces of data were coded. Then, the open codes were analyzed and grouped under 42 code groups or categories (i.e., axial coding). Finally, the 42 categories were further grouped into eight themes. The coding did not occur linearly, but through iterations from the codes to data, until the eight themes emerged (Curry et al. 2009). Five of the 42 categories were left out and not grouped under any of the eight themes because they were user recommendations for improvement on existing features and suggestions for new features and services. The eight themes were analyzed further to identify relationships among them, leading to the construction of a proposed model that illustrates the factors that influence the adoption and post-adoption use of a mobile app in higher education context. We discuss that in the next section.

Findings and Discussion

Evidence from our data suggests that when users are introduced to mobile apps, they progress towards post-adoption use along two main paths influenced by mobile app attributes, user attributes, support structures, and task attributes. After initial adoption, users either progress along confirmation – satisfaction – post-adoption use, or progress along satisfaction – post-adoption use. We noticed that whereas some users did have urgent tasks that they perceived could be performed using *SmartCampus* (i.e., perceived usefulness), others did not have prior perception of usefulness. Instead, they just installed and tried out *SmartCampus* and then serendipitously realized that *SmartCampus* was actually useful (or useless) for performing certain tasks. Figure 1 illustrates the various stages and the factors that influence the initial adoption and post-adoption use of *SmartCampus*. In the sub-sections that follow, we discuss how the various factors influence the adoption, confirmation, satisfaction, and post-adoption use of a mobile app.

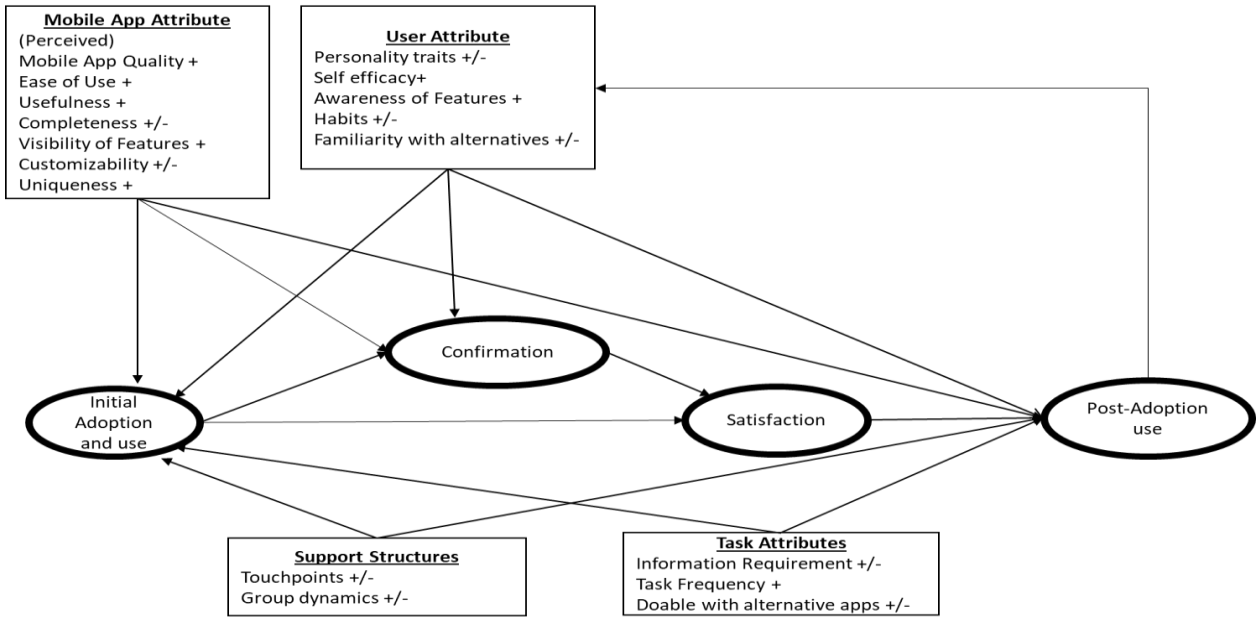

Figure 1. A model for the adoption and post-adoption use of a multi-feature mobile app

