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An Investigation Of Boaters' Attitudes Toward And Usage Of Targeted Mobile Apps

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AN INVESTIGATION OF BOATERS' ATTITUDES TOWARD AND USAGE OF TARGETED MOBILE APPS

by

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ABSTRACT

The purpose of this study was to understand boaters' adoption and usage of smartphones and mobile apps as well as to obtain their opinion on potential features of a targeted mobile app being developed as part of a broader interdisciplinary Florida Sea Grant outreach project. Data were gathered from an online survey of a sample of 164 boaters from the surrounding Central Florida area. In contrast with previous empirical mobile app studies, many respondents reported using mobile apps for information-seeking versus escape gratifications. Further more than half of the respondents' age sixty-five and over indicated using smartphones and mobile apps. These findings reflected recent national trend data showing shifting gratifications and an increase in technology use among older American adults. In regards to the planned mobile app, the study's respondents had favorable reactions to its potential features and indicated an above average intent toward downloading the app.

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CHAPTER ONE: INTRODUCTION

There is a relatively large body of scholarly work examining mobile technology through the theoretical lenses of the diffusion of innovations, uses and gratifications, and the technology acceptance model; however, to date there is a gap in knowledge over individual-based adoption, use, and intent to use targeted mobile apps (i.e., mobile apps specifically designed for a targeted audience). This thesis attempts to fill this gap by examining individual's reactions to mobile technology, in particular mobile apps among a targeted population of boaters. By applying communication theories, this study aims to provide a better understanding of the role of new technology in this context and to make practical recommendations for the development of future environmental social marketing mobile apps.

The telephone has long been the way to connect people with friends, family, co-workers, and everyone in-between. Similarly, the Internet connects people through computer mediated communication. A merging of these technologies resulted in the smartphone, a multifaceted innovation that has become more than just a talking device, but a tool with advanced capabilities that can assist users in various ways including their daily activities.

Smartphones are the next era of cellphones. Upgrades in technology, including faster processors, have revolutionized the traditional cellphone and led to the advanced capabilities of the smartphone. While there is not a standard definition of a smartphone, there are some key features that separate it from traditional cellphones such as an operating system, a QWERTY keyboard, and web capability.

A recent study by the Pew Internet and American Life Project shows that nearly half of American adults are smartphone owners (Smith, 2012b). One advantage to owning a smartphone is the ability to download mobile applications. Mobile applications or "apps" are special software programs that smartphone owners can download to their phones. These software programs are operating system and brand specific and run faster than a typical computer program, since they are (in most cases) smaller versions of complete software packages. Even though smartphone owners have the ability to download mobile apps, only a quarter of adults are currently downloading and actively using these mobile apps on their phones (Purcell, Entner, & Henderson, 2010). This leads to questions about why adults are using or are not using mobile apps and what perceived or actual barriers prevent those individuals from downloading new or utilizing mobile apps pre-installed by the manufacturer.

Even more, the mobile app market is currently a $20 billion industry with growth expectations of $100 billion by 2015 (Smith, 2012); therefore, by understanding how adults use mobile apps and the rewards or gratifications that they receive from them, developers can better tailor their mobile app which may increase the likelihood that an individual will download and/or use it.

When developing a targeted mobile app, it is important to analyze the uses and gratifications of that particular subset of the population to which the mobile app will be marketed in order to identify potential individual or user-based differences. For instance, different subsets may have contrasting lifestyles or cultural norms which may impact their technology usage and adoption patterns. By understanding these subset or niche populations, developers can first

determine whether a mobile app's features would be useful or desired by the target population and then determine whether the mobile app has a wider appeal to mass audiences.

Recently an opportunity arose to examine the diffusion, uses and gratifications, and the behavioral intent to use a planned targeted mobile app being developed as part of an interdisciplinary Florida Sea Grant campaign project. The purpose of the campaign's mobile app is to promote environmentally-responsible boating by providing users with educational information and awareness about important marine species and habitats as well as the locations of ecologically sensitive zones within Mosquito Lagoon. The Mosquito Lagoon is part of the Indian River Lagoon System and is located north of Cape Canaveral on Florida's East Coast. The Mosquito Lagoon was chosen for the campaign because the area has been going through a number of ecological changes including declines in sea grass beds and has seen increases in damage to oyster reefs (US Fish & Wildlife Service, n.d.) which some believe are due in part to improper boating practices (Burfeind & Stunz, 2007; Fletcher & Fletcher, 1995; Virnstein, 1999). As a part of the broader Florida Sea Grant campaign project, the mobile app will be used along with other social marketing tools to help educate and influence behavior change among those who boat recreationally in Mosquito Lagoon.

The Florida Sea Grant project's planned mobile app is expected to include map-based LBS (location-based service) app features. Map-based LBS mobile apps allow users to find geographic location information and include the ability to view images of a specific location (through aerial and street view maps), find directions to a location (via a global positioning system or GPS) and create bookmarked list of their favorite locations. However, at this time,

little is known about the target audience for the Florida Sea Grant project's planned mobile app, including whether they have access to, or would utilize, mobile technology which makes it an interesting case study to explore through the lens of traditional mass communication theory.

Purpose of the Study

Thus, the purpose of this study is: (1) to determine the current adoption rate and barriers to the adoption of smartphones, mobile apps, and map-based LBS apps within the targeted population; (2) to explore the uses and gratifications of mobile apps and map-based LBS apps among those within the targeted population who are smartphone adopters; (3) to identify what features of the planned Mosquito Lagoon mobile app the target audience would find most useful while boating; and (4) to assess whether the perceived usefulness of the planned mobile app's features would increase adoption intent.

From a theoretical standpoint, the study will contribute to the scholarly research stream by providing insight into the viability of the uses and gratifications approach for explaining the use of mobile technology (mobile apps and map-based LBS apps) and how the diffusion of innovations and the technology acceptance model (TAM) can be applied to better understand smartphone and mobile app adoption rates, barriers, and the features that drive adoption intention among this targeted audience. It is hoped that the findings from this study will offer practical guidance for the future development of targeted mobile apps including the planned Florida Sea Grant mobile app.

Justification

The targeted group being studied is Mosquito Lagoon recreational boaters who reside in the Central Florida area. Recreational boaters were chosen as they are the target audience for the Florida Sea Grant planned mobile app and it is expected that this targeted population will provide unique results compared to previous empirical findings in terms of both their technology adoption rates and their uses and gratifications. For example, in terms of adoption, the features available on many boating-related technologies are similar to those being proposed on the planned Mosquito Lagoon mobile app making it possible that boaters will be more receptive to using mobile apps compared to the general U.S. population. The potential for these findings makes it worthwhile to investigate how this notion may apply in a recreational boating context, foster comparative analysis, and extend mass communication theory in a new domain.

This study will also ask boaters which potential features of the Mosquito Lagoon mobile app would be most useful to them while boating. By gaining a better understanding of which of the potential mobile app features would be most desired by the targeted audience, the present study will provide guidance to the Florida Sea Grant project which aims to increase the likelihood of their mobile app's adoption.

There is also a limited amount of scholarly literature available on map-based LBS apps overall; therefore, this study will provide insight into how map-based LBS apps are adopted as well as individual-based uses and gratifications. Finally, there is a gap in empirical research on the use of mobile technology for environmental responsibility purposes. With that in mind, this

study will be exploratory with the hope of spurring research towards future environmental marketing campaigns looking to utilize mobile technology.

Organization of Remaining Chapters

This study begins with a secondary analysis of previously collected data from U.S. national surveys (e.g., Pew Internet and American Life studies) and empirical data to determine the current adoption and diffusion rate of smartphones, mobile apps, and map-based LBS apps among the general adult population. This is followed by an examination of empirical data on individual-based uses and gratifications of mobile apps and map-based LBS apps. The secondary analysis portion of this study concludes with an assessment of the factors that affect the acceptance of and intention to use map-based LBS apps. Together, these findings will be used to aid in the development of an online survey geared towards the targeted audience.

The Method Chapter is divided into two parts: Study 1 and Study 2. The first study includes a content analysis of previously conducted focus groups and associated short written questionnaires resulting from other aspects of the broader Florida Sea Grant project in order to identify potential features of the planned mobile app that would be desired by recreational boaters. This data was used to inform instrument development the second study's online survey. Study 2 involves an online survey that will be conducted to better understand the target audience's attitudes toward and usage of smartphones and mobile apps.

In the next chapter, the literature review provides background on the theoretical foundations guiding the present study and an overview of relevant empirical research. The three

theoretical frameworks guiding the present study include: the diffusion of innovations (to understand the barriers to adoption of smartphones, mobile apps, and map-based LBS apps); the uses and gratifications approach (to understand how adults use mobile apps and map-based LBS apps); and the technology acceptance model (to understand what factors may increase an individual's intent to use mobile apps). The following section begins with an overview of the diffusion of innovations and its application to the diffusion and adoption of smartphones, mobile apps, and map-based LBS apps.

CHAPTER TWO: REVIEW OF LITERATURE

Diffusion of Smartphones and Mobile Apps

Diffusion of Innovations (DOI) has been deemed as a useful theory to understand how an innovation is adopted within a society (Im & Ha, 2012; Lin, 2001; Rogers, 1995). The theory has been applied to understand the diffusion of other technologies similar to smartphones and mobile apps including personal computers (Lin, 1998) and mobile gaming (Schuurman, Courtois, & De Marez, 2011). An innovation can be defined as anything perceived as new to an individual. Whether the innovation is an idea, a product, a technology, or a tool, it follows a similar pattern of adoption; however, the time it takes for an innovation to be adopted can vary based on two factors: the technology's attributes and the individual's attributes (Rogers, 1995).

When an individual is making a decision over whether or not to adopt a new technology they are faced with uncertainty and are motivated to reduce it by more seeking information (Rogers, 1995). After seeking information about the innovation, they begin to form an attitude towards it by evaluating how they would use it or how it would fit in with their life. Informing this process is the individual's perception of the technology based on the technology's five attributes. There are five technology attributes in the DOI theory: 1) relative advantage; 2) compatibility; 3) complexity; 4) trialability; and 5) observability (Rogers, 1995).

The first (relative advantage) is based on an individual's perception about the degree to which the technology is better than its predecessor. For boaters, this could be a comparison drawn between a multi-feature mobile app and a single feature GPS unit. Looking at the

attributes of complexity and compatibility, the technology must be user-friendly and be easily integrated into a person's life (Kleijen, de Ruyter, & Wetzels, 2004). In this instance, it would be important to understand the level of experience or comfort the boater has when using mobile apps as well as how the mobile app could be integrated to supplement their lifestyle and needs. The trialability attribute in the aspect of technology is the ability of the individual to try-out or test the new technology on a limited basis, while observability is the ability of the individual to see others successfully using the technology (Rogers, 1995). When an innovation includes positive aspects of these five attributes the likelihood of adoption increases; however, individual attributes can also hinder a technology's adoption.

When looking at an individual's attributes, Rogers (1995) defines five different innovator categories based on a person's level of innovativeness: 1) innovators, 2) early adopters; 3) early majority; 4) late majority; and 5) laggards. Innovators tend to be younger and have a higher education and income than those in the late majority and laggard groups (Atkin, 1995; Leung & Wei, 1999). They are also more likely to be the first to try a new technology versus individuals labeled as laggards who tend to adopt well after an innovation has reached critical mass (Wei & Zhang, 2006). Critical mass has been defined as the point when enough people have adopted a technology that it begins to take-off or maintain a consistent stream of new adopters (Rogers, 1995). These take-off points can differ and are based largely on individual attributes and the individual's perception of the technology's attributes.

Adoption Status

Adoption can be defined as a person's decision to make use of a particular innovation (Rogers, 1995). With respect to smartphones, adoption is widespread across all U.S. demographic groups (age, income, gender, education level, geographic location, and race) with each group showing large to moderate increases (Smith, 2012a).

Regarding mobile apps, the number of American adults who have downloaded mobile apps has doubled from 2009 to 2011 (Purcell, 2011b). A study in 2010 by the Pew Internet and American Life Project showed that males are more likely to use mobile apps than women, yet this gap is closing (Purcell, 2011b). Overall mobile app users tend to be younger, Hispanic, male, more affluent, and have higher education and income levels than their counterparts (Purcell et al., 2010). These demographics are relatively consistent with findings of previous technology-based studies on adoption and are typically representative of individuals within innovator groups in terms of age, education, and income; however, it is unclear whether these demographics remain consistent within the targeted group of boaters for the planned Mosquito Lagoon mobile app. One factor that may produce inconsistencies between the target population and the general public is the utility factor of a mobile app; moreover, it seems logical that the more useful a mobile app is to an individual's goals, the more likely they will adopt the technology regardless of demographics. For instance, an older boater may find that some features of the planned mobile app would be useful while boating and therefore may be more likely to adopt it. As a result the first research question is proposed:

RQ1: Are there demographic differences in terms age, gender, income, and education level between the adopters and non-adopters of smartphones, mobile apps, and map-based LBS apps?

Regarding map-based LBS apps, the adoption rate has doubled in the past year (Zickuhr, 2012). Map-based LBS apps such as Android Maps, Apple Maps, Google Maps, and Google Earth allow users to search for locations, get directions, as well as look at the satellite imagery of a location. These mobile apps are very popular amongst American smartphone owners with an adoption rate of 74% (Zickhur, 2012).

With the exception of mobile apps, the adoption rate of mobile technology is moderate amongst American adults; however, it is unclear whether these adoption rates are consistent within the targeted boating population. Thus the next set of research questions is posed:

RQ2a: What is the current rate of adoption of smartphones among Mosquito Lagoon boaters?

RQ2b: What is the current rate of adoption of mobile apps among Mosquito Lagoon boaters?

RQ2c: What is the current rate of adoption of map-based LBS apps among Mosquito Lagoon boaters?

While all of the aforementioned technologies are showing moderate to large gains in adoption, overall their rates are varied. These variations could be the result of their technological

attributes which may be partly due to actual or perceived barriers that are preventing them from reaching critical mass. In order for a technology to reach critical mass, it is important to recognize, remove and overcome these barriers to increase the likelihood of adoption. In terms of the planned Mosquito Lagoon mobile app, removing or minimizing barriers may aid in increasing the likelihood of adoption which could open new channels for the communication of environmental education information.

