Full Stack Development: Building Modern Mobile and Web Applications
(Technical Project)

The Effects of Software Application Platform Availability
(STS Project)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

The invention of the transistor, "an influential invention that changed the course of history" (Bellis, 2004), paved the way for the microprocessor as "one of the greatest inventions of the twentieth century, placing an entire room of computer equipment with a single chip" (Michihara, 2008). This led to the rise in popularity of the personal computer as the physical size of computing devices shrunk within the so-called microcomputer, or personal computer, revolution of the 1970s (*The Personal Computer Revolution*, n.d.). Later on and well into the digital age at the turn of the century, mobile computing devices such as smartphones have followed a similar mass integration into society following the "arrival of the first Apple iPhone in 2007 as the first fully realized smartphone" (Huddleston, 2021).

With an impressive 85% of Americans now owning a smartphone of some kind, not to mention another 12% that own a more rudimentary cellphone, it is safe to say that the vast majority enjoys keeping a mobile computing device at arm's reach (*Mobile Fact Sheet*, 2021). This prominence of mobile device usage is compounded by the fact that "as of August 2022, 53.74 percent of the total web visits are currently mobile, compared to 46.26 percent coming from desktops" (*What Percentage of Internet Traffic Is Mobile?*, 2022). This difference in usage is also likely to keep growing, as "the market for mobile computing devices across the globe is anticipated to develop at the fastest rate over the next few years" (Data Bridge Market Research, 2022).

There are two main ways through which most software applications are presented to the end user—web-based applications and device-native applications (Montecuollo, 2014). Web-based applications are usually able to suit a wider variety of users since all that is required to use them is a web browser, given that developers have taken care to account for the possibility of usage across different devices through responsive design (Berry, 2021). However, among other

pros and cons of development for both sides, natively designed software applications often benefit from performance and functional advantages (Holzer & Ondrus, 2012).

Within the elicitation and gathering of project requirements in the first stage of the software development process, one of the first topics that developers must decide upon is what platform they will be developing their product for ("6 Basic Steps of the Software Development Process (2022 Updated)," 2017). And inevitably, limitations in development team resources such as time or knowledge base, the directed interests of stakeholders, or other factors lead to software products being developed for certain platforms but not others (Dziuba, 2021). This means that many devices and thus many users are rendered unable to use the software.

These differences in software platform availability and the resulting consequences are the central concern of my sociotechnical research, closely coupled to my technical project dealing with mobile application development for a specific use case. The motivation for my STS research stems somewhat from my work on the technical project, as a conscious decision was made to utilize a cross-platform development strategy that would allow both Android and iOS users to use the application yet disallow usage in a standard web browser. Therefore, I am interested in how these design decisions and availability discrepancies affect society in a broad context. In my technical project, I have contributed to the creation of a cross-platform mobile app to aid in the facilitation of a large-scale event summit. In my STS project, I will investigate how conscious design decisions regarding the chosen release platform for software applications affect usage patterns and availability among other implications.

Technical Topic

FATHOMWERX, a governmental entity that works to bring together public and private stakeholders for the Department of Defense (*Fusing Academia, Civilian and DoD Partners*, 2022), needed a software platform to facilitate a meaningful user experience for attendees of an

upcoming event summit. Although I do not have an extensive understanding of the previous technology, we can assume certain characteristics based on my working knowledge and a brief online investigation. Event and exhibitor information were likely posted online in a static manner that was inconvenient for continuous and live usage during in-person attendance. There was no personalization of content on a user-by-user basis in that the information given was the same for all participants. Paper fliers would be used in person to convey more information specific to attendees of individual events and for other similar purposes. All in all, there was certainly room for improvement in terms of organization, centralization, and convenience.

This need was addressed through the development of a cross-platform mobile application that served as an event agenda and networking platform for the specific conference itself. Once the problem was communicated and passed off to Naval Information Warfare Center (NIWC) Atlantic, their mobile applications team decided that a mobile app would best suit the needs of the user. FATHOMWERX and the NIWC development team began working closely together to establish and continually evolve requirements and specifications—the event planners articulated what they wanted while the developers returned with evaluations of what was possible and or realistic. After a few months and many design iterations and adaptations, the mobile application was successfully deployed and utilized by event participants to enhance their attendance experience.

Unfortunately, my internship period ended before the application was deployed for use. However, I can certainly comment on speculative innovations made and anticipated outcomes of the mobile app, all of which involve increased the efficiency and productivity of both event facilitators and attendees. First off, all event information is held within a single domain in the form of the software application. Updates to this information can be made synchronously and

remotely without the need to worry about redistributing physical copies of fliers—the information is digital and in the palm of your hand. Mobile push notifications conveniently replace the need for megaphones to update eventgoers in real time. Users can network and chat remotely with multiple others from different locations, though third-party networking and messaging platforms like LinkedIn are likely to take over once the initial connection itself is made. Also, presenters can view and answer questions from various audience members in virtual question-and-answer rooms without disrupting their presentation. Overall, the application is sure to facilitate an extraordinarily heightened degree of convenience and efficiency in all realms of the event summit. The functionality is digitally consolidated in a centralized manner that caters to the needs of each of the parties involved.