Initial Adoption

Initial adoption is the stage where a user is introduced to a mobile app, installs the mobile app, and uses the mobile app to perform some tasks or realizes that the mobile app can be used to perform some tasks. The initial adoption stage is influenced by mobile app attributes, user attributes, support structures, and task attributes. Aside from the well-known mobile app attributes, e.g., ease of use, usefulness, customizability, and mobile app quality (e.g., see Chen et al. 2012; McLean 2018), we noted that other mobile app attributes including visibility of features, completeness, and uniqueness do influence initial

adoption of a mobile app. Mostly, all contents and features in a mobile app hardly fit on a screen (Adipat and Zhang 2005). Thus, whereas some contents and features are displayed on the home screen, others are organized behind menus (e.g., hamburger menu). Depending on how the contents and features are organized, we noticed that users might not discover and use some of the features of a mobile app. Users usually look at the features on the home screen as the important, and sometimes the only, features of the mobile app. Thus, if a user does not find an important feature on the home screen, the user may refrain from adopting and using the app without exploring other features hidden behind menus. Consider this quote from a user:

*"If you click on it then different features come up like jobs, you can book sports sessions, this and that. So, I feel like at least me, for the first two months, I didn't even click there. I just thought that it was just some kind of option. I didn't understand that some specific very good features are hidden in there." (**Int. 1**)*

Some users adopted and used *SmartCampus* because, for example, it had features that made it possible for the users to perform tasks that they would have otherwise performed by browsing several webpages or using several mobile apps. It is apparent that users are gravitating towards adopting and using mobile apps that are *complete*; that is, mobile apps that have several features to enable a user to perform a range of tasks without the user having to use other mobile apps or websites. For example, consider a user's comment about what makes him/her adopt a mobile app:" *…if it is complete, that's if I don't have to use five apps that I believe could belong together to have the information that I need*" (***Int. 19***). Comments from users also suggest that completeness of *SmartCampus* makes a user's life on campus convenient. However, the quest for completeness creates a paradox because the availability of several features means some features may be hidden behind menus reducing their visibility and use.

Another mobile app feature that influences the initial adoption of *SmartCampus* is its uniqueness. The uniqueness of a focal mobile app reflects the extent to which a user believes there exist other mobile apps that can perform a task that the focal mobile app can perform. *SmartCampus* rarely has uniqueness at the feature level since all features in *SmartCampus* are built on existing web services, websites, or mobile apps. Besides, users found third-party mobile apps that could perform certain tasks better than corresponding features in *SmartCampus* can do. For instance, the Google Calendar is named by users as a preferred alternative to the calendar feature in *SmartCampus*. However, at the mobile app level, *SmartCampus* derives uniqueness from the different features it has assembled. We observed that users used *SmartCampus* because of its uniqueness.

User attributes also influence the initial adoption and use of *SmartCampus*. Our data suggest that personality traits (e.g., attitude), the self-belief in one's skills, and capabilities (i.e., self-efficacy) do influence the initial adoption and use of *SmartCampus*. Further, our study also reveals that a user's awareness of features, past habits, and familiarity with alternative mobile apps do influence initial adoption and use of *SmartCampus*. From prior quotes (from **Int.1** and **Int.6**), we infer that a user's awareness of the features of a mobile app may positively influence the likelihood of the user to use the mobile app. Furthermore, evidence from our data suggests that a user's familiarity with alternative mobile apps and past habits positively or negatively influence his/her adoption of *SmartCampus*.

"*…the lunch page is like now when I look it, it's great you can see all of them [the cafeterias on campus] but like somehow, it's not my routine to check the lunch from there [SmartCampus], I just, I've got used to check every page [the webpages of the various cafeterias] like differently…*" (***Int.8***")

"*We use in the browsers, CampusMap (a pseudonym for a campus map), …then when I used SmartCampus, after the first time I noticed it's exactly the same thing. It's the same like the program that you use on your browser. Then of course I already know how to use SmartCampus' maps then of course it was easy for me to start using it because I know that ooh this is the same thing*" (***Int.7***).

The initial adoption and use of the mobile app is also influenced by support structures, namely, touchpoints, and group dynamics. Touchpoints refer to the entities (or activities) that introduce a user to a mobile app. In the case of *SmartCampus,* examples of touchpoints include university webpages, posters, orientation programs, student tutors, and friends. Mostly, formal and impersonal touchpoints (i.e., university webpages, posters, and orientation programs) are less effective than informal and personal touchpoints (e.g., student tutors and friends). Another notable observation is that users are usually content with and mostly limited to the features that they are introduced to by the touchpoints they interact with. Beyond the initial features that users are introduced to, users rarely explore *SmartCampus* for new/other features, including the features on the home screen. This comment illustrates our point.