Barriers to Adoption

Barriers to adoption, both perceived and actual, can help explain why an innovation is not being adopted. On one side, individual attributes such as access to the device and income can deter an individual from adopting an innovation; while characteristics of the technology's five attributes (relative advantage, compatibility, complexity, trialability, and observability) can also play a role in hindering an innovation's adoption rate (Rogers, 1995; Verkasalo, López-Nicolás, Molina-Castillo, & Bouwman, 2010). When a developer understands and removes these barriers, they maximize the opportunity for adoption.

For example, when Leung and Wei (1999) looked at cellphone laggards, they found that socioeconomic factors (i.e., age and income) as well as compatibility, "technology cluster" (people who own several compatible technologies with similar attributes) were the best predictors of whether a person chose to adopt a new technology. Within the boating population, these demographics might be skewed as older boaters may have the financial resources to purchase multiple boating-related technologies (e.g., GPS, depth finders, chart plotters) while

younger, less affluent boaters may only have the ability to purchase one or only a few boating-related technologies.

When Lin (2010) examined technology clusters and satellite radio adoption, she found that individuals with a larger technology cluster indicated fewer perceived barriers (e.g., cost) to adoption of other complimentary technologies. For boaters, these complimentary technologies could be a handheld GPS unit and a smartphone with GPS capabilities. Further Rogers (1995) found that when an individual owns two or more innovations that share multiple attributes, they are more likely to adopt both technologies. In this case, it might be worthwhile to determine what other types of boating-related technology boaters are using, compare those features to the desired features of the planned mobile app, and then determine whether the similarities increase the likelihood of adoption. This leads to this study's first hypothesis:

H_1: The greater a boater's technology cluster (boating technologies), the greater their behavioral intent to use the planned Mosquito Lagoon mobile app.

In regards to the diffusion of the smartphone, Boulos, Wheeler, Tavares, and Jones (2011) found that the barriers to smartphone adoption include high cost, not understanding the benefits of the smartphone compared to other technologies (relative advantage), and the perception that the smartphone interface is difficult to operate (complexity). On the other hand, Kim, Seoh, Lee, and Lee (2010) found that the attributes of relative advantage (ability to receive information) and compatibility (the technology aligns with their values) were strong predictors for smartphone adoption. For boaters, the relative advantage of the smartphone could be the

lower cost compared to more expensive boating-related technologies (e.g., onboard GPS and chart plotters) and since some boating-related technologies are similar to smartphones (e.g., handheld GPS devices) they may have a lower perceived complexity.

Potential barriers to mobile app adoption include complexity (e.g., finding and downloading a mobile app) and a general confusion over the definition of a mobile app (Purcell, 2011b; Verkasalo et al., 2010). In terms of confusion, Purcell (2011b) refers to a lack of understanding (e.g., what is a mobile app) and a lack of knowledge (e.g., knowing whether one's phone has the ability to download mobile apps). These barriers were most consistent across individuals age 50 years or older (Purcell, 2011b). There is also the barrier of compatibility, as mobile apps are phone operating system specific; therefore, some individuals may not be able to download a mobile app if it is not available for their phone's platform.

Conversely when Hu, Li, and Hu (2008) looked at mobile banking apps, they found that the relative advantages of convenience and low cost were positive indicators of a mobile app's adoption. In addition, given the large number of American adults who own smartphones it can be inferred that mobile apps have high trialability since smartphone owners can download many mobile apps free and high observability as 42% of U.S. adults smartphone owners have downloaded mobile apps (Purcell, 2011b) making it more likely for a person to observe someone using a mobile app on their phone.

To date few barriers have been indicated in the existing literature regarding map-based LBS app adoption. On one side, it could be assumed that the barriers to map-based LBS app

adoption are similar to mobile apps as an individual must have access to a smartphone (trialability) in order to use a map-based app and understand how to use a map-based LBS app (complexity); yet, given that map-based LBS apps are based upon a platform similar to other map-based technologies (e.g., handheld GPS, map-based websites like Google Earth) it could also be assumed that these types of mobile apps have the least barriers. For instance, people have used technologies similar to map-based LBS apps such as: paper maps, hand-held GPS, as well as Internet websites such as Google Maps, Google Earth, and Map Quest, so it is more likely that map-based mobile apps will be compatible with users' lifestyles and have a perceived lower complexity than other types of mobile apps and map-based technologies.

Map-based LBS apps also have the relative advantage of mobility compared to computer-based map services making them more convenient than carrying paper-based maps (Fortenberry & Brown, 2011). This may be especially helpful for Mosquito Lagoon boaters, as the area is relatively large and can be challenging to navigate. In this instance, if a boater got lost while navigating the Lagoon, they could use a map-based mobile app to find their location and then safely navigate to their desired destination. This in comparison with paper maps where a boater would first have to find their location on the map, given they are actually aware of their present location.

Further most map-based LBS apps come pre-installed on users' phones so they can be used without additional fees (relative advantage), are easy to try-out (trialability) and since a large number of smartphone owners already use these apps, it is easy to observe (observability) others using these types of apps (Zickuhr, 2012).

Diffusion of Innovations Summary

The previously discussed technologies are reflecting moderate to high gains in adoption and diffusion. The barriers are varied but appear to be based on a general lack of knowledge of the technologies' capabilities and the advantages of using these devices. Understanding and overcoming these barriers is important, especially when designing the planned Mosquito Lagoon boating mobile app. This leads to the second set of research questions regarding barriers to the adoption of smartphones, mobile apps, and map-based LBS apps among the Mosquito Lagoon recreational boating population:

RQ3a: What are the barriers to smartphone adoption among Mosquito Lagoon boaters?

RQ3b: What are the barriers to mobile app adoption among Mosquito Lagoon boaters?

RQ3c: What are the barriers to map-based LBS app adoption among Mosquito Lagoon boaters?

For individuals who have adopted these technologies, it is also important to understand *how* they use these technologies as well as the gratifications that they seek. By understanding an individual's underlying needs, mobile app developers can better tailor a mobile app that aligns with that individual's goals. To understand these uses and needs, the next section will provide an overview of the uses and gratifications approach. This theoretical approach was deemed appropriate for this study because it is based on a user-centered perspective. This is important as mobile devices are considered personal devices.

The uses and gratifications approach has also been shown to provide a viable framework to examine individual technology use, as it is based on the assumption "that individual differences cause each user to seek out different media and use the media differently" (Wei & Lo, 2006, p. 55). This approach has been applied in research involving technology similar to smartphones and mobile apps including: tablet e-book readers (Shin, 2011); personal computers (Zhang & Zhang, 2012); and personal digital assistants (Peters & Allouch, 2005).

The Uses and Gratifications Approach

The uses and gratifications approach is one of the traditional theoretical lenses scholars have used to examine individual-based media use. The approach relies on three basic assumptions: 1) the audience is active in their choice of media; 2) the audience is aware of their needs; and 3) audience members choose how they use media based on the gratifications they receive (Katz, Blumler, & Gurevitch, 1973). Previous researchers have also examined why a person uses a specific media source and how a new medium may fulfill a person's individual needs. Katz, Gurevitch, and Haas (1973) categorized five general needs that are fulfilled through media use:

1. Cognitive needs are based on a user's need to gain knowledge and understanding.
2. Affective needs are based on a user's need for an aesthetic, pleasurable, and emotional experience.
3. Personal integrative needs are based on a user's need to strengthen their credibility, confidence, or status.

4. Social integrative needs are based on a user's need to stay in contact with family and friends.
5. Escape needs are based on a user's need to escape from self or their role in society.

All of these elements combine to create a basis for analyzing a person's behavior when using media; however, other researchers have indicated that additional factors should be considered when employing the uses and gratifications approach to mobile technology, In fact, scholars have proposed that each new medium generates unique motivations and gratifications for use (Kaye & Johnson, 2002; Papacharissi & Rubin, 2000).

The next section outlines the unique motivations and gratifications for conventional telephones, cellphones and advanced mobile communication technologies (smartphones and mobile apps) through the application of the uses and gratifications approach.

Uses and Gratifications of Conventional Telephones and Cellphones

When looking at a person's needs based on their use of a conventional phone, Dimmick, Sikand, and Patterson (1994) noted that people want first to fulfill their social integrative needs (socialize with family and friends), their cognitive needs (make appointments, seek information and order products), followed by their reassurance needs. Reassurance is the need of the telephone user to know the well-being of their friends and relatives and to have the ability to make calls during an emergency (Dimmick et al., 1994). Williams, Dordick, and Jesuale (1985 as cited in Leung & Wei, 2000) added fun or entertainment motivations for telephone use; moreover, making a phone call was considered a fun-seeking activity. O'Keefe and Sulanowski

(1995) looked at the gratifications sought through conventional telephone use and indicated that "the greater the motives for entertainment [escape needs], time management, and social interaction [social integrative needs], the more time people spent on the phone" (p. 930).

When comparing the uses and gratifications of the cellphone to the traditional phone, similar user gratifications (social integrative needs and cognitive needs) were reported. However, with the advent of the cellphone, additional gratifications such as: mobility (Ishii, 2006; Leung & Wei, 2000; Wei & Lo, 2006) fashion and status (Wei & Lo, 2006), and relaxation (Leung & Wei, 2000) emerged. Even though similar gratifications between the cellphone and the traditional phone were found; given the advanced functions of smartphones, it is expected that individuals will find new uses and gratifications for these devices.

Uses and Gratifications of Smartphones

While many American adults still perceive their smartphones as talk devices, added data capabilities are allowing them to be used for much more (Belson, 2006). Smith (2011) found that American adult smartphone owners use their phones most often to fulfill their cognitive needs through email and other web based services.

Many American adults are also using their smartphones for a variety of gratifications through just-in-time services such as: "coordinating meetings, solving problems, finding restaurants and businesses, settling arguments they were having, looking up sports scores, getting traffic updates, or finding help in emergency situations" (Rainie & Fox, 2012, para. 3). Survey results from Kim et al. (2010), showed that the most common motives for smartphone use were

based on cognitive needs (information) and personal integrative needs (symbolic factors). When Wei (2008) looked at the motivations for smartphone use, he found that people use their smartphones to meet their cognitive needs (news-seeking and web-surfing) and escape needs (gaming). Here Wei (2008) inferred that the advanced capabilities of the smartphone allowed people to use them more frequently to fulfill their cognitive needs. One way that the smartphone may enable users to fulfill their cognitive as well as a range of underlying needs is through mobile apps, which will be discussed in the following section.

Uses and Gratifications of Mobile Apps

Looking at the mobile apps available in the Apple App Store (one of many sources for downloading mobile apps) there are a variety of mobile app categories that could be used to fulfill an individual's needs. Categories of mobile apps include: cognitive need based apps (e.g., news, weather); personal integrative need based apps (e.g., lifestyle, business); social integrative need based apps (e.g., social networking); and escape need based apps (e.g., games, entertainment). In March of 2012, Apple announced that users had downloaded 25 billion apps from Apple's App Store (Brian, 2012; Murphy, 2012). In spite of the large number of downloads, the Pew Internet and American Life project has estimated that only a third of smartphone users actively use the mobile apps available on their phones (Purcell et al., 2010). Even with a small number of mobile app users, technology experts believe the next revolution will involve "targeted apps" (i.e., specialized mobile apps directed towards specific audience's needs such as personalized health care or weight management mobile apps), which are expected to be the driving force behind the next web evolution (Anderson & Rainie, 2012).

According to a recent Nielsen survey, the most popular mobile apps by adult smartphone users are for game play, followed by news and weather, navigation, and social networking (Purcell et al., 2010). These findings are consistent with other researchers (Ho & Syu, 2010; Wei, 2008) who found that these mobile apps are mainly used for escape needs or to pass the time since they are mostly used for gaming, followed by cognitive needs such as web browsing and news-seeking.

However, deviating from these findings is a study by the Pew Internet & American Life Project which showed that American adults are more likely to download mobile apps that fit with their cognitive needs (informational apps - weather, sports, stocks), then social integrative needs (social networks), followed by escape and entertainment needs (Purcell, 2011b). Inconsistencies between these studies findings could be the result of sampling differences, the time between samples, the rapid adoption rates of mobile apps in the past year (Purcell, 2011b), or the number of new mobile apps available across a variety of categories. Further this divergence could also be the result of recent infrastructural improvements which have increased Internet speeds (3G and 4G networks) and advancements in mobile phone hardware component (e.g., more powerful processor chips).

It is important to note that even though these advancements allow a person to use their smartphones for internally-driven information-seeking, they also generate questions as to whether the technology is externally pushing people towards using these devices for information-seeking. An example of one such advancement is the global positioning system (GPS) feature which was added to cellphones and smartphones as a part of the Wireless Communications and

Public Safety Act (also known as the 911 Act or E911 Act). While the act was created to aid emergency responders in locating cellphone and smartphone users during emergency situations, this feature also created a new market for location-based service (LBS) apps.

Uses and Gratifications of Map-Based LBS Apps

Internet and GPS-enabled smartphones have provided opportunities for the development of map-based LBS apps. As previously mentioned, map-based LBS apps allow users to find a location, get directions to a location, and create saved bookmark lists of their favorite locations.

The Pew Research Center has recently indicated that almost three-quarters of U.S. adult smartphone owners use map-based LBS apps for directions and recommendations (Zickuhr, 2012). Map-based LBS apps are typically a source for cognitive need-based information such as finding restaurants, locating businesses, and getting directions (Fortenberry & Brown, 2011; Lindqvist, Cranshaw, Wiese, Hong, and Zimmerman, 2011; Zickuhr, 2012).

Prior research has suggested that map-based LBS app use is more tied with cognitive information-seeking needs and perceived enjoyment in using the interface versus financial motivators like deals and coupons which are not perceived as useful features (Fortenberry & Brown, 2011). From this research it can be inferred that map-based LBS app users are typically looking for information about a location compared to finding deals or discounts. This notion may or may not hold true for boaters as it is unknown whether they would be more interested in finding a fishing location or receiving a discount on fishing supplies. At this time, there is limited research on the uses and gratifications of map-based LBS apps (Fortenberry & Brown, 2011),

which could be primarily based on the newness of the technology or that most of the scholarly focus is oriented towards geo-social LBS apps (e.g., check-in apps like Foursquare and Facebook). Therefore, it is important to uncover what the audience wants or gets out of using map-based LBS apps.