In relation to my STS research topic, a conscious design decision was made to develop the event software as a mobile application instead of a web app. This decision led to the inclusion of users who own smartphones running Android or iOS but render those without such mobile devices unable to access the application from a laptop, for example. The cross-platform development strategy led to more users being included than if Android or iOS was chosen singularly (Yewale, 2021). Even if they chose to develop solely for iOS which has just recently overtaken Android in domestic market share, nearly half of the domestic population would not have been able to use the mobile application (Li, 2022). Possible implications of this access barrier in the requirement of owning an Android or iOS device include not only having a harder time following along with the event exhibits, but also potentially missing out on opportunities to network with other individuals or vendors at the summit.

STS Topic

Through an analytical lens under the general field of thought of STS as well as actor-network theory, we must address the human, social, and technical elements of the software

development process during which design plans are laid out that will ultimately create disparities in the availability of the product for end users. The first human elements in the design process of web and mobile applications are those who recognize a problem that has the potential to be addressed in the form of software. These people are either project stakeholders themselves, or constituents of stakeholders, who set out to solve the problem themselves or have the problem solved by developers. Once stakeholders convene with software developers, the two groups work together in the creation of the software product. The final human elements are the end users of the software who most closely and directly reap the benefits through their usage of the platform to solve their problems. The technical elements mostly have to do with the software itself in its design and construction through a development team. Computing devices and their respective operating systems that are chosen as the eventual usage platforms must be considered within this development. Finally, the main social element encompasses the effect of the software from the level of the user, all the way up to the collective societal impact emplaced on the larger group of users as a network. These impacts are innately multi-dimensional and sometimes deeply complicated with many scales of potential implications. Inclusion and exclusion are inevitable by-products of design decisions.

Given the form of these groups of human, social, and technical actors and networks, it seems appropriate to investigate the topic under the ideology and lens of actor-network theory. Actor-network theory posits that essentially all elements of society, human and non-human, are connected in more ways than may be immediately apparent to the naïve investigator who may not know that "actor-network theory has very little to do with the study of social networks" (Latour, 1996). Each element works as an actor or network within this aptly-named framework,

although whether an element acts as an actor, or a network depends on the context in which it is analyzed and there are loose boundaries for interpretation (Latour, 1996).

Arguably the most important groups of human actors in terms of this investigative research are the classes of those included and excluded by the availability of software products across various platforms. The developers and stakeholders who choose those platforms are also important but in a more causal than reactionary form. Technical actors include the software itself and the devices used to run the software. However, these actors could also be viewed as networks in how they relate to and influence each other. There are many ways through which actor network theory can be used to analyze software applications from a societal equity standpoint among others. The naïve investigator, again, may jump to social media and networking as the most obvious networks, but this view merely scratches the surface of the much more intricate relationships between the actors and networks in web and mobile application development and usage.

Research Question and Methods

This landscape in which design choices lead to variation in availability of software products begs the question—how do differences in software availability across different platforms affect potential end users and what are the consequences of these disparities? Although software products in general without a specific category of use cases may seem broad, I have found that a lack of existing research would make it hard to narrow the focus to a specific category of software or a singular app by itself. Many apps that employ services to users on an account-by-account basis follow many of the same design architectures and philosophies, so a limitation of scope would be unnecessary for this high-level research.

This question is important because for much of the world's population, "smartphones have become an inseparable part of their lives" in addition to computers and the internet as a

whole (Kil et al., 2021). Seemingly minor differences in equity of software availability could very well have implications ranging beyond the simple inability to play a certain game, as software technologies are "permeating all aspects of life" (Fenwick & Edwards, 2016). As one can imagine when contemplating a day spent without their laptop or smartphone, "the importance of mobile phones in our everyday life and activities is undeniably unending" (Oza, 2017).

I plan to investigate past research regarding differences in software platform availability that affect what subsets of society can use the software in question and how these disparities lead to further socioeconomic problems. This could take the form of analyzing retrospective analyses of applications from teams who admit they fell short in making their products as widely available as they may have liked and what lessons they learned from those shortcomings. Although literature review may be the easiest way to gather information on the subject, I will also supplement this research review with interviews of software development team members from past internship experiences or elsewhere regarding how they choose what platforms they use to target their desired user bases and what past decisions in that regard have led to in their experience.

Conclusion

In summary, software in the form of mobile and web applications that run on smartphones and personal computing devices have become ubiquitous in society today and will continue to rise in popularity and scope. Some of these software products can be used effectively across multiple devices, while others are constrained in use to specific platforms such as one of the two most popular mobile operating systems, Android and iOS (*Mobile Operating System Market Share United States Of America*, 2022). Conscious design decisions such as what platform to develop software for innately have consequences for users yet beg for more research

and investigation as to how far these consequences range in who is affected and how. I expect to find a disconnect between developers and end users in terms of a lack of understanding on behalf of developers and other product stakeholders in terms of what would best benefit the users. I also expect to find that developers often fail to recognize these disconnects. Other expected results are to be comprised of a myriad of newfound perspectives on how usage patterns and exclusivity of the end user result from these development decisions.

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