"*Well, yeah I tend to use a lot, but for example I only use it [SmartCampus] for what people have said, 'you can use it for this, you can use it for that,' but normally I don't like …how can I say, I don't explore the application that much. So maybe that's why I don't see everything that the application has*" (***Int16***)

Further, group dynamics influence the initial adoption and use of the mobile app. Whereas positive group dynamics; e.g., recommendation from friends, group activities, and positive feedback, may positively influence initial adoption and use, negative group dynamics; e.g., negative feedback may negatively influence the initial adoption and use of a mobile app. For example, an interviewee reflects on why s/he uninstalled *SmartCampus* after initial adoption and use.

"*Well, at first, it was really negative…like when I talked with my friends that were using the app, we started using the app at the same time so… it was like negative feedback loop going around so I don't remember maybe not so many crashes happened maybe to myself, maybe a couple but when you are in an environment and the app crashes, you feel that it happens to you when it actually happened to your friend or something so… it might be that it multiplied the external experience with the App*" (***Int.4***)

Finally, task attributes also influence the initial adoption and use of a mobile app. The extent of information required to accomplish a task and the rate at which the information changes do positively or negatively influence the initial adoption and use of a mobile app. We noticed that in situations where a user does not need much information to accomplish a task (e.g., a student locating a familiar classroom), the user might find no need for *SmartCampus*, whereas, in situations where the user needs much information to accomplish a task (e.g., a student looking for menus in student cafeterias) the user is likely to use *SmartCampus*. Further, the frequency of tasks also influences adoption. Users adopt *SmartCampus* for daily tasks (e.g., checking their study schedules) than they do for infrequent tasks. Also, our data suggest that tasks that can be performed with other mobile apps may impede the adoption of *SmartCampus* unless a feature or a bundle of features in *SmartCampus* presents a better alternative.

Confirmation

After initial adoption and use, a user who had an expectation or perception about the attributes of a mobile app (e.g., ease of use, usefulness, quality, completeness, uniqueness, and customizability), may confirm (or disconfirm) such perceptions based on his/her experiences from using the mobile app (Chen et al. 2012). Apart from the actual experiences from the initial adoption and use of the mobile app, the mobile app attributes and user attributes influence the user's confirmation of his/her initial perceptions. For example, a user who is familiar with alternative mobile apps may find the focal mobile app easy to use (e.g., see the *CampusMap* example by **Int7** above). Further, a user's expectation and perceptions may be influenced by his/her familiarity with alternative mobile apps. For example, a user said:

"*…a bit [of lag] with the map and the location process, but I think it's normal because even google maps takes time so…I was not expecting a faster experience if that makes sense. So, this is fine, everything else is pretty quick so…*" (***Int.19***).

Also, the user's awareness of features may influence his/her confirmation about the visibility of features, whereas his/her self-efficacy (i.e., self-belief in his/her skills or capability to use a mobile app) may influence the confirmation of *ease of use* and *quality* of a mobile app. For example, we observed that users who do not profess to have the level of IT skills to understand the operations and failures of *SmartCampus* blame negative experiences with *SmartCampus*, e.g., disruption in use, on other things, including themselves, but not on *SmartCampus*. One user puts it this way: *"[I felt] stupid because I think it's my fault and I didn't manage to use it properly….so the first thing is frustration with myself*" (***Int.19***).

Personality traits (e.g., attitude) also influence a user's confirmation of his/her perception. Whereas some users are patient and tolerant of bugs whilst anticipating improvements in non-functional features in *SmartCampus,* others are less tolerant of bugs and either discontinue using or uninstall *SmartCampus*. For instance, one user said, "*… at first time when I installed it, …I haven't had positive experience with it, so I just deleted it after a while*" (***Int.4***). Whereas, another said:

"*When I used it first, it wasn't actually that functional in my opinion at that time. I was like okay it's nice to have an app for the university but I was realizing that it was something under development, new functional features will come so I kept the app on my phone hoping that there will be some iteration and there will be more features but right now I use the app but previously I did not that much, yeah*"

Satisfaction

Satisfaction relates to an experience a user has from confirming his/her expectations (or perceptions) of a mobile app (Chen et al. 2012), or an experience a user gets from the actual use of a mobile app without any ex-ante expectation of the mobile app. We noted that whereas some users installed *SmartCampus* with ex-ante perceptions (e.g., the ability to find locations on campus, and have access to course schedules), others did not have such ex-ante expectations but just decided to try *SmartCampus* to see what it has to offer. Thus, the first group of users could have satisfaction (or dissatisfaction) from confirming their ex-ante perceptions of *SmartCampus,* whereas the second group could have satisfaction (or dissatisfaction) directly from the actual use of *SmartCampus*. The following comments from users illustrate our point.