Uses and Gratifications Summary

As previously stated, scholars (Kaye & Johnson, 2002; Papacharissi & Rubin, 2000) have inferred that each new medium creates unique motivations and gratifications for use. From the traditional telephone to the smartphone, the basic underlying needs are similar (e.g., social integrative; information-seeking, and escape); however as the technology was modified it generated and reordered priorities in the hierarchy of those needs. For example, the cellphone added mobility but still included other needs such as social integrative and information-seeking. The smartphone included information-seeking and social integrative needs as well as a new dimension of escape through mobile apps. At the same time, smartphone features such as Internet capability, mobile apps, and GPS capabilities are potentially shifting individuals' needs by providing users with new tools to assist them in managing their personal life, tracking their health, and completing work-related tasks. Further all of these tools may be a catalyst for the shifting mobile app gratifications from escape to information-seeking needs. Given these un-tested gratification shifts as well as a gap in the existing literature, the next set of research questions regarding the uses and gratifications of the aforementioned technologies is proposed:

RQ4a: What are the common uses of mobile apps by Mosquito lagoon boaters?

RQ4b: What gratifications do Mosquito Lagoon boaters seek from mobile apps?

RQ5a: What are the common uses of map-based LBS apps by Mosquito Lagoon boaters?

RQ5b: What gratifications do Mosquito Lagoon boaters seek from map-based LBS apps?

As previously stated, researchers are only in the beginning stages of understanding how and why adults are using these technological advancements which could be a result of the low adoption rate with respect to mobile apps or the newness of the technology. It is important to recognize that access to a technology does not necessarily lead to adoption or usage; moreover, an individual has to believe that the mobile app has observable benefits, is useful and is easy to use.

With those ideas in mind, the next section will discuss the Technology Acceptance Model (TAM), specifically looking at map-based LBS apps. While it may seem redundant to discuss both the Diffusion of Innovations (DOI) with the Technology Acceptance Model (TAM), the DOI has been deemed appropriate for understanding attributes associated with the individual and the technology that may lead to adoption intention and the TAM has been shown to help explain an individual's adoption and usage intentions (Davis, Bagozzi, & Warshaw, 1989; Lin, 2004). Moreover, TAM will be utilized to understand what factors or elements drive an individual's behavioral intent to use (adoption intention). Only map-based LBS apps will be analyzed using the TAM, since the planned Mosquito Lagoon mobile app will potentially incorporate map-based LBS app features.

The Technology Acceptance Model

The Technology Acceptance Model (TAM) is a useful way to examine an individual's likelihood of technology adoption. Within the framework of TAM (Davis, 1989), this likelihood of adoption is based on an individual's behavioral intent to use and is comprised of two factors: perceived usefulness (PU) and perceived ease of use (PEOU). Where PU is an evaluation of how the technology will increase an individual's performance; PEOU is an evaluation of how easy or difficult the technology is to operate. Together, these evaluations form a link towards an individual's attitude towards using a technological device (behavioral intent) and in some cases PU has been found to be a more robust indicator compared to PEOU regarding an individual's behavioral intent to use (Im & Ha, 2012). In the literature, TAM has been applied in empirical studies to predict individual behavioral intention towards using technologies similar to map-based LBS apps including: GPS units (Chen & Chen, 2011) and mobile data services (Hong, Thong, Moon, & Tam, 2008).

Since the theory's original conceptualization by Davis (1989), modifications and extensions to the TAM have been developed, including TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008). From these modifications, three additions to the original TAM including barriers, behavioral control, and perceived enjoyment (Verkasalo et al., 2010) will be discussed in the next section as they pertain to map-based LBS apps.

TAM and Map-Based LBS Apps

Barriers to map-based LBS app adoption as discussed in the previous diffusion of innovations section have been shown to have a negative effect on a person's behavioral intent to

adopt. These barriers also have a negative effect on an individual's behavioral control and perceived enjoyment (Verkasalo et al., 2010). Behavioral control is "an individual's perception of the availability of knowledge, resources, and opportunities needed to carry out a task" (Verkasalo et al., 2010, p. 243) while perceived enjoyment is an individual's perception that a device is enjoyable to use (Davis, Bagozzi, & Warshaw, 1992, as cited in Nysveen, Pedersen, & Thorbjornsen, 2005). Looking at boaters' attitudes toward map-based LBS apps, behavioral control would refer to their belief that they could find the location or use the mobile app to find the information they need, while perceived enjoyment would be their belief that the mobile app will provide them with an exciting and enjoyable experience.

In extant research on the use of map-based LBS apps, behavioral control, perceived enjoyment and perceived usefulness were found to be directly related to an individual's behavioral intent to use (Cakmak & Basoglu, 2012; Verkasalo et al., 2010). Adding on to the previous boating example, perceived usefulness could be the boater's attitude toward how useful the mobile app's features are when compared to other mobile apps or boating-related technologies (e.g., a single feature handheld GPS versus an "all in one" targeted mobile app).

Cakmak and Basoglu (2012) found that for a map-based LBS app to be perceived as useful it must be compatible with the individual's lifestyle and their phone's operating system, fit with the task the individual is trying to complete, and save the individual time. They also found that for the mobile app to be perceived as easy to use it must be perceived as less complicated, easy to configure, easy to understand, and accurate in identifying the user's location. In this instance, it may be beneficial for the mobile app designer to understand the boating audience

(e.g., age and technology skill level) and to provide accurate and up to date location-based information. It will also be important to determine what features would be useful to the area boaters, to determine where they may use the mobile app (e.g., complexity such as reduced visibility of the phone's screen while outdoors), and to know which type of smartphone platform (e.g., Android, Blackberry, iPhone, or Windows Phone) is most popular to reach the maximum number of potential adopters.

Summary of TAM and Map-Based LBS Apps

The literature on TAM research indicates that the most important factors that lead to an individual's behavioral intent to use a map-based LBS app are reducing barriers, providing an enjoyable and easy to use interface, and providing useful features. In planning the Mosquito Lagoon mobile app, it seems these factors should be accounted for to increase the likelihood that an individual boater will adopt the mobile app and increase the potential for exposure to the campaign's environmentally-responsible boating messages. This leads to the present study's second hypothesis:

H_2: Boaters' perceived usefulness of the planned Mosquito Lagoon LBS mobile app features will be positively associated with boaters' behavioral intention to use the app.

Since the mobile app is still in the planning and development phase it will not be possible to test whether the interface will be enjoyable to use; therefore, the respondent's will be asked how useful they perceive *potential* features of the mobile app. It will also be important to

understand whether there is a single feature of the planned mobile app that would be perceived as most useful for Mosquito Lagoon recreational boaters; as a result, the respondents will also be asked which single feature would be most useful to them while boating in the Lagoon. It is hopeful that by determining (and incorporating) this single feature, it will increase the likelihood that a boater will download the planned mobile app. This leads to the study's final research question:

RQ6: What feature(s) of the planned mobile app would be preferred or perceived as useful among Mosquito Lagoon boaters?

Summary of Chapter 2

The previous literature streams suggest that the gratifications of smartphones and mobile apps may be shifting towards cognitive, information-seeking needs; yet, to date there are inconsistencies between empirical reports and national trend data (Pew Internet & American Life Project studies). Further, empirical data on the uses and gratifications of map-based LBS app users is scarce, leaving missed opportunities for LBS mobile app developers. The diffusion and adoption of smartphones and map-based LBS apps appear to be strong across the general American adult population but the adoption of mobile apps is still relatively moderate. These moderate gains could be the result of barriers to adoption based on complexity and a lack of perceived relative advantage of using mobile apps. To possibly remove and/or reduce such barriers to adoption, researchers must first begin to uncover and understand why an individual does or does not use a technology.

Overall, the goal of this study is to contribute to the relevant scholarly research streams by providing insight into the viability of the uses and gratifications approach for explaining the use of mobile technology (mobile apps and map-based LBS apps); identification of the adoption rates and barriers of smartphones, mobile apps and map-based LBS apps, as well as to uncover desired features of the planned Mosquito Lagoon mobile app that may increase the likelihood of adoption among the targeted boating audience.

By assessing these factors, recommendations can be made with respect to the ecologically-focused social marketing campaign funded by Florida Sea Grant. These recommendations may include how to better tailor the development of the planned Mosquito Lagoon mobile app to provide information promoting and facilitating more environmentally-responsible boating as well as the incorporation of useful features that may increase the likelihood that the targeted boating population will download the app. The next Chapter will begin with a brief review of the purpose of the study and a detailed explanation and justification of the study's methods.

CHAPTER THREE: METHOD

Introduction & Method Overview

The primary objectives of this study are: to identify the adoption rates and barriers to adoption of smartphones, mobile apps, and map-based LBS apps; to understand boaters' uses and gratifications of mobile apps and map-based LBS apps; to identify what features of the planned Mosquito Lagoon mobile app the target audience would find most useful while boating and whether the perceived usefulness of the planned mobile app's features would increase adoption intent. From these findings, it is hoped that recommendations can be made for the Florida Sea Grant environmental social marketing campaign to aid in the development of a targeted mobile app for Mosquito Lagoon recreational boaters. Although previous studies have examined adoption rates, barriers, uses and gratifications, and adoption intentions of new mobile technologies, there is a relatively small scholarly literature stream focused specifically on map-based LBS apps and questions remain as to whether these findings apply to Mosquito Lagoon recreational boaters.

The remainder of this section has been organized into two parts: Study 1 and Study 2. Study 1 involved an analysis of previously collected data (focus groups and associated short written surveys) from the broader Florida Sea Grant project. The results from this analysis informed development of an online survey instrument which was used to collect data on: the current mobile apps used by boaters; other non-smartphone boating-related technologies used by boaters (technology cluster); and the desired features of the planned Mosquito Lagoon mobile

app. These results were also used for sampling purposes to locate popular boating associations and organizations in the area. Study 2 utilized previously validated scales to develop items for an online survey that was sent out to members of selected Mosquito Lagoon boating associations and organizations identified in Study 1.

Study 1

Introduction

To understand the desired features of the planned Mosquito Lagoon mobile app, data from focus groups and associated short written questionnaires (previously collected from boaters as part of the broader Florida Sea Grant project) were used to inform the present study's methodology. The focus groups took place in the fall of 2012 in the Central Florida cities of Palm Bay, Orlando and Titusville. The associated short written questionnaires were distributed and collected in person to participants as they arrived at each of the focus groups. The focus group participants were mainly recreational boaters who regularly visit Mosquito Lagoon. They were predominately male (85%) and Caucasian (95%) which is expected to be an accurate reflection of the Mosquito Lagoon boating population.

Data Collection and Procedures

A content analysis of the existing focus group data (300 pages of transcripts from six focus groups and 60 associated short written questionnaires) guided the development of several measures for the online survey in Study 2. The content analysis method is a well-known social scientific tool that is commonly employed across multiple disciplines to examine a diverse array

of phenomena and topics. It offers methodological strengths in documenting patterns and providing comparative assessments in an objective and un-bias manner (Krippendorff, 2004). For the purpose of this study, the content analysis method was utilized to identify which mobile apps boaters are currently using; what other types of (non-smartphone) technology boaters use while boating (technology cluster); the desired features of the planned Mosquito Lagoon app; and popular local boating organizations/associations for the online survey's sampling procedure in Study 2.

This investigation is exploratory in nature due to a gap in scholarly research on targeted mobile app use overall and within this targeted boating population. Focus group data was chosen for analysis as the data obtained from focus group discussions has been shown to provide unique insights into the population being studied by "drawing upon respondents' attitudes, feelings, beliefs, experiences, and reaction[s] in a way that would not have been feasible using other methods" (Goss & Leinback, 1996, as cited in Kurniawan, 2008, p. 890). The transcripts from the focus groups were analyzed to determine which features of the planned mobile app would be desired by boaters and which mobile apps the participants are currently using while boating in the Lagoon.

From the associated short written questionnaires, participant write-in responses were analyzed to determine the most popular boating organizations/associations in the local Central Florida area. These findings were used to develop a purposive sampling procedure to target Mosquito Lagoon boaters through their membership in those groups. The short questionnaires

were also used to develop items for the online survey instrument to determine which boating-related technologies boaters use in addition to smartphones and mobile apps.

Measures

For the following measures, each participant's response was coded as '1' = condition present or '0' = condition not present. If a participant mentioned multiple responses, each response was coded separately. For example, if a respondent indicated being a member of multiple boating organizations each occurrence was counted as '1.'

Boating organizations and associations. To determine the most popular local organizations/associations among the participants in the previously held focus groups, the results from one question on the short written questionnaire was analyzed: "Please list your active memberships in any local boating, fishing, duck hunting, or watersports clubs or organizations."

Boater technology cluster. To determine which boating-related technologies (non-smartphone and mobile app) boaters use, the results of one question on the short written questionnaire was analyzed: "Do you use any navigational aids (e.g., chart, GPS map) when boating in Mosquito Lagoon?"

Currently used boating-related mobile apps. To understand which mobile apps that recreational boaters are currently using while boating, a content analysis was performed on the results (i.e., transcripts) of six previously conducted Florida Sea Grant project focus groups which included 60 total boaters. After carefully examining all of the transcripts, items were

coded as ‘non-boating mobile apps’ (e.g. mobile apps not tailored specifically for boaters) and ‘boating-related mobile apps’ (e.g. mobile apps designed for and tailored towards boaters).

Mosquito Lagoon mobile app desired features. A content analysis was also performed on the transcripts of the six previously conducted Florida Sea Grant project focus groups to identify which features boaters would prefer with respect to the planned Mosquito Lagoon mobile app. In each focus group, participants were prompted with a similar variation of a question from the moderator’s interview guide: “Would you use a smart phone app with real time maps to locate eco-sensitive zones in the Lagoon? What other content or features of an app would be useful to you?”

Results

Boating organizations and associations. From the short written surveys, participants indicated memberships in the following boating-related organizations/associations: Coastal Conservation Association (9); Backcountry Fly Fishing Association (8); Internet Shrimpers and Anglers Association (5); Central Florida Off-Shore Anglers (4); Florida Fly Fishing Association (4); and the LeeNoga.com Shrimping Forum (3).

Boater technology cluster. From the short written surveys, participants indicated that the most frequently used non-smartphone and mobile app boating technologies were: handheld GPS (33); Top Spot Maps (14); Chart Plotter (13); Depth finder (1); Fish finder (1); and Other (9) which included items that were either related to smartphones and mobile apps or were not technology based.

Currently used boating-related mobile apps. From the analysis, the most frequently used non-boating mobile app was Google Earth (8) followed by Google Maps, See-Click-Fix, and Android maps, each of which had a frequency of one. Boating-related apps included iAngler (2) with Avionics, Florida Wildlife Center (FWC) and Boat US each having a frequency of one.

Mosquito Lagoon app desired features. To determine the desired features of the mobile app, each coded response was first placed into the following six categories: 1) area conditions, which relates to weather and water conditions at Mosquito Lagoon; 2) navigation, which relates to features that will help guide boaters at the Lagoon; 3) customization and social media, which relates to being able to customize the mobile app and socialize with friends; 4) fishing regulations, which relates to boating rules and regulations, and contact information and website links to regulatory agencies that manage the Lagoon; 5) educational information, which relates to information that could be used to educate boaters about the area; and 6) other, which represented information that did not fit into any of the specified categories (for frequencies see Figure 1).

From the original six categories, subcategories were created (explained below) and used to develop the survey questionnaire (see Appendix A for categorized data followed by a breakdown of features based on actual focus group participant responses). After all of the subcategories were determined, a total of sixteen survey items were developed. These categories were coded twice by the researcher, two months apart, and yielded a 97% agreement from time one to time two. The subcategories are specified as follows:

1) *Area conditions* was divided into six subcategories: weather; water cleanliness; water level; water temperature; wind direction and speed; and sunrise, sunset, tides and lunar phases.
2) *Navigation* was divided into five subcategories: GPS and general maps; GPS with navigation; maps of key features; water depth charts; and zoning and enforcement maps.
3) *Customization and social media*: for this category the response items were merged into one item: the ability to save the geographic location of my favorite fishing spot in Mosquito Lagoon so I can find it again readily and the ability to personalize the app and share pictures of my catch with others.
4) *Fishing regulations* was divided into two subcategories: rules, regulations and seasonal slot fish guidelines and government hotline information.
5) *Educational information* was divided into two subcategories: boater education and species information.
6) *Other* included items that were vague (water) or did not fit into any other specified categories (boat ramp traffic, bait and tackle shops, and best fishing areas). These items were excluded from the survey to prevent confusion.

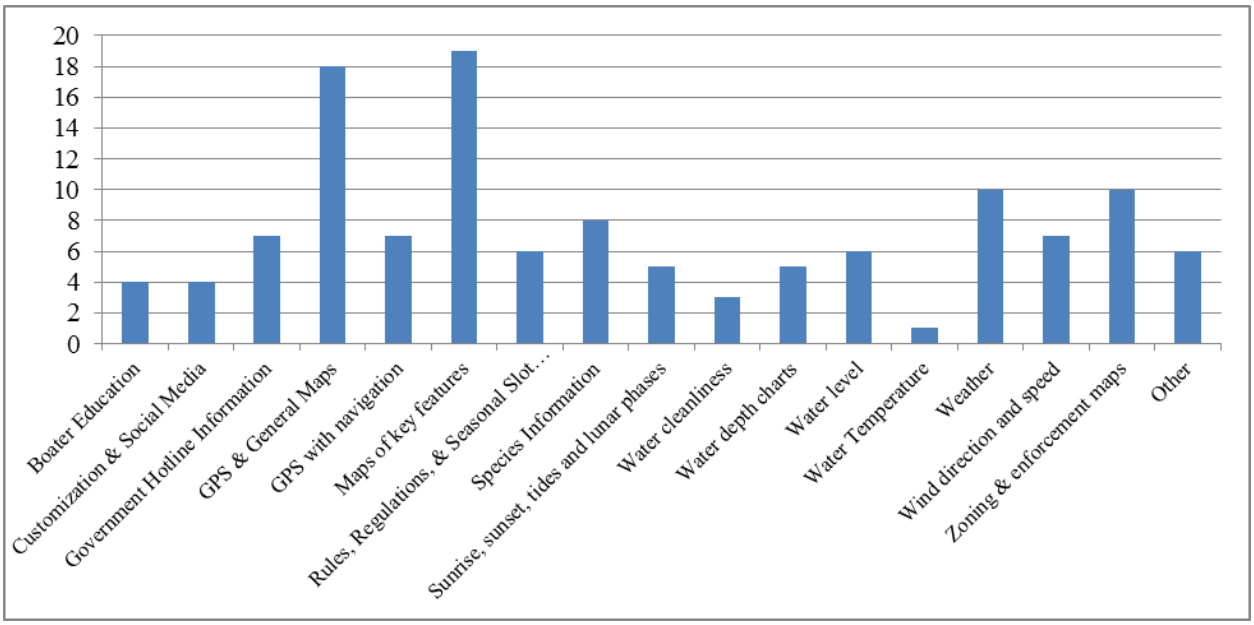

Figure 1: Frequencies of Mobile App Desired Features by Focus Group Participants

For the purposive sampling targeted groups, Backcountry Fly Fishing Association (35-40 members), Central Florida Off-Shore Anglers (165 members), and Lee Noga (2,000 members were chosen. Three organizations: the Internet Shrimpers & Anglers Association (ISAA), the Florida Fly Fishing Association (FFFA) and the Coastal Conservation Association (CCA) were popular among focus group participants; however, ISAA and FFFA were omitted due to a lack of contact information and CCA was omitted since they are focused on conservation not technology usage. LeeNoga.com, while less popular among participants, was selected to reach the ISAA population as it is a popular shrimping forum with over 2,000 registered members and the website receives on average over 44,000 visits per day. Also, many of the focus group participants who were members of CCA and FFFA were also members of one of the other

selected boating groups; therefore, it was hoped that by contacting the other associations and organizations, those members would reached.

Due to the small number of mobile apps mentioned during the focus groups, the names of all of the mobile apps were included in the online survey instrument for Study 2 and an open-ended 'other' option was also incorporated . The 'boater technology cluster' response categories included: handheld GPS; Top Spot Maps; Chart Plotter; Depth finder; and Fish finder. For the desired app features analysis, all sixteen response items (excluding the 'other' category) were included in the online survey instrument.

Study 2

Introduction

To address the present study's two hypotheses and six research questions, an online survey was conducted. A link to the online survey (questionnaire) was distributed via email and also posted to a local boating-related forum's website (further explanation of these procedures is provided in the following Participant Recruitment section). The sampling strategy involved a convenience purposive sample combined with a snowball sampling approach. Purposive sampling was necessary to target specific boating groups and the snowball approach was added in an effort to increase the number of respondents. It was expected that the Mosquito Lagoon boater population is relatively small and geographically scattered throughout the local Central Florida area; therefore, the snowball method was considered less costly and less time consuming compared to random sampling (Welch, 1975).

Email was chosen as a delivery vehicle for the survey, since 92% of American adults use email and 62% use it every day (Purcell, 2011a). An online survey was chosen as 85% of American adults use the Internet ("Trend Data," 2012) and individuals who own mobile phones are also more likely to also have access to the Internet (Rice & Katz, 2003). The methodological strengths of online surveys include the ability to reach a large and diverse audience, to obtain large sample sizes, and to gather data in a short period of time (Kurniawan, 2008). Excluding the exploratory content analysis measures from Study 1, all scales in the present study's questionnaire have been empirically validated as indicators for the theories being examined.

Participant Recruitment

An invitation to participate in the online survey was distributed via email to purposefully-selected boating-related associations/organizations in the Orange County, Brevard County, and surrounding Central Florida areas. The associations/organizations were selected based on the results from Study 1 and included: Backcountry Fly Fishing Association (35-40 members), Central Florida Off-Shore Anglers (165 members), and Lee Noga shrimper's forum (2,000 members). Due to a low response rate, reminder emails were sent to the initial three groups as well as to the Florida Fly Fishing Association which enabled the researcher to obtain a satisfactory number of completed surveys (N = 164). The survey and associated contact documents were approved by the University of Central Florida's Institutional Review Board (IRB) and the approval letter can be found in Appendix E. The online survey was available beginning January 18, 2013 and the results were downloaded for analysis on February 11, 2013.

The recruitment letter (see Appendix B) was emailed to the leaders of the purposively selected boating and fishing associations/organizations inquiring if their members would be interested in participating in the study. After approval was received from the association/organization leader, a follow-up recruitment letter (see Appendix C) was emailed to the leader to be forwarded to their members. This email letter provided the members with an explanation of the study's purpose, an invitation to participate, a description of the informed consent process, a link to the survey, and a statement requesting that they forward the email to their fellow Mosquito Lagoon boaters. The online survey was anonymous and there was no tangible incentive for participation. It was expected that several different boater categories (i.e., commercial boaters, recreational boaters, and kayakers) would likely receive the survey, so a question was included in the survey to distinguish the different boater types. While the present study is focused on recreational boaters, responses from all boater categories were collected for comparative purposes and to provide information for possible future, more generalized studies.

Questionnaire Construction and Measures

The online questionnaire (see Appendix D) consisted of 29 questions including quantitative measures (and in some cases open-ended qualitative measures) derived and adapted from previously tested and validated scales to aid in investigating the current adoption rates and barriers pertaining to smartphones, mobile apps, and map-based LBS apps as well as the uses and gratifications of mobile apps and map-based LBS apps by Mosquito Lagoon boaters. The scales and scale statements can be found in Appendix F. Unless otherwise indicated, all questionnaire items were based on a 5-point Likert-type scale where '1' = strongly disagree, '2'

= disagree, ‘3’= neither agree nor disagree, ‘4’ = agree, and ‘5’= strongly agree. Likert-type scales were chosen as they are commonly used to determine respondent attitudes across a variety of social science disciplines and study topics.

The results from Study 1 including the Mosquito Lagoon app desired features, boater technology cluster, and currently used boating-related mobile apps were integrated into the online survey instrument development and those scales will also be discussed below.

Demographics. Respondents were asked five questions related to their demographic characteristics including their: age, gender, race, income, and level of education. The questions were presented on one final page and a statement was included informing the respondents that each response was completely optional in order to prevent potential survey drop-outs. In addition to basic demographics, respondents were also asked: 1) where they predominately boat (the Banana River, the Indian River Lagoon, the Mosquito Lagoon, the St. John’s River, and included an open-ended option of other); and 2) how they classified themselves as a boater (commercial power boater, recreational power boater; commercial kayaker, recreational kayaker, and included an open-ended option of other). The boating locations were chosen based on their proximity to the Mosquito Lagoon and were used to determine whether there would be differences between boaters from different areas. The boating type classifications were based on common boater types and were used to determine whether there would be differences between boater types.

Smartphone adoption and barriers. A smartphone is needed to run a mobile app like the planned Mosquito Lagoon boating mobile app; therefore, it is important to determine whether

recreational boaters own this technology. Respondents were asked whether they own or use a smartphone. To reduce respondents' uncertainty about whether their cellphone is a smartphone, a definition of a smartphone and a brief description of its characteristics were provided. The scale was trichotomous ('1' = yes, '2' = no, '3' = not sure). Respondents who answered 'no' to smartphone adoption were asked 'why not' based on two scales: a two-item scale 'incompatibility with existing values' (r = -.295) and a three-item scale 'absence of observable benefits' (α = .885) developed by Fortenberry and Brown (2011) to understand the barriers that prevent respondents from using a smartphone. Due to an error in measurement, the 'incompatibility with existing values' scale did not reach significance; therefore, only the frequencies of those items were recorded. Respondents who answered 'not sure' were taken to the 'mobile app adoption section,' where if they answered 'my phone does not download apps,' were taken to a similarly-worded 'why not' question utilizing Fortenberry and Brown's (2011) barriers to smartphone adoption scales.

Mobile app adoption and barriers. Respondents who answered 'yes' to smartphone adoption were asked whether they download and/or use mobile apps on their phone. Examples of common mobile apps were provided in the question. The scale was trichotomous ('1' = yes, '2' = no, and '3' = my phone does not allow me to download mobile apps). Respondents who answered 'yes' were asked a follow-up question about their uses and gratifications of mobile apps, while respondents who answered 'no' were asked 'why not' based on a six-item frequency scale developed by Fortenberry and Brown (2011) to determine the barriers to mobile app adoption. Respondents who selected 'my phone does not allow me to download mobile apps,'

were asked a modified version of the barriers to smartphone adoption question utilizing the same six-item 'why not' scale developed by Fortenberry and Brown (2011).

Mobile app uses and gratifications. For respondents who answered 'yes' to mobile app adoption, questions about the gratifications they receive from using mobile apps were asked based on three scales: 'information-seeking;' 'social integrative;' and 'escape' developed by Wei (2008). Survey items were modified to include common motivations for using apps based on Purcell's app adoption survey (2011b). To determine whether the modification affected the scale measurement, a principle component analysis with a Varimax rotation was conducted on each of the 16 items resulting in four factors of which four items ('shop or make purchases', 'track or manage my health', 'let others know I care about them', and 'perform work-related tasks') were removed as they were not considered strong factors with the other components. The resulting factors provided a six-item social integrative scale ($\alpha = .904$), a four-item escape scale ($\alpha = .887$), and a two-item information-seeking scale with a ($r = .382$, $p < .01$). These items were used to assist the researcher in determining how respondents view mobile apps (e.g., escape or as an information-seeking tool). To determine the most common uses of mobile apps, nine usage items were developed based on Purcell's mobile app adoption study (2011b). The respondents were asked to select all that apply.

Map-based LBS adoption and barriers. Smartphone adopters who answered 'yes' to downloading mobile apps to their phones were asked if they use map-based LBS apps. Examples of common map-based LBS apps were included in the survey question. This question was used to determine if recreational boaters use map-based LBS apps. The scale was dichotomous ('1' =

yes, '2' = no). Respondents who answered 'no' to map-based LBS app adoption, were asked 'why not' based on a six-item (select all that apply) frequency scale developed by Fortenberry and Brown (2011) to determine the barriers to map-based LBS app adoption while respondents who answered 'yes' were asked about their uses and gratifications.

Map-based LBS app uses and gratifications. Respondents who answered 'yes' to map-based LBS app adoption were asked about their motivations for using map-based LBS apps derived from four scales modified to reflect map-based app gratifications including: a five-item usefulness scale ($\alpha = .740$) by Lindqvist et al. (2011); a five-item information resources/services scale ($\alpha = .773$); a three-item information quality scale ($\alpha = .827$); and a six-item leisure/escape scale ($\alpha = .923$) from Chua, Goh and Lee's (2012) study on the gratifications of mobile content contributors. These items were included in order to determine which gratifications respondents receive from using map-based LBS apps. This information assisted the researcher in determining how respondents view their map-based apps (e.g., escape/pass time or as an information-seeking tool). To determine their uses of map-based LBS apps, respondents were asked a three-item (select all that apply) frequency scale from Zickuhr and Smith's (2011) survey on American adults' uses of mobile location-based services.