" *I was struggling with my routine… I was kind of missing the several lecture change or some other things… So, when I saw this app, I was like maybe this app is the solution where it will just give me the proper calendar with the updated calendar and or something. I remember when I was first using it, it did not actually have those calendar feature…but now it has so it's useful right now*" (**Int.1**)

" I *was very satisfied with it. When I downloaded it, it was quite easy to locate buildings on this map and it's working quite fine without any problems …, I didn't have any expectations but I'm okay with using it.*" (***Int.2***). Another said "*before I started using it, I didn't know anything about what it has before I started using it. It was when I started using it [that] I got to know so many other things about the app"* (**Int.14**).

Thus, on the one hand, users can have ex-ante expectations of a mobile app and confirm them by actually using the mobile app. On the other hand, users can just serendipitously find features of, and uses for, a mobile app leading to satisfaction (or dissatisfaction) without confirmation.

Post-adoption Use

Post-adoption use refers to the actual use beyond initial adoption that a user makes of known and new features of a mobile application in order to perform tasks. *Known features* include used and unused features that a user is aware of. Also, note that a *new feature* of a mobile application, as used here, does not refer to only a feature that was previously non-existent, but also a previously existing feature that was unknown to a user. Thus, post-adoption use does not only refer to the *continuance use* of known features but also the adoption and use of new features, and the revision of the set of features that a user uses (Sun 2012). Our data do suggest that post-adoption use is influenced by satisfaction, mobile app attributes, user attributes, support structures, and task attributes and that post-adoption use in turn influences user attributes, introducing a feedback loop that either re-enforces or derails use.

The quality, ease of use, and usefulness are well-known attributes of a mobile app that influences post-adoption use. From this study, we have observed that other attributes, including completeness, visibility of features, customizability, and uniqueness, influence post-adoption use. Completeness and uniqueness allow users an array of features with which users can perform a wide variety of tasks. We noted that because *SmartCampus* has an array of features, users still use *SmartCampus* even when they discontinue using some of the features they used at initial adoption. The completeness of a mobile app allows a user to revise the set of features the user uses depending on, for example, the attributes of tasks that the user performs. A user comment reflects this assertion:

"… I used SmartCampus pretty much the same as at the time I downloaded it, but since I bought the sports card …I use the sportfeature [pseudonym for a feature] now because I have the card so I need that information so I can check there is yoga at this time at this location" (***Int.3***)

Customizability enables users to select options, including features, to be displayed on the home screen. For example, in the case of *SmartCampus*, users can select their favorite cafeteria and have lunch menus from the favorite cafeteria displayed on the home screen. Customization thus allows users to personalize *SmartCampus*, making it easier for users to integrate the use of *SmartCampus* into their everyday student life on campus. However, we also noted that customization makes users contempt with known features and prevent users from exploring new features, or new options for known features (e.g., a new cafeteria added to the list of cafeterias). In line with McLean (2018), our findings suggest that customizability influences post-adoption use mostly by influencing continuance use of known features. Nevertheless, our findings also suggest that customizability can constrain post-adoption use by hindering the exploration of new features and options. The following quote illustrates our point.

"*…ever since I started using it, I've been using the calendar. I always want to check what I have for the day, most especially. I think it's just now I see that I can view for the whole week. I didn't know that before. Because from the home page, it just says today and tomorrow*." (***Int.14***)

User attributes influence post-adoption use. We have discussed how personality traits (e.g., attitude) and self-efficacy may cause a user to discard a mobile app or to retain it after initial experience with the app. Awareness of features also influence post-adoption use. During the interviews, we observed severally that when users get to know of new features, they are eager to try the new features in performing tasks. For instance, see the quotes from **Int.1** and **Int.6** above**.** Thus, when users become aware of new features, they find more use for *SmartCampus*. Further, we observed that though some users avoid using *SmartCampus* because of existing habits (***e.g., Int.8***), others use *SmartCampus* to either entrench existing habits or form new ones. For instance, a user said "*… it has been really easy for me to know for example where I have to go because it's been like easy to adapt me to SmartCampus that's why I keep using it"* (***Int.16***).