Boater technology cluster. All respondents were asked whether they use any non-smartphone (or mobile app) boating technologies (select all that apply) while boating in Mosquito Lagoon. Survey items were derived from the Study 1 'boater technology cluster' results and included an open-ended option of 'other.' These items were used to determine the

types of boating-related technology (besides smartphones and mobile apps) that boaters use. The sum of the frequencies determined each respondent's technology cluster (0-6).

Mosquito Lagoon app desired features. Respondents who answered 'yes' to smartphone adoption were asked to indicate on a 5-point Likert type scale how much they would find each of the sixteen potential features (identified from results of Study 1) of the planned Mosquito Lagoon mobile app 'useful' or 'not useful' to them while boating on the Lagoon, with '1' meaning "not at all useful" and '5' meaning "very useful." The mean score of each item determined which features the boaters would find useful on the mobile app. Afterwards, the respondents were asked a follow-up question to identify which 'single' feature (of the original sixteen) would be *most* useful to them while boating in the Lagoon. The question also included a response option of 'none of these would be useful to me while boating in Mosquito Lagoon.'

Mosquito Lagoon app intent to adopt. Following the 'Mosquito Lagoon desired app features' item, respondents were asked a four-item 'behavioral intent to adopt' scale ($\alpha = .927$) developed by Lopez-Nicolas, Molina-Castillo, and Bouwman (2008). Question wording was modified to reflect their intent towards adopting and using the planned Mosquito Lagoon mobile app. The purpose of this question was to determine the respondents' attitudes toward downloading the planned Mosquito Lagoon mobile app if it was currently available.

Additional exploratory survey items (specific to the Florida Sea Grant Project). Additional items were included in the online survey instrument to aid the broader Florida Sea Grant project in understanding the target audiences' attitudes, uses, and preferences towards

mobile technology as well as to offer guidance with respect to the development of the campaign's planned mobile app.

Smartphone type. If the respondent answered 'yes' to smartphone adoption, they were asked which smartphone operating system they use. The question allowed the respondent to select multiple smartphone types to account for those who own more than one smartphone. If a respondent selected a smartphone type, it was coded as '1' and if an item was not selected, it was coded as '0.' Operating system items were based on 2012 Nielsen Wire data and included: Android, Blackberry, iPhone, and Windows Phone. Respondents were also given the option of 'don't know/not sure' and an open-ended option of 'other.' The purpose of this question was to understand which smartphone platform is most popular among the respondents. This information was expected to be beneficial since each smartphone operating system utilizes different software coding; therefore, knowing which mobile platform is most popular will aid the mobile app developers in choosing the platform with the most potential users.

Mosquito Lagoon Mobile App Fee. After respondents completed the 'Mosquito Lagoon app intent to adopt' question, they were then asked on a scale of $0 to $15, how much they would pay for the mobile app if the proceeds went towards helping to restore the Mosquito Lagoon's marine ecosystems. These responses were considered important for campaign planning to determine an acceptable download price point fee for the mobile app.

Boating-related mobile apps (currently used). Respondents who answered 'yes' to mobile app adoption were asked which mobile apps (select all that apply) they use *while* boating

in Mosquito Lagoon. Survey items included the 'currently used boating-related mobile apps' results from Study 1 as well as two additional response options: 'I do not use apps while boating' and an open-end response option of 'other.' These items were included in order to determine which types of mobile apps that Mosquito Lagoon boaters use or do not use to draw comparisons with the planned Mosquito Lagoon mobile app features.

Final open-ended comments. The last item on the survey was open-ended and asked the respondents if they had any comments based upon the information obtained or the questions asked during the survey. This question was included to provide the respondents with an avenue to provide any additional feedback and was examined to look for common themes or other important information that could provide insights into the present study.

CHAPTER FOUR: RESULTS

Respondent Characteristics

The respondents (N = 164) included a range of Mosquito Lagoon and surrounding area boaters ranging from 20-77 years old (M = 48.97, SD = 12.33). Males comprised 85.4% of the sample and 13.4% were female. The respondents were 92.7% Caucasian. The average annual household income was between $50,000 and $100,000 (53.6%) and the average level of education was relatively split between some college (36%) and college graduate from a four-year institution (30.5%). Most respondents indicated that they mainly boat in Mosquito Lagoon (51.2%) or in the Indian River Lagoon (21.3%). The majority of respondents were recreational power boaters (81.7%).

It was unclear whether including the results from different boating groups (commercial power boaters and kayakers) would produce different results in terms of adoption rates, uses and gratifications, desired mobile app features, and behavioral intent to adopt. However, when all other groups (non-recreational power boaters) were excluded from the analysis no significant differences were indicated across measures; therefore the following results include responses from all the survey respondents.

Research Questions

The first research question asked whether there were demographic differences between the adopters and non-adopters of smartphones, mobile apps, and map-based mobile app. As it turns out, income was negatively associated with smartphone adoption (r = -.274, p < .01) and

age was positively correlated with map-based app adoption (r = .183, p < .05). All other differences between adopters and non-adopters were not significant when ran against the mid-point (test value = 3).

The second set of research questions were based on the respondents' rate of smartphone adoption (RQ2a), mobile app adoption (RQ2b), and map-based mobile app adoption (RQ2c). For RQ2a, of the (N = 164) total survey respondents, 86.6% indicated that they own a smartphone and 12.2% indicated that they do not own a smartphone. For RQ2b, of the (n = 142) smartphone adopters 95.1% stated that they download mobile apps while 4.2% indicated that they do not download mobile apps. For RQ2c, of the (n = 136) respondents who indicated that they download mobile apps, 93.4% stated that they use map-based mobile apps, while 6.6% stated that they do not use map-based mobile apps.

The third set of research questions were based on the barriers to smartphone adoption (RQ3a), mobile app adoption (RQ3b), and map-based mobile app adoption (RQ3c). Two scales were used to measure respondents' perceived barriers to smartphone adoption (incompatibility with existing values and absence of observable benefits). The first scale, 'incompatibility with existing values' did not reach significance (M = 3.9, SD = .575, r = -.295) meaning that the two factors together were not indicators of incompatibility. Basically the non-smartphone adopters felt that smartphones are expensive (M = 3.95, SD = 1.050) and that their regular cell phone is already convenient enough to use (M = 3.85, SD = .875) but the respondents who indicated that a smartphone was expensive they did not necessarily believe that their cell phone was more convenient than a smartphone. In regards to the 'absence of observable benefits' scale, a one-

sample t-test revealed that factors such as a smartphone is useless to me, and not having a need or opportunity were not barriers to smartphone adoption (M = 3.81, SD = .834, $t(19)$ = .983, p =.338). These results meant that the scale was an indicator of the absence of observable benefits, but the respondents did not feel that this was a significant barrier to smartphone adoption.

Of the six smartphone owners who indicated that they do not download apps (RQ3b), the most common barriers included: not knowing how to use mobile apps (50%); not having a need for mobile apps (50%); and being unfamiliar with what is considered an app (33.3%). Of the nine smartphone owners who indicated that they do not download map-based apps (RQ2c), common reasons included: the ability to get map-based information in other ways (77.8%); not being familiar with map-based mobile apps (33.3%); and not seeing a need for map-based apps (22.2%).

The fourth set of research questions were based on the uses (RQ4a) and gratifications (RQ4b) that boaters receive from mobile apps. For RQ4a, the respondents indicated using mobile apps to find information on news, weather, sports, or stock updates (96.3%), to access the internet (90.4%), and to get directions (86%). For mobile app gratifications (RQ4b), a one-sample t-test (see Table 1) revealed that the respondents use mobile apps for: information-seeking needs (M = 4.46, SD = .615); followed by escape needs (M = 3.94, SD = .791); and social integrative needs (M = 3.87, SD = .809).

Table 1 Results of One-Sample t-test for Mobile App Gratifications

	M	SD	Test Value	t	df	p
Information Seeking	4.46	0.615	3	27.80	135	0.001
Social Integrative	3.87	0.809	3	12.58	135	0.001
Escape	3.94	0.791	3	13.94	135	0.001

The fifth set of research questions were based on the uses (RQ5a) and gratifications (RQ5b) that boaters receive from map-based mobile apps. For RQ5a, common uses of map-based mobile apps were: to get directions (92.9%); to get information about their current location (67.7%), and to get recommendations about a place they would like to visit (28.3%). For mobile app gratifications (RQ5b), a one-sample t-test (see Table 2) revealed that respondents use map-based mobile apps: for information-seeking needs (M = 4.14, SD = .496); based on their perception of the quality of the information they receive from map-based apps (M = 3.81, SD = .377); and their perception of the map-based apps' usefulness (M = 3.75, SD = .645). Escape gratifications were not supported (M = 2.92, SD = .803) meaning that the respondents were not using map-based mobile apps to fulfill their escape needs.

Table 2 Results of One-Sample t-test for Map-Based App Gratifications

	M	SD	Test Value	t	df	p
Information Seeking	4.14	0.496	3	26.05	126	0.001
Information Quality	3.81	0.61	3	14.93	126	0.001
Escape	2.92	0.803	3	-0.99	126	0.332
Perceived Usefulness	3.75	0.645	3	13.14	126	0.001

The final research question (RQ6) examined the boaters' attitudes towards a set of 16 possible features for the planned Mosquito Lagoon mobile app (see Table 3) and was followed-up with a question asking which *single* feature would be most useful to them while boating in Mosquito Lagoon. A one-sample t-test indicated that: weather radar (M = 4.67, SD = .629); wind direction and wind speed (M = 4.61, SD = .674); and maps of the key areas within Mosquito Lagoon (M = 4.64, SD = .700) were considered the most useful rated features. In terms of the most useful features, respondents (n = 141) indicated that maps of key areas within the Lagoon (41.8%), the ability to personalize the mobile app (12.8%), and GPS with navigation (9.2%) were the *single* most useful features.

Table 3 Results of One-Sample t-test for Mosquito Lagoon Mobile App Desired Features

	M (SD)	t	df	p
Weather Radar.	4.67 (.629)	31.48	140	< 0.001
Current wind direction and wind speed.	4.61 (.674)	28.37	140	< 0.001
Maps of key areas in the Lagoon (boat ramps, shallows, shoals, sandbars, oyster reefs, and channel markers).	4.64 (.700)	27.76	139	< 0.001
Locations of pole and troll zones, manatee zones, no wake zones, or no motor zones.	4.57 (.702)	26.32	138	< 0.001
Sunrise, sunset, tides, and lunar phases information.	4.52 (.713)	25.27	140	< 0.001
Rules and regulations, and seasonal slot limits for each fish species based on the season.	4.41 (.708)	23.67	140	< 0.001
General aerial maps (similar to maps found on Google Earth).	4.45 (.743)	23.10	139	< 0.001
Current water temperature information.	4.39 (.715)	23.09	140	< 0.001
Current water level information (similar to information on the Haulover Canal USGS.gov)	4.43 (.768)	22.14	140	< 0.001
A general map showing the average water depths in the Lagoon.	4.38 (.808)	20.33	140	< 0.001
Ability to track your boating patterns while on the water (similar to an automobile GPS with turn by turn directions.)	4.43 (.839)	20.27	140	< 0.001
Water cleanliness information including updates on the algae bloom.	4.31 (.796)	19.52	139	< 0.001
Ability to save the geographic location of my favorite fishing spot, personalization, and the ability to share pictures of my catch with others.	4.30 (.933)	16.60	140	< 0.001
Links and contact information to USGS.gov or other local government agencies including the manatee and alligator hot lines.	4.00 (.941)	12.61	140	< 0.001
Information about common species found in the area (sea grasses, mangroves, types of fish, birds, alligators, etc.)	3.98 (.996)	11.66	140	< 0.001
Information on how to boat in an environmentally-responsible way (avoiding sea grasses and information about what types of boats are most appropriate for Mosquito Lagoon).	3.79 (1.22)	7.60	140	< 0.001

Note. Test value = 3.

Hypotheses

For H_1, it was hypothesized that the greater a boater's technology cluster, the more likely their intention to adopt the Mosquito Lagoon mobile app. There was no relationship between the scales (r = .108, p = .107). This failed to support H_1 that the two scales were positively correlated.

For H_2, it was hypothesized that the more useful a boater perceives the Mosquito Lagoon mobile app features, the higher their adoption intention. There was a moderate positive correlation between the two scales, r = .723, p < .001. This supports H_2 that the two scales are positively correlated.

Additional Exploratory Survey Items (Specific to the Florida Sea Grant Project)

Smartphone type. Respondents who indicated smartphone adoption (n = 146) were asked a follow-up question regarding which type of smartphone they use. Respondents were able to select 'all that apply' in order to account for secondary phones (i.e., a work and a personal phone). The three most frequent responses included the Apple iPhone (52.7%), Android (41.1%), and Blackberry (3.4%).

Mosquito Lagoon mobile app fee. After the respondents were asked their intention towards downloading the mobile app, they were then asked how much they would consider paying for the mobile app (from $0 - $15) if the proceeds went towards restoring the Mosquito Lagoon area. Frequencies revealed that 75.4% of this study's respondents would pay between $1

and $6 to download the mobile app (M = 5.55, SD = 3.39). The median and the mode were both $5.

Boating-related mobile apps (currently used). Respondents were asked which mobile apps (select all that apply) they use while boating in the Mosquito Lagoon. The most frequently used mobile apps included: Google Maps (53.7%); Google Earth (51.5%); Navionics (26.1%); with 17.9% of respondents stated that they do not use mobile apps while boating.

Final open-ended comments. The last question on the online survey instrument asked respondents to provide open-ended feedback on the information obtained or the questions asked during the online survey. A total of 16 respondents provided open-ended feedback. All the comments were related to smartphones or the planned Mosquito Lagoon mobile app. The comments were grouped by the researcher into three general categories or themes (positive comments, negative or barrier-related comments, and concern comments).

Positive comments included seven generic responses reflecting positive attitudes towards the mobile app's development and features, such as: "*good luck with the app*;" "*wow this app would be a Godsend*;" "*we could use an app like this;*" as well as a specific and personal story from one respondent: "*Found a deceased juvenile manatee in the Lagoon last year and had a difficult time alerting authorities. Had to Google search for contact info and then got rerouted a few times. Would have been useful if we had the app*."

Negative or barrier-related comments included four issues with using a smartphone: a lack of cellular service at the Lagoon, not knowing how to use a smartphone ("*I have no*

knowledge of a smart phone or its uses. I am admittedly a technological dinosaur!"), small screen size, and problems with glare from the sun.

Concern comments were considered as responses related to the mobile app's potential effect on the boating population as well as on the Lagoon area. There were four responses related to concerns: 1) accuracy of the mobile app data in regards to different water depths around the Lagoon area; 2) the amount of pressure that will be put on the Lagoon as a result of the mobile app's release; 3) issues with the social media element, "*many seasoned fisherman do not want to advertise their fishing spots*;" and 4) a simple request to "*be true to the fisherman*."

The final chapter will provide a discussion and interpretation of the study's results in light of the theoretical frameworks and previous relevant literature, an acknowledgment of the study's methodological limitations, and offer suggestions for future targeted mobile app research and the Florida Sea Grant project's planned mobile app.

CHAPTER FIVE: DISCUSSION

This study set out to provide a better understanding of boaters' attitudes toward and uses of mobile technology in order to advance knowledge on the role of new technology in this understudied context. Specifically, the purpose of this study was: (1) to determine the current adoption rate and barriers to the adoption of smartphones, mobile apps, and map-based LBS apps within the targeted population; (2) to explore the uses and gratifications of mobile apps and map-based LBS apps among those within the targeted population who are already smartphone adopters, (3) to identify what features of the planned Mosquito Lagoon mobile app the target audience would find most useful while boating; and (4) to assess whether the perceived usefulness of the planned mobile app's features would increase their adoption intention. It also aimed to provide practical guidance for the development of a planned targeted mobile app for the broader Florida Sea Grant project and for environmental social marketing campaigns looking to incorporate targeted mobile apps into their overall campaign strategy.

An online survey was conducted utilizing validated scales along with qualitative data derived from the Florida Sea Grant project's previously-conducted focus groups with Mosquito Lagoon boaters. The survey asked respondents whether or not they used smartphones, mobile apps, and map-based mobile apps and what gratifications they receive from mobile apps and map-based apps. Respondents were also asked about their reactions to and preferences for certain potential features of the planned Mosquito Lagoon mobile app and their overall attitudes towards using the mobile app. Those who reported that they did not use these technologies were asked 'why not' in order to identify the barriers that prevent their mobile technology adoption.

Discussion

While some of the findings in this study were in line with previous empirical studies, there were a number of interesting findings that may warrant future research. For example, one of the most interesting findings came from the positive correlation between map-based mobile app use and age, where older respondents were more likely to use map-based mobile apps than younger respondents. These results contrast those of prior studies which have suggested that on average older adults feel less comfortable and are less likely to adopt new media and technology (Fox, 2004; "Generations," 2010; Reese & Beckland, 2011). However, these numbers are in line with researchers Zickuhr and Madden (2012) from the Pew Internet and American Life Project, who found that an increasing number of older adults (age 65+) are beginning to adopt new media. Respondents in this present study age 65 and older (n = 16) were smartphone adopters (81.3%), mobile app and map-based app adopters (75%), owned an average of three non-smartphone boating technologies (M = 3.18, SD = 1.37) and had an above average intent to download the planned Mosquito Lagoon mobile app (M = 4.38, SD = .582). These numbers were also higher when all respondents age 50 and older were included in the analysis.

Another particularly interesting finding came from the uses and gratifications of mobile and map-based apps where the respondents indicated that they are using mobile apps and map-based apps to fulfill their information-seeking needs versus escape needs. This evidence also falls in line with other research from the Pew Internet and American Life Project (Purcell, 2011b) which found that American adults are now using mobile apps more to fulfill their information-seeking needs.

Planned Mosquito Lagoon Mobile App

In regards to the Florida Sea Grant project's planned mobile app, it was hypothesized that the more useful a boater perceived the Mosquito Lagoon app's features, the greater the boater's behavioral intent to adopt. Results from this study supported this hypothesis, which suggests that these app features are perceived as useful to boaters. Consequently, incorporating some of these desired features in the finished app product could potentially increase the likelihood that a boater would adopt the targeted mobile app. Further, if the mobile app designers could successfully incorporate the respondents' desired features with the campaign goals, the result could provide a mutually beneficial relationship. For example, to meet the needs of the boaters, the targeted mobile app could provide a map of the key areas within the Lagoon and to meet the goals of the campaign, use those maps to highlight eco-sensitive zones (i.e., oyster reefs, mangrove areas, and sea grass bed locations). This interactive combination would likely provide a useful navigational tool for the boater while at the same time raise their awareness and understanding about important species and locations of vulnerable marine habitats.

Of the sixteen predetermined mobile app potential features, the top four desired features were related to weather conditions at Mosquito Lagoon and maps of the key points at the Lagoon. These results are not completely surprising as weather conditions can drastically change a boater's ability to navigate the Lagoon. For example, due to the extremely shallow waters in parts of the Mosquito Lagoon, a slight wind shift could substantially reduce the water levels in some areas making it difficult or impossible to maneuver a boat without damaging the boat and/or the natural marine resources. Therefore, such features would be important and useful to

those who boat in the Lagoon. Also, these desired mobile app features were similar to the features available on other mobile apps that the respondents reported using such as: the Weather Channel, NOAA, and WESH 2 (a local news station's mobile app) for weather-related information and Navionics, Google Maps, and Google Earth for map-based information. These results were also consistent with two of the most frequently reported boating-related (non-smartphone and mobile app) technologies: Top Spot Maps and GPS.

Interestingly, when respondents were asked which *single* feature would be most useful to them while boating; the top responses included not only maps of key Lagoon areas and turn-by-turn navigation but also a social media element (i.e., ability to personalize the mobile app). This social media feature was reported as the second most useful single feature; yet, it only ranked thirteenth most useful when respondents were asked to compare it against all the other potential features. Consequently, it seems caution is warranted with respect to incorporating personalization as a feature for the planned Mosquito Lagoon mobile app. In light of these findings, if the campaign does chose to incorporate a social media element a more appropriate and effective approach may involve offering it as an optional rather than mandatory feature. Future research may help to explain the divergent reaction to personalization in this context and should be considered and revisited.

Mobile Technology Adoption

In terms of mobile technology adoption overall, the numbers of respondents who indicated smartphone ownership, mobile app and map-based app adoption were well above the average American adult population's adoption rate (Purcell et al., 2010; Smith, 2012b; Zickuhr,

2012). It could be inferred that many boating-related technologies have features similar to smartphones, mobile apps, and map-based mobile apps, which may have made the respondents more open to adopting and using mobile technology. Surprisingly, income was found to be negatively associated with smartphone ownership, meaning that high income respondents were less likely to own a smartphone. This is in contrast to previous research showing a positive relationship between technology adoption and income (Atkin, 1995; Leung & Wei, 1999; Rogers, 1995). In terms of mobile technology adoption overall, these results suggest that the Mosquito Lagoon boater population is unique in terms of their openness to mobile technology.

Mobile Technology Barriers

Further, very few respondents indicated that they did not use smartphones, mobile apps, or map-based mobile apps; yet, their reasons behind not using mobile technology (barriers) were still relatively consistent with the existing literature (Fortenberry & Brown, 2011; Purcell, 2011b; Reese & Beckland, 2011). For example, smartphone non-adopters felt that their regular cellphones were convenient enough, that smartphones were costly, and that smartphones lacked observable benefits. While these findings were not significantly correlated, the responses were in line with previously mentioned studies. The most common reasons for not using mobile apps were also in line with the previous research and included: not knowing how to use apps, not having a need for apps, and being unfamiliar with what constitutes an app. Map-based app barriers also supported findings from prior research and included 'the ability to get map-based information in other ways.' Overall, it may be interpreted from these results that there is still what Fortenberry and Brown (2011) called the "experience gap" surrounding mobile technology.

The researchers inferred that individuals who have never used a mobile app lack experience and may not see value in using a mobile app (Fortenberry & Brown, 2011). These barriers could potentially be addressed by educating non-adopters on 'what a mobile app is' and also to explain the benefits and values of mobile apps to the target audience (Reese & Beckland, 2011).

Technology Cluster

Previous researchers (Leung & Wei, 1999; Lin, 2010; and Rogers, 1995) have suggested that individuals who own technologies with similar features are more likely to adopt a complimentary technology (e.g., owning a handheld GPS would potentially make an individual more likely to adopt a smartphone app with GPS features). Therefore, it was hypothesized that the greater a boater's technology cluster (i.e., owning an above average number of similar technologies), the more likely he/she would have a favorable attitude towards downloading the Mosquito Lagoon mobile app. However, these results were not significant. This finding could indicate a negative relationship between an individual using existing boating–related technology and perceiving an observable need to download the mobile app. For example, if a respondent believed that he or she already uses sufficient or superior technology compared to the mobile app's available features, he or she may not see a benefit in downloading the mobile app. In contrast, boaters who use fewer boating-related technologies may see the mobile app's multiple features as an advantage to other, more expensive, single-feature boating technologies (e.g., purchasing a depth finder, chart plotter, and a handheld GPS).

Another potential explanation could be that the items within the survey were not properly operationalized. During the survey development, little was known about the different

technologies that boaters use while boating, how they use these technologies while boating, what types of features are available on these devices, and how different brands could potentially offer a variety of different features. For this reason, it is possible that a boater who owned a multi-function handheld-GPS unit (e.g., one with a built in depth chart, Top Spot Map, and a fish finder) may have only selected the GPS option or selected all the available options. Since the scale items were not brand specific and an accurate definition of the items was not provided, this may have prevented respondents from accurately selecting items for their technology cluster.

Recommendations for the Florida Sea Grant Project

This study set out to not only offer theoretically-driven insights regarding the targeted audience's attitudes towards and usage of targeted mobile apps, but also to provide practical implications for the Florida Sea Grant project's planned mobile app.

First, in order to provide guidance for the overall mobile app platform, respondents were asked which type of smartphone they use. While the Apple iPhone was the most frequently used platform, there was also a significant number of respondents who used an Android-based smartphone. Therefore, to maximize the number of potential adopters, the mobile app designers should consider developing the targeted mobile app for both platforms.

When asked how much they would consider paying for the mobile app if the proceeds went towards restoring the Mosquito Lagoon, most respondents indicated they would pay between $2 and $6, with an average around $5. Interestingly, there was a small percentage of respondents who stated they would consider paying $10 for the mobile app; however it seems

more likely that that level of expense would prevent most boaters from adopting the mobile app. As a result, it might be best to initially provide the mobile app for free or at a relatively low cost in order to increase the likelihood that a boater would download the mobile app.

The respondents were also asked which boating-related mobile apps they use while boating in the Mosquito Lagoon. As previously stated, the features available on these existing mobile apps were very similar to the respondent's desired mobile app features; therefore, it will be important for the designers to differentiate the campaign's mobile app in order to provide a competitive advantage to other, similar mobile apps.

The last question on the online survey instrument was open-ended and provided the respondents with an opportunity to share any of their perceptions or thoughts in regards to the survey. While only sixteen respondents commented, their feedback provided an additional dimension regarding those individual respondents' attitudes and perceptions towards mobile technology. Each comment was categorized into three larger theme groups: positive, negative, and concern. The positive comments inferred that the respondents were excited and interested in the mobile app, while the negative comments indicated important additional potential barriers to consider with respect to using mobile technology (i.e., glare from the sun, lack of cellular service) that were not included in the original scales. These additional potential barriers should be investigated further by the mobile app team, including field testing of the mobile app to determine problems with sun glare on the visibility of the mobile app's interface. Also, if the mobile app designers decide to use real-time features, it will be vital to test different areas to determine whether a boater has access to cellular service in the Mosquito Lagoon area. Concern

responses included uncertainty over whether the mobile app would "*put more pressure on the Lagoon*" (i.e., environmental impact) and the real-time accuracy of the mobile app's features. Further, one respondent requested that the researchers "*be true to the fisherman*," which seems to indicate that this and future studies should include boater feedback and also include boaters in the decision making process.

The present study provided a unique perspective of this boating population use of mobile technology through the application of traditional communication theories and also provided new insights into emerging mobile technology. It is important to note that the results from this study are suggestive, not conclusive and there are a number of limitations that must be acknowledged. The next section will discuss these limitations and will be followed by suggestions for addressing them in future research.

Limitations

As is true for all studies, there are a number of limitations of the present study that should be acknowledged. The main limitation pertains to the sample. The researcher chose a purposive, snowball sampling procedure with the expectation of obtaining a large sample size; however, this procedure resulted in only (N = 164) completed responses. Given that the Mosquito Lagoon boating population size and overall characteristics are relatively unknown, the researcher is unsure whether this procedure created or overcame sampling bias and also whether the responses can be generalized to the larger Mosquito Lagoon boating population. Additionally, the purposively-sampled associations/organizations contacted for recruiting the present study's

respondents were also used in the process of recruiting participants for the previously conducted focus groups, which may have resulted in similar respondents and responses.

A further limitation is that the boating associations/organizations used to recruit respondents were all Internet-based. While this technology-oriented recruitment method was expected to produce respondents who are more likely to own mobile phones, it may have reduced the researcher's ability to accurately determine how many boaters in the geographic area do not use smartphones and the barriers to smartphone adoption.

The scales in this study were all adapted to reflect mobile technology. Two scales in particular (smartphone barriers - 'incompatibility with existing values;' mobile app benefits 'information-seeking') were modified and their factors were reduced as a result of a principal factor analysis. The 'incompatibility with existing values' scale was also hindered as the online survey inadvertently did not include one of the original scale's three factors. Given these scale modifications and the lack of generalizability with this cross-sectional study, it is unclear whether any of these changes had an effect on the results. While caution is warranted with the interpretation of these results, this investigation was exploratory in nature and provides a framework for future studies.

Finally, in regards to the qualitative coding procedures for the mobile app feature categories, the researcher was the sole coder. She attempted objectivity by coding two separate times, two months apart and the second coding elicited a 97% agreement. However, it cannot be determined if a second independent coder would have had the same percentage of agreement.