Furthermore, we noted that support structures are valuable in driving post-adoption use. For instance, touchpoints and activities within groups assist users to identify new features of, and new uses for, *SmartCampus*. Likewise, negative feedback within groups and from touchpoints may as well discourage a user from further exploring *SmartCampus* for new features and uses. Our data suggest that after a user finds a functional and important feature in a mobile app, negative feedback may influence the user's opinion about the app and prevent the user from exploring new features, but it may not deter the user from continuing to use the functional feature provided the feature remains useful. For example, a user said "*..no I wouldn't say that they have influence, it's just that…well, maybe not the use really but the opinion to explore the app* (***Int.7***) and another said "*…at the start but now I am minimally satisfied with SmartCampus so I'm not influenced by them*" (***Int.4***).

Lastly, our data suggest that task attributes influence how users interact with *SmartCampus*. For tasks that require a lot of information to complete, users are forced to continue using *SmartCampus* to acquire the needed information. We also noted that, in cases where the information required to complete a task is static (e.g., locating a building), the use of *SmartCampus* to obtain such information declines when users become acquainted with the information. On the other hand, when the information required is dynamic (e.g., checking sports events), users continue to use *SmartCampus* to obtain such information. For example, a user said:

"*… I only used the map when I first came, … when I first started my Finnish 2 classes and I was going back to other campus, then I started using the map again but after I've done it for almost one month plus, I don't use the map frequently because I already know where I am going to*".

How frequently a user performs a task, especially tasks that require dynamic information, also influences the post-adoption use of *SmartCampus*. Further, we observed that using alternative mobile apps to perform tasks may prevent a user from using *SmartCampus*. However, the presence of alternatives may as well serve as a back-up in moments when *SmartCampus* fails, thus reducing the frustration that users experience.

Implications, Limitations, and Conclusions

This study qualitatively examines the actual adoption and post-adoption use of a mobile app in a higher education context. The mobile app is primarily for informative purposes (Nickerson et al. 2013) and provides users with access to university resources. The study contributes to the literature on the adoption of mobile apps. It contributes a model that illustrates how mobile app attributes, user attributes, task attributes, and support structures influence initial adoption and post-adoption use of a multi-feature mobile app. This contribution is important for several reasons. First, it augments prior research in that beyond a user's intention to use and continue using a mobile app, it explains how the factors influence actual adoption and post-adoption use of a mobile app. Second, whilst it confirms findings from prior research (e.g., on the effect of perceived usefulness and ease of use on use), it also unravels nuances beyond the correlations presented in prior research models. For instance, the findings of this study agree with those of McLean (2018) that customization may enhance the influence of ease of use and usefulness on initial adoption and post-adoption use. However, customization may also prevent a user from exploring and using new features in a mobile app. Similarly, though the result of our study agrees that social influences may not affect the continuous use of known features (e.g., see Lu 2014), it does suggest that social influences may affect the exploration of a mobile app for new features and uses. Third, it highlights the importance of the initial features that a user gets to know during initial adoption (e.g., through touchpoints) on the extent to which the user uses a mobile app. Users tend to use few features, especially those that are on the home

screen by default or by customization. This may be because traditionally, users expect mobile apps to have limited features. The finding has implications for future research on how multi-feature mobile apps (e.g., those used in smart campuses) can be designed to aid the exploration of features. Fourth, it has unraveled several details, including completeness and uniqueness of a mobile app, visibility and user awareness of features, familiarity with alternative mobile apps, and task frequency and has highlighted how they influence adoption and post-adoption use of mobile apps.

For practice, managers may find the findings of this study insightful in designing and promoting the adoption and use of multi-feature mobile apps. Specifically, whilst managers design digital services bundled as multi-feature mobile applications, they should do so without constraining the visibility of the various features. Also, the results suggest that managers of mobile apps, especially for smart campuses, should bundle features that may not be unique in isolation, but collectively provide users unique and complete digital service experiences. Furthermore, the findings suggest that the rollout of a multi-feature mobile app in a smart campus initiative should not only be accompanied by formal support structures, but also informal support structures and activities that influence the adoption and use of the several features in the multi-feature mobile app.

This study, aside from its contributions, has limitations. First, the mobile app studied is an informative mobile app used within a higher education context. Thus, factors such as risk, security, and trust did not come up during the interview. However, we envisage that such factors may come up in future rollouts when there are transactional features, especially across third-party services. We thus encourage scholars to research how such factors may influence the development and adoption of mobile apps with transactional features for smart campus initiatives.

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