Future Research Recommendations

Future studies that further extend and refine theoretical knowledge pertaining to the diffusion of innovations, uses and gratifications, and the technology acceptance model in this mobile app context are encouraged. It is also recommended that future research provide more depth and direction to campaign planning in terms of what mobile app features boaters would prefer and how these desired features could be combined to help better protect marine habitats and ecosystems in Mosquito Lagoon. For example, the online survey respondents indicated that they would prefer maps of the key features in the Lagoon; therefore, the mobile app designer could provide maps of these features while also highlighting the locations of sensitive marine habitats and ecosystems.

While the researcher had an adequate rationale for selecting the purposive sampling groups, future studies should attempt to recruit more diverse relevant groups of research respondents by possibly visiting local boating events (fishing tournaments; boat shows) in order to provide further insights into mobile technology use (and non-use) by Mosquito Lagoon boaters. This study was successful in reaching and examining the targeted recreational power boater audience; however, it would be worthwhile to expand the sampling parameters both in terms of the type of boater (i.e., recreational versus commercial; power boater versus kayaker) and the boating location (Mosquito Lagoon versus off-shore) to determine whether these features would be relevant and beneficial to larger boating populations.

There were two particularly interesting findings worth noting from the survey. First, the results indicated a possible shifting of mobile app gratifications toward information-seeking. As

the present study's limitations prevent the ability to fully explain this finding, it is recommended that future studies include uses and gratifications information-seeking scales to examine this phenomenon. Second, in regards to desired features, a social media element (e.g. the ability to personalize the mobile app) was one of the most desired 'single' features but was ranked relatively low when respondents were asked to compare it against all the available features. Given this inconsistency, future research should investigate the population's attitude towards specific dimensions of the social media mobile app feature before possibly implementing it into a mobile app.

It is hoped that the Mosquito Lagoon recreational power boating population will adopt the planned mobile app. Careful identification, assessment, and integration of the desired features should help increase the likelihood of the mobile app's adoption and provide new avenues for disseminating environmental information and promoting careful and ecologically-responsible boating behavior. It would be appropriate to conduct follow-up research with boaters after the actual mobile app is released in order to evaluate the intended effectiveness, any unintended consequences as a result of the mobile app adoption, and possible new uses and gratifications specific to this new targeted mobile app technology.

Conclusion

Smartphones and mobile apps have advanced both in terms of technological capabilities and the number of adopters from just a few years ago. As costs continue to decrease and the available features increase, there will soon be a smartphone and a mobile app for (or at least

available to) a large percentage of the American adult population. Further, as more and more developers create mobile apps and the market growth expectations rise, understanding what the audience wants or needs from their mobile apps will become increasingly important.

The results of this study provided a glimpse into a small subset of the population. While this study was exploratory in nature and is limited in generalizability, many of the findings (barriers and common uses) were consistent with the results from previous empirical research.

The study also provided the researcher with some interesting results which seem in line with new survey data from the Pew Internet Research Center. For example, Purcell (2011b) found that a shift is occurring where more American adults look for mobile apps to fulfill their information-seeking versus escape needs. The results from the study also suggest that respondents also look to mobile apps to fulfill their information-seeking versus escape needs from mobile apps.

Recently Zickuhr and Madden (2012) found that an increasing number of older adults (age 65 and over) are adopting new media. This adoption pattern also appeared in the present study and the results indicated that more than half of the respondents age 65 and over reported using mobile technology. Overall, the adoption rate of mobile technology among the respondents was higher than expected, which could be attributed to recruiting respondents by email and through Internet organizations and associations.

Utilizing mobile technology in environmental social marketing campaigns is new and exciting; however, much is still unknown as to whether this technology will be successful in

promoting attitude and behavioral changes or simply distract from the campaign's message. The respondents overall seemed interested in the planned mobile app, perceived many of the potential features to be useful, and indicated intent to download the mobile app if it was available. This study was able to provide insights into which of the mobile app's potential features boaters would find most useful; yet the next discussion needs to focus more on how these features could aid boaters in boating more carefully and responsibly to help protect Mosquito Lagoon species and habitats.

APPENDIX A:
ANALYSIS OF PREVIOUS FOCUS GROUP DATA
CATEGORIZATION AND FREQUENCIES

Categorization and Frequency of

Mobile Apps Used and Desired App Features

from Analysis of Prior Focus Group Data

Mobile Apps Used:

General non-boating apps - apps not specifically designed for boaters

- Google Earth (8)
- Bing Maps (1)
- Google Maps (1)
  See-Click-Fix(1)
  Android Map (1)

Boating-related Apps - apps designed and tailored towards boaters

- iAngler (2)
- Avionics (1)
- FWC (1)
- Boat US (1)

Desired App Features:

Area Conditions - related to weather and water conditions at the Lagoon

Weather

- Weather radar (4)
- Weather report (1)
- Weather (5)

Water Cleanliness

- Algae bloom updates (1)
- Algae bloom (1)
- Water cleanliness (1)

Water Level

- Water level (5)
- Average water level (1)

Water Temperature

- Water temperature (1)

Wind Direction and Speed

- Wind direction (4)
- Wind speed (2)
- Wind (1)

Sunrise, Sunset, Tides and Lunar Phases

- Sunrise and sunset (2)

- Lunar phases (1)
- Tides (1)
- Lunar charts (1)

Navigation- related to navigating the Lagoon

GPS and General Maps

- GPS (10)
- GPS w/ granular detail (1)
- GPS (real time) (1)
- Charts (1)
- Aerials (1)
- Maps (4)

GPS with Navigation

- GPS w/directions (2)
- Directions routing (1)
- Navigation (1)
- Indicator alerts (shallow areas) (2)
- Warning indicators (2)

Maps of Key Features

- Maps of shallows (2)
- Shallow areas (2)
- Shallows (1)
- Sandbars (1)
- Key points in the Lagoon (1)
- Cuts (1)
- Channel markers (3)
- Charts indicating running lanes (1)
- Map of shoals (1)
- Shoals (1)
- Water contours (1)
- List of ramps (4)

Water Depth Charts

- Water depths (3)
- Depth charts (2)

Zoning and Enforcement Maps

- No wake zones (1)
- Slow zones (1)
- No motor zones (1)
- Manatee zones (1)
- Highlight manatee zones (1)
- No fish zones (1)
- Pole and Troll zones (3)
- Sanctuaries (1)

Customization - related to customizing the mobile app for each individual user

Socialization and Customization

- Mark favorite spot (1)
- Mark fishing spot (1)
- Fishing Picture (1)
- Forums (1)

Fishing Regulations - related to fishing rules for the area

Rules, Regulations, and Seasonal Slot Limits

- Slots (1)
- Seasonal slot limits (3)
- Slot limits (1)
- Rules and regulations (1)

Government Hotline Information

- Links to government agencies (1)
- Links to information (website for more information about the area) (1)
- Links to USGS and Haulover Canal (1)
- Alligator hotline (1)
- Manatee hotline (1)
- Closures (NASA) (1)
- Closures (fires and controlled burns) (1)

Educational Information

Boater Education

- Boater Education (1)
- Education (1)
- Correct boat type information (flat boat vs. yacht) (2)

Species Information

- Sea grasses (1)
- Manatees (1)
- Wildlife (1)
- Common species in the area (1)
- Fish species (1)
- Birds (1)
- Alligators (1)
- Sea grass bed locations (1)

Other

- Best fishing areas (1)
- Boat ramp traffic (2)
- Bait and tackle shops (1)
- Water (2)

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APPENDIX B:
EMAIL TO LEADERS OF BOATING ORGANIZATIONS AND ASSOCIATIONS

Dear Boating Organization Leader:

I am a graduate student at the University of Central Florida and I would like to invite you and the members of [boating organization name here] to take part in an online survey on boaters' use of mobile phone technology. Participation is encouraged regardless of whether an individual uses this type of technology or not. Everyone's answers will be equally valuable to this study.

The survey will take about 10 minutes and will be extremely helpful in developing a technology-based outreach campaign to promote environmentally-responsible boating in Mosquito Lagoon. The survey is completely confidential and no personally identifiable information will be obtained.

Participants must be 18 years of age or older to participate in this survey and participation is entirely voluntary. The survey is part of my master's thesis research and is connected to a larger interdisciplinary Florida Sea Grant project focusing on environmental education and Mosquito Lagoon.

If you would please send this email survey to your [name of boating organization here] members to complete, I would be most grateful to learn about their viewpoints and attitudes towards mobile technology.

Thank you very much for your time and cooperation.

Sincerely,

Kamra Bowerman, Masters Student

Graduate Research Assistant

School of Communication

University of Central Florida

APPENDIX C:
PARTICIPANT EMAIL AND SURVEY INTRODUCTION

Email invitation to potential survey respondents:

Hello,

I am a graduate student at the University of Central Florida and I would like to invite you to take part in a survey on boaters' use of mobile phone technology. Your participation is encouraged whether you use this technology or not. Your answers will be equally valuable to the study. The survey will take about 10 minutes and will help us greatly in developing a technology-based outreach campaign to promote environmentally-responsible boating in Mosquito Lagoon. The survey is completely confidential and no personally identifiable information will be obtained.

You must be 18 years of age or older to participate in this survey and your participation is entirely voluntary. The survey is part of my master's thesis research and is connected to a larger interdisciplinary Florida Sea Grant project focusing on environmental education and Mosquito Lagoon. By clicking on the "Continue" button below, you are giving your consent to participate in this research study.

If you have already taken the survey, please do not take it again but pass it on to your fellow boaters!

Thank you very much for your time and cooperation.

Sincerely,

Kamra Bowerman, Masters Student

Graduate Research Assistant

Nicholson School of Communication

University of Central Florida

Study Contact

For questions about the study or to report a problem: If you have questions, concerns, or complaints, please feel free to contact Kamra Bowerman (K.Bowerman@knights.ucf.edu) or Dr. Denise DeLorme (Denise.DeLorme@ucf.edu).

IRB Contact

For questions about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research &

Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

https://ucfcos.us2.qualtrics.com/SE/?SID=SV_3xugEWt7o6DtRRj

APPENDIX D:
PARTICIPANT SURVEY

Participant Survey
[Items in brackets were not visible to survey respondents]

1. Welcome. Thank you for agreeing to take part in this survey. You must be 18 years or older to participate in this survey. So first, are you age 18 years or older?
    a. Yes [go to Q2]
    b. No [Go to Survey Ending 1]
2. I would like to ask you a little bit about the technology you use while boating. Which of the following boating technologies, if any do you use *while* boating in the Mosquito Lagoon? Please select all that apply. [After go to Q3]
    a. Handheld GPS (Excluding mobile phones. For example a Garmin GPS units.
    b. Top Spot Maps
    c. Chart Plotter
    d. Depth Finder
    e. Fish Finder
    f. Other (Excluding mobile phones)
3. Now I'd like to ask you about some non-boating technology. Do you currently own a smartphone? Smartphones are mobile phones that allow users to download and use apps, send email, and surf the Internet. Examples of smartphones are Android, Blackberry, the iPhone, or Windows 7 Phone.
    a. Yes [Go to Q5]
    b. No [Go to Q4]
    c. Not sure [Go to Q6]
4. Thank you. We would like to understand why you do <u>not</u> currently own or use a smartphone. Please indicate how much you agree or disagree with the following statements… I don't have a smartphone because[1]… [Based on a 5-point Strongly disagree to Strongly agree Likert scale…After go to Q22]
    a. [Incompatibility with existing values (*hidden from participants on the actual survey*)]
        i. My regular cell phone is already convenient enough to use.
        ii. Using a smartphone is expensive.
    b. [Absence of observable benefits (*hidden from participants on the actual survey*)]
        i. The features on smartphones are useless to me.
        ii. I do not have a need for a smartphone.
        iii. I have no opportunity to use a smartphone.

[1] Fortenberry & Brown (2011)

5. Thank you. Please indicate which type of smartphone you currently own. Please select all that apply.[2] [After go to Q6]
    a. Android based phone
    b. Blackberry
    c. iPhone
    d. Windows Phone
    e. Other (please indicate)
    f. Don't Know/Not sure
6. Now I would like to ask about some of the features of your smartphone. Have you ever downloaded or used a preexisting software application or 'app' on your smartphone? A few examples of apps include: Google Maps, Google Earth, Angry Birds, and Fandango.
    a. Yes [Go to Q9]
    b. No [Go to Q8]
    c. My phone does not allow me to download apps. [Go to Q7]
7. It seems as if your phone may not be a smartphone. We would like to understand why you do not currently own or use a smartphone. Please indicate how much you agree or disagree with the following statements… I don't have a smartphone because[3]… [Based on a 5-point Strongly disagree to Strongly agree Likert scale…After go to Q22]
    a. [Incompatibility with existing values (*hidden from participants on the actual survey)*]
        i. My regular cell phone is already convenient enough to use.
        ii. Using a smartphone is expensive.
    b. [Absence of observable benefits (*hidden from participants on the actual survey)*]
        i. The features on smartphones are useless to me.
        ii. I do not have a need for a smartphone.
        iii. I have no opportunity to use a smartphone.
8. Thank you. We would like to understand why you do not use or download apps to your smartphone.[4] Please select all that apply.[After go to Q17]
    a. I'm not familiar with what apps are.
    b. I don't know how to use apps.
    c. I have no need for apps.
    d. Apps don't work on my mobile phone.
    e. Apps are intrusive to my privacy.
    f. I get my information in other ways.

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[2] Nielsen Wire (2012)
[3] Fortenberry & Brown (2011)
[4] Fortenberry & Brown (2011)

9. Thank you. We would like to understand what you see as the benefits of using smartphone apps. Please indicate how much you agree or disagree with the following statements… I use smartphone apps to[5]… [Based on a 5-point Strongly disagree to Strongly agree Likert scale…After go to Q10]
    a. [Cognitive – Information-Seeking (*hidden from participants on the actual survey*)]
        i. Find information about products or services.
        ii. Track or manage my health.
        iii. Shop or make purchases.
        iv. Get updates on news, weather, sports or stocks.
        v. Communicate with others.
        vi. Perform work-related tasks.
    b. [Social Integrative (*hidden from participants on the actual survey*)]
        i. Let others know I care about them.
        ii. Stay in touch with people I don't see often.
        iii. Keep up-to-date on people and events.
        iv. Feel involved with what's going on with other people.
    c. [Escape (*hidden from participants on the actual survey*)]
        i. Keep me company.
        ii. Be entertained.
        iii. Have fun.
        iv. Relax.
        v. Pass the time.
        vi. Chat with others.
10. From the list below, please select the reason or reasons that you typically use smartphone apps.[6] Please select all that apply. [After go to Q11]
    a. Finding information on news, weather, sports, or stock updates.
    b. Accessing the Internet.
    c. Learning about something I'm interested in.
    d. Getting information about a destination I am visiting.
    e. Shopping or making purchases.
    f. Getting more information about an event I'm attending.
    g. Playing games.
    h. Getting directions.
    i. Other

[5] Wei (2008) modified using common motivations Purcell (2011b)
[6] Purcell (2011b)

11. We would also like to know about any smartphone apps you may use while boating in Mosquito Lagoon. From the list below, please select which apps, if any, you use while boating. Please select all that apply.[7] [After go to Q12]
    a. Android Maps
    b. Navionics
    c. Boat US
    d. Florida Wildlife Center (FWC)
    e. Google Earth
    f. Google Maps
    g. iAngler
    h. See-Click-Fix
    i. Other (Please indicate) [*open-ended*]
    j. I do not use apps while boating.
12. Which of these smartphone apps is the most helpful to you while boating in Mosquito Lagoon? [After go to Q13]
    a. [*Open ended*].
13. Do you ever use smartphone apps to get directions to certain geographic locations or to find maps of an area? Examples of these types of map-based apps are Apple Maps, Google Maps, and Google Earth.
    a. Yes [Go to Q15]
    b. No [Go to Q14]
14. Thank you. We would like to understand why you do not use or download map-based apps to your smartphone. Please select all that apply.[8] [After go to Q18]
    a. I'm not familiar with these kinds of apps.
    b. I don't know how to use these kinds of apps.
    c. I have no need for these kinds of apps.
    d. These kinds of apps don't work on my phone.
    e. These kinds of apps are intrusive to my privacy.
    f. I get map-based or directional information in other ways.
15. We would like to know what you get out of using map-based apps. Please indicate how much you agree or disagree with the following statements… I use map-based apps such as Apple Maps, Google Maps, Google Earth because[9]… [Based on a 5-point Strongly disagree to Strongly agree Likert scale…After go to Q16]

[7] Analysis of Previous Focus Group Data, see Appendix A
[8] Fortenberry & Brown (2011)
[9] Lindqvist et al., 2011 (usefulness); Chua, Goh, & Lee (2012) information-seeking, information quality, escape

a. [Cognitive – Information-Seeking (*hidden from participants on the actual survey*)]
   i. They help me find a location.
   ii. They make it easy to get information I need.
   iii. They provide up-to-date information.
   iv. They are more convenient than accessing information from other sources.
   v. They provide immediate access to information anywhere at any time.
b. [Information Quality (*hidden from participants on the actual survey*)]
   i. I can trust the information I receive on these apps.
   ii. I know the information from these apps will be accurate.
   iii. I know I can rely on the information from these apps when I need it urgently.
c. [Escape (*hidden from participants on the actual survey*)]
   i. They allow me to escape from my daily activities.
   ii. They help me combat boredom.
   iii. They help me pass time.
   iv. They are a pleasant break from my routine.
   v. They are entertaining to use.
   vi. They help me to relax.
d. [Perceived Usefulness (*hidden from participants on the actual survey*)]
   i. They allow me get directions to a place I am interested in going to.
   ii. They allow me to get tips about a place I am interested in going to.
   iii. They motivate me to go to new places.
   iv. They help me discover new places.
   v. They help me keep track of places I have visited.

16. What do you typically use your map-based smartphone apps for?[10] Select all that apply. [After go to Q18]
    a. To get directions to a location I would like to visit.
    b. To get recommendations about a place I would like to visit.
    c. To get information related to my present location.
17. We understand that you do <u>not</u> currently download apps on your smartphone, but we think it is important to get your opinion on an app being developed <u>for Mosquito Lagoon</u>. Would you like to rate some of the proposed features of the Mosquito Lagoon app?
    a. Yes [Go to Q18]
    b. No I am not interested in providing my opinion on this app. [Go to Q22]
18. We would like to get your opinion on possible features for a new smartphone boating app. If an app was developed specifically for boaters in Mosquito Lagoon, which of the

[10] Zickuhr & Smith (2011)

following features of the app do you think would be *useful* or *not useful* while boating in the Mosquito Lagoon?[11] [Based on a 5-point Not at all useful to Very useful Likert-type scale…After go to Q19]

a. [Boater Education (*hidden from participants on the actual survey*)]
    i. Information on how to boat in an environmentally-responsible way such as avoiding sea grasses and information about what types of boats are most appropriate for Mosquito Lagoon.
b. [Customization and Social Media (*hidden from participants on the actual survey*)]
    i. Ability to save the geographic location of my favorite fishing spot in Mosquito Lagoon so I can find it again readily and the ability to personalize the app and share pictures of my catch with others.
c. [Government Hotline Information (*hidden from participants on the actual survey*)]
    i. Links and contact information to Haulover Canal USGS (U.S. Geological Service) Website or other local government agencies including the manatee and alligator hotlines.
d. [GPS and general maps (*hidden from participants on the actual survey*)]
    i. General aerial maps (similar to maps found on Google Earth).
e. [GPS with navigation (*hidden from participants on the actual survey*)]
    i. Ability to track my boating patterns while on the water (similar to an automobile GPS with turn by turn directions.)
f. [Maps of key features (*hidden from participants on the actual survey*)]
    i. Maps of key areas in the Lagoon (like boat ramps, shallows, shoals, sandbars, oyster reefs, and channel markers).
g. [Rules and regulations and seasonal slot fish limits (*hidden from participants on the actual survey*)]
    i. Rules and regulations for fishing in Mosquito Lagoon as well as slot limits for each fish species based on the season.
h. [Species Information (*hidden from participants on the actual survey*)]
    i. Information about common species found in the area (sea grasses, mangroves, types of fish, birds, alligators, etc.)
i. Sunrise, sunset, tides, and lunar phases information.
j. Water cleanliness information including updates on the algae bloom.
k. A general map showing the average water depths in the Lagoon.
l. Current water level information (similar to information available through the Haulover Canal USGS website.)

[11] Analysis of Previous Focus Group Data, see Appendix A

m. Current water temperature information.
n. Current weather radar information to track storms or check the weather at the Lagoon.
o. Current wind direction and wind speed at the Lagoon.
p. Zoning and enforcement maps.
q. Locations of pole and troll zones, manatee zones, no wake zones, or no motor zones.

19. Which of these smartphone app features would be <u>most useful</u> to you while boating in Mosquito Lagoon? Please select only one. [After go to Q20]
    a. [Boater Education (*hidden from participants on the actual survey*)]
        i. Information on how to boat in an environmentally-responsible way such as avoiding sea grasses and information about what types of boats are most appropriate for Mosquito Lagoon.
    b. [Customization and Social Media (*hidden from participants on the actual survey*)]
        i. Ability to save the geographic location of my favorite fishing spot in Mosquito Lagoon so I can find it again readily and the ability to personalize the app and share pictures of my catch with others.
    c. [Government Hotline Information (*hidden from participants on the actual survey*)]
        i. Links and contact information to Haulover Canal USGS (U.S. Geological Service) Website or other local government agencies including the manatee and alligator hotlines.
    d. [GPS and general maps (*hidden from participants on the actual survey*)]
        i. General aerial maps (similar to maps found on Google Earth).
    e. [GPS with navigation (*hidden from participants on the actual survey*)]
        i. Ability to track my boating patterns while on the water (similar to an automobile GPS with turn by turn directions.)
    f. [Maps of key features (*hidden from participants on the actual survey*)]
        i. Maps of key areas in the Lagoon (like boat ramps, shallows, shoals, sandbars, oyster reefs, and channel markers).
    g. [Rules and regulations and seasonal slot fish limits (*hidden from participants on the actual survey*)]
        i. Rules and regulations for fishing in Mosquito Lagoon as well as slot limits for each fish species based on the season.
    h. [Species Information (*hidden from participants on the actual survey*)]
        i. Information about common species found in the area (sea grasses, mangroves, types of fish, birds, alligators, etc.)
    i. Sunrise, sunset, tides, and lunar phases information.
    j. Water cleanliness information including updates on the algae bloom.
    k. A general map showing the average water depths in the Lagoon.
    l. Current water level information (similar to information available through the Haulover Canal USGS website.)
    m. Current water temperature information.
    n. Current weather radar information to track storms or check the weather at the Lagoon.

o. Current wind direction and wind speed at the Lagoon.
p. Zoning and enforcement maps.
q. Locations of pole and troll zones, manatee zones, no wake zones, or no motor zones.
r. None of these would be useful to me while boating in the Mosquito Lagoon.

20. If a smartphone app developed specifically for Mosquito Lagoon was available, how much would you agree or disagree with the following statements?[12] [After go to Q21]
    a. I would use this app.
    b. I expect to have a need for this app in the future.
    c. I think this app would make boating easier for me.
    d. I think this app would be useful to others.
21. If a fee was charged for this smartphone app and the proceeds went to restoring the Mosquito Lagoon area, how much money would you consider paying for the app? (Restoration may include rebuilding oyster reefs, planting sea grasses or other environmental projects related to Mosquito Lagoon.) (Sliding scale from $0 - $15) [After go to Q22]
22. Thank you. Just a few final questions. What is your current age? [*open ended*]
23. Please indicate your gender.
    a. Male
    b. Female
24. What is the highest level of education that you have completed?
    a. Some high school
    b. High school graduate/ G.E.D.
    c. Some college
    d. Trade/Technical/Vocational Training
    e. College graduate (4 year institution)
    f. Some post graduate work
    g. Postgraduate degree
    h. Professional degree
25. Which of the following best describes your race?
    a. Asian/Asian American
    b. Black/African American
    c. Caucasian/White
    d. Hispanic/Latino
    e. Multiracial
    f. Pacific Islander

[12] Lopez-Nicolas et al., 2008

g. Other

26. What is your annual household income before taxes? (select one)
    a. Less than $10,000
    b. $10,000 to under $20,000
    c. $20,000 to under $30,000
    d. $30,000 to under $50,000
    e. $50,000 to under $75,000
    f. $75,000 to under $100,000
    g. $100,000 to under $200,000
    h. $200,000 or more
27. In which of the following geographic areas do you boat most frequently?
    a. Banana River
    b. Indian River Lagoon
    c. Mosquito Lagoon
    d. St. John's
    e. River
    f. Other, please specify [*open ended*]
28. Which one of the following categories best describes you as a boater? Please select only one category. [After go to Ending 2]
    a. Commercial power boater angler
    b. Recreational power boat angler
    c. Commercial kayaker
    d. Recreational kayaker
    e. Other, please specify [*open-ended*]
29. If you have any comments based on the information obtained or the questions asked during the survey, you are welcome to share them here or contact the main researcher through the contact information provided in the survey invitation.
    a. [*Open ended response*]

Ending 1: We appreciate your interest in the project but unfortunately you need to be age 18 years or older to participate in this survey. Thank you.

Ending 2: You have reached the end of the survey! Thank you very much for taking the time to provide us with your attitudes about using mobile technology while boating in the Mosquito Lagoon. Your responses are extremely important to the project.

Please forward the link to this survey to your fellow Mosquito Lagoon boaters. The survey will be available online from (date to date) (*2 week time period*). <link to survey>

APPENDIX E:
IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Kamra D. Bowerman**

Date: **January 16, 2013**

Dear Researcher:

On 1/16/2013, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Modification Type:	Revision to Study Title, Protocol, Consent, Survey Organizational letter and Participant letter
Project Title:	AN INVESTIGATION OF BOATERS' ATTITUDES TOWARD AND USAGE OF TARGETED MOBILE APPS
Investigator:	Kamra D. Bowerman
IRB Number:	SBE-12-09016
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Patria Davis on 01/16/2013 10:04:21 AM EST

IRB Coordinator

APPENDIX F:
VARIABLE MEASUREMENT SCALE STATEMENTS

Appendix F
Variable Measurement Scale Statements

I. Smartphone Barriers[13]
    A. Incompatibility with existing values
        1. My regular cell phone is already convenient enough to use.
        2. Using a smartphone is expensive.
    B. Absence of observable benefits
        1. The features on smartphones are useless to me.
        2. I do not have a need for a smartphone.
        3. I have no opportunity to use a smartphone.
II. Mobile App Benefits[14]
    A. Information-Seeking
        1. Find information about products or services.
        2. Get updates on news, weather, sports or stocks.
    B. Social Integrative
        1. Communicate with others.
        2. Stay in touch with people I don't see often.
        3. Keep up-to-date on people and events.
        4. Feel involved with what's going on with other people.
        5. Keep company.
        6. Chat with others.
    C. Escape
        1. Be entertained.
        2. Have fun.
        3. Relax.
        4. Pass the time.
III. Map-based App Benefits
    A. Information-Seeking[15]
        1. They help me find a location.
        2. They make it easy to get information I need.
        3. They provide up-to-date information.
        4. They are more convenient than accessing information from other sources.

[13] Modified scales from Fortenberry & Brown (2011)
[14] Modified scales from Wei (2008) using common motivations Purcell (2011b)
[15] Information-seeking scale from Chua et al. (2012)

5. They provide immediate access to information anywhere at any time.

B. Information Quality[16]

1. I can trust the information I receive on these apps.
2. I know the information from these apps will be accurate.
3. I know I can rely on the information from these apps when I need it urgently

C. Escape[17]

1. They allow me to escape from my daily activities.
2. They help me combat boredom.
3. They help me pass time.
4. They are a pleasant break from my routine.
5. They are entertaining to use.
6. They help me to relax.

D. Perceived Usefulness[18]

1. They allow me to get directions to a place I am interested in going to.
2. They allow me to get tips about a place I am interested in going to.
3. They motivate me to go to new places.
4. They help me discover new places.
5. They help me keep track of places I have visited.

IV. Mosquito Lagoon App Behavioral Intention to Adopt

A.Behavioral Intent to Adopt[19]

1. I would use this app.
2. I expect to have a need for this app in the future.
3. I think this app would make boating easier for me.
4. I think this app would be useful to others.

[16] Information-quality scale from Chua et al. (2012)
[17] Escape scale from Chua et al. (2012)
[18] Perceived usefulness scale from Lindqvist et al. (2011)
[19] Behavioral Intent scale from Lopez-Nicolas et al. (2008)

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